

The Scholar

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*Promoting wellbeing in young lives:
the importance of space, connection
and voice*

+
Academic essays on how emotions
influence our financial behaviours
and fighting inequality in education
from Brilliant Club Scholars.

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Introduction from The Brilliant Club

Welcome to the latest edition of The Scholar!

We are delighted to be celebrating the incredible work of pupils who have taken part in The Scholars Programme and Uni Pathways from schools across the UK.

In this edition, you will find 30 outstanding assignments with course titles ranging from 'The unseen enemy – diagnosing bacterial infections' to 'Social media, mental health and you'. This edition of The Scholar features some of the most impressive articles ever produced by pupils who have taken part in The Scholars Programme and Uni Pathways. The university-style learning that pupils are exposed to on our programmes is designed to provide pupils with the freedom to develop their own ideas and approaches. Not only will this help pupils who go on to study at university, but we believe these are crucial skills to develop in the adult world. The development of independent study skills and support with critical thinking provides young people with a platform to share their ideas. We hope it will empower these young people to engage in debates that shape our world, whether they concern the neurobiology of parenting behaviour or understanding whether there is an external world. The Brilliant Club is passionate about exposing pupils on our programmes to these important aspects of university.

We hope that these projects encourage pupils to dig a little deeper into subjects that matter to them and to seek opportunities to make unique contributions to their fields. In doing so, pupils can change their own lives by enriching them with opportunities for learning and being inspired by the topics they cover. This year, we had a record number of nominations for The Scholar, so we would like to say a huge congratulations to the pupils published in this edition and to the pupils who completed The Scholars Programme and Uni Pathways. All the pupils who graduate from the programmes should be very proud of themselves! On Page 4, we are delighted to have a guest article from Ella Devereux, who took part in The Scholars Programme when she was in Sixth Form. She is now studying Journalism at Kingston University. We would like to say a massive thank you to Ella for taking the time to write her thoughtful piece on the importance of reading and research.

If you are a teacher who would like to find out how your school can get involved with The Scholars Programme, we would love to hear from you! Please get in touch via this email address: tpschoools@thebrilliantclub.org.



The map above shows the locations of all pupils featured.

Do you want high quality tutoring led by subject experts to support pupils' learning? The Brilliant Club's Brilliant Tutoring Programme offers tutoring to reengage and rebuild pupils confidence in core subjects. Our courses have been created in collaboration with curriculum experts. Our Masters and PhD tutors have been rigorously assessed and undergo extensive training.

If you are interested in finding out more, please get in touch with us at: btpschoools@thebrilliantclub.org

Guest Article

Find the joyous moments when you read, write and research and cherish them

Ella Devereux

Scholars Programme Alumna

If 2020 taught me anything as an undergraduate student, it is that reigniting my love for reading, writing and researching was the main thing which helped navigate through a very unpredictable time. Amidst the chaos I sought refuge in finding practical things to fill the days to keep my mental health in check. Whether it was finally picking up *that* book which I had been meaning to read, double checking a fact I had heard on the news, listening to a podcast, or getting an old notepad and scribbling down what I had been feeling that day, it all made three national lockdowns a little more manageable.

I was finally doing all of these things for pleasure again, and it was a breath of fresh air. After years of compulsory academic study, I think we can often feel burnt out at the thought of voluntarily conducting research, reading or writing. We lose joy and pleasure in these skills because we see them as things which serve a narrow purpose: to help us pass exams. All too often by association we see them as a means to an end in our studies, rather than things which can be experimented with and that we can do for fun.

Covid-19 came along and created a rift in academia which could have never been predicted. How on earth would we judge the intellectual capabilities of our young people if we did not have exams? Institutions began to question the necessity of timed exam papers and shifted the focus onto alternative forms of assessment. I fundamentally believe that this issue would be far less contentious if we were more willing to embrace young people writing for pleasure, conducting independent research and thinking critically about the ideas and institutions which surround them.

It is incredibly hard to identify parts of compulsory education which aren't overshadowed by rigid mark schemes and core textbooks. Which is why programmes like The Brilliant Club should be cherished by education institutions and those within them; it is in these moments of analyses, lateral thinking, and inspiration which we will find joy in studying again.

I took part in The Scholars Programme when I was in sixth form. I appreciated any alternative forms of examination and particularly enjoyed delving into topics beyond the realms of my A-Level specification. Since then I have always held onto the feeling of accomplishment when an idea hits the page, or one question leads you onto another and you are free to explore new concepts and change your mind along the way.

As always, this edition of The Scholar is rich with ideas from bright young brains. It is a testament to inquisitiveness and enjoyment of reading, writing and researching which makes these papers so wonderful. Particularly with the challenging year, which was 2020, it is a hunger for knowledge and finding joy in reading and writing once again which will prevail above all other things and carry them along their own paths of education. I do hope they can cherish these moments in the future as much as I have done this year.

Ella Devereux,
Scholars Programme Alumna, 2017



Arts and Humanities

In the eleventh century, the difference between invader and native was a matter of perspective. Do you agree?

Year 6, Key Stage 2

Pupil Name: **B. Kos**

School Name: **Ashwood Spencer Academy, Derby**

Supervised by: **Dr R. Shields**

Tutor University: **Royal Holloway, University of London**

Course Title: **Invasion, Integration and Identity - Britain in the Eleventh and Twelfth Centuries**

A matter of perspective is the way you see something, based on your nationality, the sources you have access to, what people think around you and your culture. An example: let's say you are from a country, and one day a random person or group of people decide to take over. You would think that they are invaders. They on the other hand might think they are not invaders and are just settlers trying to grow crops or just live their life happily.

I believe that the difference between native and invader is a matter of perspective, and not how it happened in real life. Proof of this is shown in the 10th, 11th and 12th centuries as many people believed they were native even though the true ones were the Britons.

One of the pieces of evidence is the fact that Geoffrey of Monmouth (a historian and bishop from the twelfth century) believed the true natives of Britain were the Cornish and Welsh (called Britons). William of Newburgh (another historian) thinks that Geoffrey is incorrect and possibly Anglo-Saxons are natives. Another piece of evidence is the fact that the Vikings were thought to be aggressive pagans. But that was not true. That shows how culture can affect your point of view. The way it proves that culture affects your point of view is because one of the reasons they are hated by other medieval people is because they are pagans.

Vikings were always thought to be aggressive and were also thought to be only invaders. But was that true? No, the truth was that they were peaceful settlers just looking for land due to the fact that they could not grow any food in Scandinavia (Denmark, Norway and Sweden). That means that they would have not attacked if they were not so desperate for food. An example of Vikings settling in England due to desperation is shown in Viking story called Havelock the Dane. Havelock the Dane is about a boy whose father and sister are killed by a wicked man, called Godart. Luckily, he's saved by a servant named Grim. Grim and Havelock sailed to England and founded the town of Grimsby. Havelock acts as if he's Grim's son and while working he gets very strong physically. One day the old English king dies, but before that happens, he asked his second in command to marry his daughter to the best man in England. Instead, he married her to the strongest man in England to trick her out of the king's

kingdom. When they got married the king's daughter was woken by a light coming from his mouth. It turns out that the light was a Kyne mark. A Kyne mark is a birthmark that is in a shape of cross. It is a mark given to true kings. In a dream an angel says to her that he's the king of Denmark. When Havelock found out, he went back to Denmark, where he won over the people and defeated the Godart. After that he sails back to England with his Danish army (Here). While he's sailing Godrich (previous kings second in command, gave a speech. In that speech he states that the Vikings will hang them, and kill them, make them slaves, tie up priests and strangle nuns and monks. When Godrich is defeated, they do none of the things described by him. After that they rule for sixty years, have fifteen children and are compassionate for the poor. All their children became kings and queens and Grim and his kids' earls. Everyone lives happily ever after. The way the Vikings prove my point is because they state they belong in Britain as shown in Havelock the dane. The other inhabitants of Britain don't think so.

Normans were Vikings who had settled in northern France. The most well-known thing they ever done was the Norman conquest of Britain. The Norman conquest was when the Normans invaded England. The Norman conquest happened in the year 1066. The reason it happened was because William (the Duke of Normandy) had been promised the throne through an oath, made by Harold Godwinson (earl of Wessex). When he realised that Harold was king, he was furious and made an alliance with a Viking King. The Viking King started a battle but was quickly defeated. William on the other hand, started a battle called a battle of Hastings. Unlike at the other battle Harold was killed and William had won. His death was caused by an arrow to the eye. William was crowned as the new king of England on Christmas day 1066. The location of his coronation was Westminster Abbey. There were many rebellions against William. These rebellions did not stop William though. These people prove my point, as William believed that he belonged in England because of his point of view.

Anglo-Saxons were the Saxons who were driven away by flood in their homeland (Germany). Just like the Vikings, they only invaded England because they were desperate. They did not specialize in wars. What they did specialise in was woodwork and farming. They also made jewellery out of metal. They were the first people to live in England after the Britons. They also were the people who established the kingdom of England and made half of medieval language. They were living in England from the year 450 to the year 1066. The last Saxon king was Harold Godwinson, who was killed during the Norman conquest. A famous historian from the twelfth century was Anglo Saxon. His name was William of Newburgh. William used to criticize other historians and historical figures. William was born in Yorkshire and was a priest. He was especially critical of one person. That person was Geoffrey of Monmouth. According to William of Newburgh, Geoffrey was writing fictions about Britons, and that Britons were greater than Macedonians and Romans. The Saxon's prove my point as the last saxon king (Harold 3rd) believed he should be king because more than William mainly because of his nationality.

The Britons were the Natives of England. They owned all of England from shore to shore. according to Geoffrey of Monmouth the last English king before the Saxons reign over England was King Arthur. The two people who made up the Britons were the Cornish and the Welsh. Geoffrey of Monmouth was most likely Welsh, meaning he was a Briton. He wrote books one of which is called 'the history of the kings of Britain.' Another king described by Geoffrey of Monmouth was named king Vortigen. The king was in many stories one of which is called 'The prophecies of Merlin. The Britons had lived in England since the stone age. This group confirm my point because most of the people that believe they are native are British.

I believe that the difference between natives and invaders is a matter of perspective. Another point that proves my opinion is the fact that people couldn't except the truth meaning they thought they were native.

Tutor comment:

"B. is a fantastic student and brilliant writer. This essay illustrates his strong knowledge of the topic and great critical evaluation of the evidence. It is really well written, with a perfect structure, and thoroughly deserving of a first. He has a great career as a historian ahead of him."

What is war?

Year 6, Key Stage 3

Pupil Name: N. Laviniere

School Name: St Angela's Ursuline School, Newham

Supervised by: T. Ogbe

Tutor University: King's College London

Course Title: What is war?

Introduction

War is a phenomenal concept deriving from multiple cultural traditions of warfare that can be defined as a mutual form of armed conflict centred around a political, social, or environmental contention that emanates amongst the state, government, or paramilitary groups/alliances. Civil wars are a type of warfare concerning two entities within the same state or city that are at an existing conflict. For example, the Spanish Civil war (1936 - 1939), and the English Civil war that occurred during the seventeenth century. Often when considering the topic of war as a whole, it can be facilely associated with violence, hegemony, emancipation, imperialism, and liberation. The 4 main factors associated with the subject matter of wars and conflict include: justifications for war, positive and negative peace, types of war and how wars are fought? The purpose of this essay is to produce an extensive analysis by referring to the 4 factors that have been previously listed in order to demonstrate a structured argument evaluating the fundamental principles that govern the notion of war.

Types of warfare

The first recorded war in history, was fought in Mesopotamia between Sumer and Elam around 2700 BCE, known to this day through an inscription found by archaeologists with the earliest recordings referring

to prehistoric warfare linking to Ancient Jericho. The existence of war thousands of years before the present day denotes its manifestation within our changing society that have welcomed wars and conflicts by the century to lead to the seemingly endless types of warfare throughout history. I anticipate from my own knowledge that wars encompass ideology as a whole, furthermore these structural complexities of ideals ensue the hostility and vehemence concerning the violence of war. Moreover, there are multiple epitomes of the conglomerate of warfare for example: Asymmetric warfare, Conventional warfare and Unconventional warfare, Guerrilla warfare, Network-centric warfare, biological warfare, aerial warfare, Insurgencies, Cyberwarfare, proxy wars and Wars of Aggression. In justification, such example classifications of conflict relate to the ideology of war as one can infer that there is not just a lone reason for warfare. In addition, the many existing types of warfare also inexplicitly refer to the possible reasoning of the existence of wars and conflicts fought over 10,000 years ago in pre-historically cultured towns and cities of present-day Jordan, Syria, and Iraq.

Guerrilla warfare, also classified as unconventional warfare, is evident throughout the greatest wars in history. Furthermore, it involves the use of battle tactics including ambushes and compact-unit raids by smaller military groups against a larger and more formal army. Moreover, this particular type of warfare became recognisably common after 1945 as occurring conflicts involved mainly Asians and Africans attempting to depart from colonial rule by European countries, the use of guerrilla warfare was well-suited as combatants gained support from local populations and had profound knowledge of terrain. Guerrilla warfare was once again in motion due to developments of the cold war after 1945, which led to its promotion through the struggle against communism/capitalism as well as the spread of Marxism. Guerilla warfare represents the casual link between civil wars and unconventional warfare elaborating that the many types of warfare share multiple similarities and differences. Overall, these types of warfare play a constant part in human nature and could possibly increase in numbers in the years to come the compatible techniques that resonate with each example of warfare also highlight how they compare and differentiate.

How are wars fought?

Wars have featured in human history for thousands of years and have become gradually more destructive as industrialization and technology have advanced. Conflict can be perceived as an inevitable aspect of human nature, while others have accumulated the concept to amount to evil and evident destruction. The resort to war is a choice of certain unpredictability; it is not merely the questionable outcomes of battle, but the very nature of war. Traditional values elucidate the methodology that human beings discern right from wrong. International Humanitarian law and the Latin principle's jus in bello (justice during war), jus ad bellum (justice before war) and jus post bello (justice after war) are the principles that govern the conduct of warfare. The principles were first published in the United Nations charter of 1945. However, only two are the most

significant in this context as ¹. 'jus ad bellum refers to the conditions under which states may resort to war' and ². 'jus in bello regulates the conduct of parties engaged in an armed conflict'. Throughout history various principles have been established to govern the conduct of war. For example, in 1864 the first Geneva Convention was introduced to protect the sick and wounded as well as medical facility staff and civilians aiding those who are injured. The convention was signed by 10 countries in the 18th century.

The requisite for a 'cultural' understanding of war has significantly grown in recent memory. Culture as a main aspect of modern warfare is highly anticipated, for example the prodigious sum of news articles, statistics and data released by the United States government concerning the fighting in Vietnam. In addition, the notion of national style is a logical derivative of the concept of political culture. Therefore, a particular culture would evidently emphasise a chosen style in thought and action; through the framework of society, we must strive towards the prominence of comprehending culture in order to elucidate the sequence in national security behaviours. Valerie M. Hudson observed that the convolutions of interpreting culture did not arouse from what to include in its definition but rather what to exclude. ³. 'She noted that the vagueness of culture's boundaries is reflected in the all-encompassing but pithy descriptions of the term found in social science literature', presenting the argument of how outcomes of war are affected because of cultural differences evidently linking to just and unjust wars racial inequalities and the real motives behind some of the greatest wars in history. From the genesis of World War One (1914), both sides of the conflict used propaganda to influence international opinion in an attempt to influence allied and enemy countries. The government invested large-scale resources to control opinion and action internationally to justify their actions and gain national support resulting in some of the most potent propaganda ever produced. Therefore, wars are fought physically through adherence to principles based on humanitarian ethics but are also fought psychologically through propaganda manipulation and links to the cultural understandings of warfare.

Positive and Negative Peace

The existence of war and peace is perhaps the greatest philosophical barrier proposed to man. Academic Johan Galtung initiated the philosophy that peace can be regarded as both positive and negative. Negative peace is ⁴. 'Often understood as the absence of direct violence, but the reasons for the original conflict have not been resolved', while ⁵. 'positive peace is often understood as a situation whereby relationships are restored, violence has ceased, and the reasons for the original conflict has been (mostly) resolved'. For example, the first world war ended in positive peace as an armistice was signed at 11am on the 11th of November 1918. Germany signed the armistice as an agreement to peace causing the fighting to cease; in justification a solution for the initial conflict was contributed. Overall, negative peace can be defined as a circumstance that is not existing in violence but the root cause for the original conflict has not been solved; it is peace without justice. On the other

hand, Positive peace is when all conflict has ceased, and a treaty has been signed. To conclude, positive and negative peace embody the concept of warfare; negative peace leaves the previous conflict's initial reasons unresolved while positive peace resolves the root cause for the original conflict.

Justifications for war

The question of intention is heavily raised when defining war as there is rarely one clear cause for conflict. A war is only perceived as just if it is fought for a reason that is substantiating and carries sufficient moral weight. A sceptical argument by Michael Walzer introduces the fact that the ⁶. 'invention of nuclear weapons alter war so much that our notions of morality - and hence just war theories - become redundant.' The Just war theory is a doctrine of military principles. The purpose of this policy is to ensure that war is with moral reasoning. The criteria of the just war theory are divided between the jus in bello and jus ad bellum principles. Justifications for war include: ideological differences, monarchical struggles, territorial disagreement, attacks on nationalism, honour and religion, human-rights violation, attack on an ally, and self defence against an invasion. St. Augustine (354-430AD) said there were only three just causes for war: ⁷. 'defending against attack, recapturing things taken and punishing people who have done wrong.' ⁸. 'Each of these can be seen as an act of justice: they harm someone who deserves to be harmed because they have done wrong.' The use of more violence than is strictly necessary constitutes for an unjust war. Moreover, if citizens oppose a war, then it is illegitimate, and the population have the right to voice their opinions toward a government waging an unjust war. Overall, there are many justifications for war, however the just war theory determines whether wars are morally justifiable preventing all unnecessary conflict.

Conclusion

⁹. 'The art of war is of vital importance to the State. It is a matter of life and death, a road either to safety or to ruin. Hence it is a subject of inquiry which can on no account be neglected.' Sun Tzu 544 BC-496 BC.

War is a concept with many forms that still has areas within its context that humanity is yet to understand, by definition, war is a state of armed conflict focused around a political, social, or environmental argument. In this essay, I have discussed the multiple types of warfare, justifications for war, how wars are fought, and positive and negative peace (when is war and when is peace?), in order to evaluate the fundamental principles associated with wars and conflict. I have determined that wars exist in various forms with a complex foundation concerning the justifiable reasons for war and the just war theory. Systematic warfare has existed in human culture since 2700BCE and will no doubt inevitably occur in the future. Therefore, if future generations are raised in a world constantly battling conflict, what is the reasoning for the continuation of this endless cycle of destruction?

Tutor comment:

"I had a great time mentoring N. and other students in her cohort at St Angela's Ursuline School. They were very committed to the programme and this was evident in the remarkable essays they submitted. N.'s essay was exceptional in many ways. Her engagement with a broad range of literature on the concept of war was proven by the depth of her analysis. Her essay was structurally sound, with ideas evaluatively articulated in paragraphs and backed up with relevant examples. It is one of the best essays I have assessed in my four years as a Brilliant Club Tutor."

Bibliography

First Blood – History’s Earliest Recorded Military Conflicts by MilitaryHistoryNow, com published: 13 October 2014
https://militaryhistorynow.com/2014/10/13/first-blood-historys-earliest-recorded-military-conflicts/
Powerful quotes about why war written by Lynette M Burrows, published: 10 August 2020
https://lynettemburrows.com/powerful-quotes-about-why-war/
The hundred years war consequences & effects written by Mark Cartwright, published: 06 March 2020
https://www.ancient.eu/article/1520/the-hundred-years-war-consequences–effects/
The U.S. Civil War – A window into the apocalypse of World War One, published: 23 January 2017 by MilitaryHistoryNow.com
https://militaryhistorynow.com/2017/01/23/the-u-s-civil-war-a-window-into-the-apocalypse-of-world-war-one/
BBC – Ethics – War_Rules and Conventions.pdf, published: 23 April 2019 by www.BBC.co.uk
https://classroom.google.com/u/0/c/MTkyMzkwODQ2Nzl1
BBC – Ethics War_ What is a 'just cause'_.pdf, published: 04 February 2019 by www.BBC.co.uk
https://classroom.google.com/u/0/c/MTkyMzkwODQ2Nzl1
Strategic Culture A – ‘‘Cultural’’ Understanding of War, published: 10 February 2009 by Rashed Uz Zuman
https://www.tandfonline.com/doi/full/10.1080/01495930802679785
Purdue online writing lab_Topic sentences
https://owl.purdue.edu/engagement/ged_preparation/part_1_lessons_1_4/index.html
Topic Sentences and Signposting, published by: Elizabeth Abrams
https://writingcenter.fas.harvard.edu/pages/topic-sentences-and-signposting
600 years of war and peace, in one amazing chart, published by: Max Roser
https://www.vox.com/2015/6/23/8832311/war-casualties-600-years
Why do wars happen? Published: 20 May 2016 by Pal Ahluwalia and Toby Miller
https://www.tandfonline.com/doi/full/10.1080/13504630.2016.1158952
Why Nations go to war? Published: August 23, 2017
https://www.policyed.org/intellections/why-nations-go-war/video
The 8 main reasons for war, published: August 15, 2020 by Paul Goodman
https://owlcation.com/social-sciences/The-Main-Reasons-For-War
What is war definition & causes, published by: Joanna Harris
https://study.com/academy/lesson/what-is-war-definition-causes.html
Critical thinking | what is critical thinking? Published by: The University of Leeds
https://library.leeds.ac.uk/info/1401/academic_skills/105/critical_thinking
Reflective Writing in Education, published by: Monash University
https://www.monash.edu/rto/assignment-samples/education/education-reflective-writing
Different types of war and causes of war | link included below:
https://docs.google.com/document/preview?hgd=1&id=1K70E13LM_MW3e7TvV5rA-z7tcYgBz4zMdUWPw1y30
10 significant battles of the first world war, published by the imperialwarmuseum.org.uk
https://www.iwm.org.uk/history/10-significant-battles-of-the-first-world-war
The German lightning war strategy of the second world war, published by the imperialwarmuseum.org.uk
https://www.iwm.org.uk/history/the-german-lightning-war-strategy-of-the-second-world-war
Modern warfare, published by Wikipedia | link included below:
https://en.wikipedia.org/wiki/Modern_warfare
The Just War Theory – Moseley | link included below:
https://docs.google.com/document/d/18rrJ8URduYVzxN4JA_87mcrBsQgAX1XtXtFJbw8T4Ms/edit
Understanding causes of war and peace, published by Thomas Ohlson | Uppsala University Sweden
https://docs.google.com/document/d/110FdCx4nxiidZL-2lwZ0FMRwXHfzbJQ4GBZw1s5cE/edit
Understanding Global War
Authors: George Modelski
University of Washington
Patrick M. Morgan
Washington State University
https://docs.google.com/document/d/1rh9XOI0WOqhyIn1vSA1IFdoWx7U6rN6TKlvckqkRS0/edit
What is war? Published: 30 January 2008 by Jeremy Black
https://docs.google.com/document/d/119JqSE8Wl65sQ5RueUWNqJiCzHgGwDp7ymeEVinb7U/edit
What are the rules of war and why do they matter? Published: 19 October 2016
https://www.icrc.org/en/document/what-are-rules-of-war-Geneva-Conventions
The Just War Theory | Published by: Wikipedia
https://en.wikipedia.org/wiki/Just_war_theory
World War One Propaganda | The British Library

https://www.bl.uk/world-war-one/themes/propaganda
Propaganda as a weapon? Influencing international opinion, published: 29 January 2014 by Ian Cooke
https://www.bl.uk/world-war-one/articles/propaganda-as-a-weapon
Quotations:
1. 'jus ad bellum refers to the conditions under which states may resort to war'
Tutorial 3: How do we fight? Page | 22 What is war? – Scholars Programme booklet
2. 'jus in bello regulates the conduct of parties engaged in an armed conflict'.
Tutorial 3: How do we fight? Page | 22 What is war? – Scholars Programme booklet
3. 'She noted that the vagueness of culture’s boundaries is reflected in the all-encompassing but pithy descriptions of the term found in social science literature',
https://docs.google.com/document/d/1zlm_7z52_COUhD5JddLPsgZNp9kw25O2lHze6eaClzc/edit
4. 'Often understood as the absence of direct violence, but the reasons for the original conflict have not been resolved',
Tutorial 4: When is war and when is peace? Page | 28 what is war? – Scholars Programme booklet
5. 'positive peace is often understood as a situation whereby relationships are restored, violence has ceased, and the reasons for the original conflict has been (mostly) resolved'.
Tutorial 4: When is war and when is peace? Page | 28 what is war? – Scholars Programme booklet
6. 'invention of nuclear weapons alter war so much that our notions of morality - and hence just war theories - become redundant.'
https://docs.google.com/document/d/18rJ8URduYVzxN4JA_87mcrBsQgAX1XtXtFJbw8T4Ms/edit
7. 'defending against attack, recapturing things taken and punishing people who have done wrong.'
https://docs.google.com/document/d/1PpzMWLvigtYaM02RRZogvD6nuPQH-tosW_0vcP52Xc/edit
8. 'Each of these can be seen as an act of justice: they harm someone who deserves to be harmed because they have done wrong.'
https://docs.google.com/document/d/1PpzMWLvigtYaM02RRZogvD6nuPQH-tosW_0vcP52Xc/edit
9. 'The art of war is of vital importance to the State. It is a matter of life and death, a road either to safety or to ruin. Hence it is a subject of inquiry which can on no account be neglected.'
https://lynettemburrows.com/powerful-quotes-about-why-war/

Are we heading towards a dystopian society?

Year 9, Key Stage 4

Pupil Name: M. Parry
School Name: West Monmouth School, Monmouthshire
Supervised by: E. Jones
Tutor University: Cardiff University
Course Title: Dreamlands and hellscapes: creating the (im)perfect world

Dystopian societies, and the social constructs they represent, have been a prominent part of literature and philosophy for much of history, ranging from ancient Biblical texts to present-day debate on the outlook of our planet. A ‘dystopia’ is defined as “an imaginary place or condition in which everything is as bad as possible.”^[1] There are several themes (such as politics and technology) in dystopian writing that have distinct relations to real-life events and impacts. In this essay, I will argue that we are heading towards a dystopian society by discussing the depictions of dystopias in literary pieces and other media, and how they relate to the current day factors that I believe could be developing into dystopian ideals.

Firstly, political motivations are a predominant theme in dystopianism. This can include totalitarianism (where there is only one political party and all citizens are controlled by the state), fascism (where a dictator has complete control and enforces aggressive nationalism), corruption of government and dictatorial rule. They are characterised by the oppression forced upon the society and the distinct split between the ‘leader’ figure and the ‘common’ people. Political divide like this is usually the result of an event that allows the corrupt person or

group to take advantage of the vulnerable people, and manipulate them to enforce their principles.

Throughout history, there have been many famous dystopian works that have centred around a political problem. In George Orwell's dystopian novel *Nineteen Eighty-Four*, he establishes a sense of distrust in the government from the very beginning of the book. Posters that represent the totalitarian regime are hung from every wall, and ‘telescreens’ that watch and listen to people prevent anyone from having any privacy.^[2] This kind of monitoring has close similarities to laws and regulations our government has put in place. The Investigatory Powers Act 2016 allows police and intelligence services to access and use internet records in an investigation without having to obtain a warrant. This controversial bill has been nicknamed ‘The Snooper’s Charter’ as a result of what many people believe to be blatant violations of privacy.

Political conflicts, in particular, are amplified by the threat of nuclear warfare from leaders who want to enforce their ruling. The nuclear tension between the USA and the Soviet Union during the Cold War got to the point where both countries almost launched thousands of nuclear warheads, which could have killed the majority of the global population. In the event of a catastrophe of this magnitude, there is ample opportunity for tyrants to seize control of the broken countries and force them under their leadership. Many people believe that history could be repeating itself, with the recent tension between the USA and North Korea being the forefront of concerns surrounding nuclear politics.^[3] The breakdown of global governments in this way could become the catalyst for a dystopian society.

Historically, there have been several political systems that revolved around values we consider to be dystopian. One of the most infamous instances was the Nazi Third Reich, led by dictator Adolf Hitler during World War 2. This fascist dictatorship pushed for racial purification by murdering Jewish people, LGBT+, Slavic people and many other minority groups that did not comply with their ideal ‘Aryan’ race.^[4] This kind of discrimination, while very extreme in this case, has continued throughout history to present-day. Far-right white supremacist hate groups still exist to this day, and their fanatical beliefs are akin to those of the Nazis. Their ideals are widely rejected by most of society, but their influence has affected a growing number of young people in the UK. The spread of these ideals among young people could cause a generation of people to believe and act similarly to the Nazis, therefore creating a dystopian society.^[5]

Environmental themes are another large influence on dystopian media. They are often a consequence of human action, such as climate change or plastic pollution. A distinct characteristic of this kind of dystopia is the relation to politics. Governments and corporations in a capitalist economic model that are exclusively financially motivated will refuse to take into consideration the effect their actions are having on the planet. In my opinion, environmental issues are some of the most threatening to our current society.

There are many examples of environmental dystopias depicted in the media, and they often include warnings of what could happen in real life. For example, the popular science fiction film *The Day After Tomorrow* tells the story of a massive global climate event that people ignore until it is upon them. This is very similar to current events happening around the world, where dozens of countries and high ranking officials are refusing to see the true global danger of climate change. In January 2020, the well-known Doomsday Clock, endorsed by scientists worldwide, moved to 100 seconds before midnight as a result of devastating climate impacts in recent months. The Bulletin of Atomic Scientists, who own and operate the Doomsday Clock, said in their latest statement that: “over the last two years, we have seen influential leaders denigrate and discard the most effective methods for addressing complex threats in favour of their own narrow interests and domestic political gain.”^[6] This highlights the main issue that I believe could mean we are heading towards a dystopian society.

Despite movements such as the Paris Agreement, countries around the world are failing to meet the emission targets necessary to prevent global warming above the target threshold of 1.5° celsius.^[7] The IPCC, who are the leading body in identifying and outlining solutions to impacts of climate change, published a special report in which they discuss the predicted impacts of global warming and the knock-on effects it may have as a result of the increased energy in the atmosphere worldwide.^[8] They stated that “For global warming above 1.5°C, risks across energy, food, and water sectors could overlap spatially and temporally, creating new hazards, exposures, and vulnerabilities that could affect increasing numbers of people and regions”. This shows that there will be catastrophic global consequences if we do not put laws in place to limit our greenhouse gas emissions.

Recently, technology has played a bigger role in fictional dystopias as our technological capabilities become more advanced. AI functions surpassing human intelligence, which was once considered impossible science fiction, is quickly becoming a real concern for our safety. This could be worsened as a result of other factors such as poor government regulations, lack of education on the dangers of technology or dishonest companies targeting consumer’s personal information to earn money.

Technology is starting to play a bigger part in our lives, and this trend is reflected in dystopian media. In his collection of stories titled *I, Robot*, Isaac Asimov poses that all sentient AI robots must follow four basic laws: do not harm or injure a human being, obey orders from humans, protect your existence and do not harm humanity.^[9] The laws are in place to protect humans from AI built by people with evil intentions. This is similar to real-life in that there are concerns over how AI can be exploited. Amazon’s Alexa, a popular virtual assistant AI, has microphones that constantly listen to everything being said around it. While there is no definitive proof, there is a real possibility that Amazon could take the voice data without the knowledge of the customer and sell it to companies who make targeted advertisements.

As advanced technology becomes readily available, our abilities to modify biological elements of humans and our surroundings will improve greatly. Biological factors of humans and the world around us are largely unpredictable, as there are infinite possibilities to modify – for human benefit or detriment. The ethical debate regarding genetic engineering has been gaining traction in medical societies such as the Royal Pharmaceutical Society, even though the true implications of it are still unknown to us.^[10]

Biological dystopias have a wide range of categories that vary depending on the changes made. They can be as simple as advancement in medicine, or large scale genetic engineering in humans. Aldous Huxley, in his novel *Brave New World*, depicts a world where the 'World State' is attempting to reach mass production of humans, by taking a single egg and splitting it into ninety-six individual people.^[11] The book was very controversial when it was published in 1932 because of its anti-religious themes, leading to it being banned in Ireland.^[12] Although humanity has not yet evolved to the point where we can edit the human genetic makeup, the principles of the story have some similarities to current events. GM (genetically modified) crops are becoming more prevalent in everyday foods. There are some security concerns with this, in that companies who own the license to grow GM plants have control of our food chain. Terrorist attacks or corrupt officials could essentially destroy the human race by poisoning or altering the genetic composition of the crops to cut off our food supply. These threats would also endanger the process of genetically enhancing humans, as an outside attacker could compromise the entire human race in a similar way.

In our recent tutorial, we debated the positive and negative impacts of genetic engineering, and how they apply to individual humans or society as a whole. The most compelling argument in favour of genetic engineering was the fact that genetic alteration could mean the elimination of diseases in humans. By altering parts of our chemical makeup, we could theoretically cure all illnesses for future generations. This is a great use of genetic engineering, provided it is not exploited. Anyone could modify genes for personal gain, or the benefit of a government/conglomerate. A government with an army of soldiers genetically designed to be fearless and tough could effectively take control of the world. Totalitarian governments could produce humans that are completely loyal to their state. As well as this, mass production of people would take away human individuality. Each person on Earth is unique, so cloning every human to be the same would remove any sense of identity.

Notably, the classification of a dystopia is based entirely on the judgement of the person or group that is defining it. In Margret Atwood's dystopian novel *The Handmaid's Tale*, the regime of Gilead enforces what seem to us to be blatantly misogynistic rules.^[13] This includes banning reading and writing; forcing women out of work; forced impregnation and harsh punishments for breaking their laws. The rulers of

Gilead believe they are saving their world from a declining population, while those most affected by the establishment live in fear and oppression. This example suggests that the way a person views the good or evil of something is subjective, and therefore one person's idea of a dystopia may be another's idea of a utopia. This also applies to fictional narrative, as there is bias depending on the viewpoint of the story. This means it is very challenging to ever create a true, universal dystopia as there will likely be a person or group of people who agree with it. However, this also implies that there can be no universally 'good' society.

Many people would consider our world to be dystopian already. As of 2015, nearly 10% of the global population live in extreme poverty, on less than \$1.90 a day.^[14] For these people, life is incredibly harsh. This brings up the question: who gets to define a dystopia? The people with the power to decide whether we have a problem are not those experiencing the problem. In some cases, they are directly causing the problem with activities such as fossil fuel usage, plastic pollution and the production of harmful chemicals.

In conclusion, I believe that we are moving towards a dystopian society. There are so many likenesses between fiction and real-life events that it is very likely our future will be significantly worse than today. Tensions between countries are increasing each year, and with the threat of nuclear annihilation will have more serious consequences should they escalate. Countries are actively choosing to ignore the evident problems our world are facing as a result of climate change, and this ignorance will inevitably have huge consequences in the coming future. I believe that governments will continue to disregard the problem, and when they finally realise that we are in real danger, it will be too late.

References

- [1] OED Online, <https://www.oed.com/view/Entry/58909> [accessed 07 March 2020]
- [2] G. Orwell, (1949) *Nineteen Eighty-Four*, 1-7
- [3] BBC, 'North Korea crisis in 300 words', <https://www.bbc.co.uk/news/world-asia-40871848> [accessed 29 March 2020]
- [4] USHMM, 'What other groups were targeted by the Nazis?', <https://www.ushmm.org/wlc/search/index>

Tutor comment:

"M.'s essay was a real pleasure to read, and it really showcases his hard work and natural talent. M. brought a sense of fun that was coupled with an astute thoughtfulness to the tutorials, and he was always a keen participant in the lively, intriguing discussions we had at West Monmouth School. M. synthesised a wide variety of information and ideas to produce a compelling, well-evidenced final assignment, and I am thrilled that his work has been recognised in The Scholar!"

How did Gender Passing Individuals Gender their bodies in Nineteenth Century Britain?

Year 10, Key Stage 4

Pupil Name: K. Kuklys

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Supervised by: BG. Thomason

Tutor University: Liverpool John Moores University

Course Title: Gender passing and the body in Nineteenth Century Britain

Gender passing individuals were historic people whose biological identity did not correspond to their gender identity, for reasons which can only be inferred. They held their bodies in high regard, as the performativity of their gender was not solely based on their behavioural psychology, but also the appearance of their body. This meant they had to appropriate the garbs and assume the habits of the socially constructed identities of gender, to avoid mass hysteria in the nineteenth century, and live under a façade, rather than being able to express themselves to all their extent. However, the fact that an individual could inaugurate a completely different perception of their body, in contrast to their sex was significant, because this concept formed the foundations of acceptance in society. Despite having to live under constant pressure of identity, they could make adaptations to their bodies, which helped them live a life no different than anyone else's, without the fear of being discriminated or criticised. By exploring the themes and ideas of gender on the body it can create an image that helps historians to understand why people chose to not conform with their biological sex, and the viability of this decision in such a bigoted and conservative era of time. Throughout this essay, I will use various articles and blogs to discuss the question so we can further understand how and why the body was so important for gender passing individuals.

One of the main sources for my argument involves a female husband, named James Allen. James Allen was a 42-year-old biological woman who lived in London and 'assumed the dress of and passed for a man'. He was married to Mary Allen for 21 years, who never knew that Allen was a female, stating she 'never had the opportunity of observing the breasts' or 'indulge in the feelings of her sex'. Allen was a sawyer and generally dressed in sailors' clothes, which would have proved beneficial in her expression of her identity as it correlated to her gender. James Allen was only ever discovered to be a female after an accident at work, when a piece of timber fell and killed him. The other source for my argument involves a gender passing individual, named Harry Stokes. Harry Stokes was also a biological female, who lived in Manchester, and worked as a master bricklayer that was very popular amongst his customers. Stokes is described as quite unfeminine and had characteristics often linked to masculinity such as being a frequent drinker. Due to this Stokes was exposed by his wife and was either to resume her biological sex or to exile the town, of which he chose the latter.

The importance of the body is well represented by Hawksley's discussion on beards. This is displayed by how the stereotyping behind beards progressed after the Crimean War. The beard became the sign of a hero, whereas before it was usually a characteristic that implied a person was either lower class or religious. In the nineteenth century, it became a 'viscerally visual representation of limitations to the suffragettes' and was socially constructed as a masculine feature. This links to gender passing individuals, as it illustrates the idea of body appropriation, and the boundaries that kept these individuals from associating to their gender. Butlers analysis of gender also presents this theme of limitation; 'It is a practice of improvisation within a scene of constraint'. The use of the phrase 'scene of constraint' insinuates how society has parameters; gender cannot be performed, due to social norms that constitute to boundaries, that have been fabricated by the citizens within it. Gender passing individuals could manipulate their bodies by matching the characteristics and stereotypes of their according gender, and other ways such as using linen to conceal breasts, which would allow them to identify with gender, but improvisation meant they needed to take advantage of their bodies to appear as 'ordinary'.

Another example of why the body was significant for Gender Passing individuals is displayed in James Allen's post-mortem. This pamphlet describes the body of James Allen in such a manner, it makes it seem that their appearance was indistinguishable from any other males, however it is stated that the body was clearly of female proportion. 'Exhibiting the truest female proportions as a striking contrast to the general beauty of the person'. This shows how Allen had deliberately made adaptations to their body in order to conceal themselves, but even more so, the hierarchy of a person's identity. From the description we can assume that Allen focussed more on the visibility of the body, rather than the proportions, that is why he displayed anti-feminine, 'roughness of hands' and 'colour of face'. Also, we are told that they compressed their breasts with linen bandages to conceal their femininity; this act of concealment, epitomises the social confinement that forces gender passing individuals to make adaptations, that 'disguise' themselves to avoid rebuke from citizens within their community. Therefore, we examine how the body affected the lives of these people, as they needed to live under constant pressure of conformity with society in the nineteenth century.

The body's importance is also conveyed in an article about Harry Stokes published by The Observer. The extract describes how Stokes contributed to society, despite having to adapt to a masculine lifestyle, and this is presented through the quote 'Being of good exterior, with prepossessing appearance and manners and of features rather handsome' The use of the adjective 'handsome' can infer how the manipulation of Stoke's body was a driving factor for his conformity with society, and a convincing disguise, as this word has masculine connotations. which would further benefit the image of Harry Stokes. Also, this theme of masculinity is prominent, as the role he played in his community creates a logical perception of a male in nineteenth century Britain. This is epitomised in the quote 'remarkable, indeed almost

a celebrity, for skill and success'. The fact that he was 'almost a celebrity' is interesting, as it displays the complete obliviousness of his customers and his peers to his biological sex, and it proves that the morphology was effective to deter any suspicion of gender passing identity.

The body is a key principle within gender, as it determines a person's life in the sense most events in life will have varying outcomes dependant on gender. People in society in the nineteenth century were treated differently depending on their gender. This is presented when Wally Seccombe describes Breadwinner Ideology. In this discussion, Seccombe infers how patriarchal society dominated, as the class divide between the affluent and deprived was ever so clear. The fact is that, even despite working class men only barely being able to provide for their families, their social dignity and honour could not be jeopardised by allowing their wives to work and therefore 'Employment rate of wives outside stayed low'. This is relevant to gender passing individuals because a person like Harry Stokes or James Allen manipulated the patriarchal themes of society, by working in sectors such as labour to further their performativity of their gender. It also presents the impact of the suffragettes, as Stokes and Harry could have both been driving factors for their movement, due to their experience of a 'male' life. This would not have been a coincidence either, as the first feminist wave began amid this era, meaning the socially articulated ideas were being transformed by the day, becoming more inclusive and equal for both women and gender passing individuals. Therefore, the body was important, as it not only affected the viability of gender passing individuals, but also other events in time, such as the equal rights act.

However, the magnitude of effect the body had on gender passing individuals was not only limited to women, as there were other accounts such as the Trials of Boulton and Park. This account is very intriguing for historians, as it provides a primary source of evidence, that helps evaluate the factors determining how gender passing individuals were treated amongst society. Boulton and Park were two Victorian cross-dressers that indiscreetly wore female attire in public and were openly homosexual. They were from the upper middle class, which allowed them to continue their performativity of femininity, as they were bound over for 2 years, until their arrest on the 28th April 1870, for conspiracy of sodomy. This is significant, as it displays how the factor of class was decisive in the prosecution of gender passing individuals; if this were the case for a lower-class gender passing individual perhaps, they would be treated differently due to their socio-economic situation.

The attire worn by people was an accurate representation of person's gender expression and this can be perceived as a spectrum of both masculinity and femininity rather than the umbrella term 'gender'. This idea of clothing is universal, as the clothes a person wore would usually represent their gender and was the main way a person would determine how somebody identified. In her early life Boulton 'began dressing up and acting as a girl, often as a parlourmaid'. The fact she wore clothing similar to

a maid was seen as feminine, as maids were associated with being a female gender role and this association of femininity was one way Boulton could use her body to portray her gender identity. Harry Stokes on the other hand used the influence of his profession to wear clothes that both correlated to his work and gender. His job as a 'masterbricklayer' can suggest his attire would have been very masculine, as being a bricklayer has association to being a manual worker, which was generally stereotyped as a male gender role. Also, from this vocation we can infer that he would have naturally formed a muscular physique, which would further to his male resemblance.

In conclusion, the body was of the highest importance for gender passing individuals as it not only prevented suspicion of the general public, but also allowed the person to display their unique expression, all being not to its full extent. The body could be changed to suit a specific role in society, but the reason for this remains somewhat unknown, as many still question the reasons for not conforming with biological sex. As the society was patriarchal, was it because the initiative of becoming a man was due to personal benefit, such as having more wealth or influence, or rather because they felt like they could not express themselves in relation to their reproductive anatomy and genetic makeup. A person's body is the presentation of their sexuality and gender, as conceptualised by the genderbread infographic, so the fact it encompasses a wide variety of a person's life, displays the fact that it was so important for gender passing individuals.

References

1 Anonymous. 'An Authentic Narrative of the Extraordinary Career of James Allen, The Female Husband', (I.S Thomas; Covent Garden, 1829), pp. 1-40.
2 Anonymous. 'An Authentic Narrative of the Extraordinary Career of James Allen, The Female Husband', (I.S Thomas; Covent Garden, 1829), pp. 1-40.
3 L. Hawksley, 2014, Moustaches, Whiskers & Beards, 63-67.
4 J. Butler, (2004), Undoing Gender, 1-3.
5 Anonymous. 'An Authentic Narrative of the Extraordinary Career of James Allen, The Female Husband', (I.S Thomas; Covent Garden, 1829), pp. 1-40.
6 Anonymous. 'An Authentic Narrative of the Extraordinary Career of James Allen, The Female Husband', (I.S Thomas; Covent Garden, 1829), pp. 1-40.
7 'A Female Husband', The Observer, (London; England), 16/04/1838.
8 'A Female Husband', The Observer, (London; England), 16/04/1838.
9 W. Seccombe. 'Patriarchy Stabilised: The Construction of the Male Breadwinner Wage Norm in Nineteenth Century Britain', Social History, 11:1, (1986), pp. 53-56.
10 'WordPress', Boulton and Park: a tale of Victorian cross-dressing | The Haunted Palace (wordpress.com) [accessed: 06/01/2021 at 12:47].
11 'WordPress', Boulton and Park: a tale of Victorian cross-dressing | The Haunted Palace (wordpress.com) [accessed: 06/01/2021 at 13:12].
12 'The Genderbread Person', https://www.genderbread.org/ [accessed: 06/12/2020 at 16:47]
(1838). A Female Husband. Manchester: The Observer.
(1829). An Authentic Narrative of the Extraordinary Career of James Allen, The Female Husband. London: I.S Thomas.
Butler, J. (2004). Undoing Gender. Genderbread. (n.d.). Retrieved from https://www.genderbread.org/
Hawksley, L. (2014). Moustaches, Whiskers & Beards.
Seccombe, W. (1986). Patriarchy Stabilised: The Construction of the Male Breadwinner Wage Norm in Nineteenth Century Britain.
Word Press. (2015). Retrieved from https://hauntedpalaceblog.wordpress.com/2015/01/03/boulton-and-park-a-tale-of-victorian-cross-dressing/

Tutor comment:

"I thoroughly enjoyed my time at Cardinal Heenan Catholic High School and both the staff and students were keen to learn and welcoming. From our first tutorial I knew that K. would produce a brilliant essay because he was enthusiastic, focussed, engaged, and determined. He asked lots of questions, listened to feedback and supported the rest of his classmates in their learning. K. received 76 out of 100 (a first) and produced an essay that would stand up to some of my first-year university students. Well done on your achievement you should be proud of yourself, as I am!"

How Is Shakespeare's Macbeth still relevant to our modern world?

Year 10, Key Stage 4

Pupil Name: **E. Rands**

School Name: **Harwich and Dovercourt High School, Essex**

Supervised by: **R. Hawkins**

Tutor University: **King's College London**

Course Title: **Macbeth then and now: Shakespeare's "Scottish Play" goes global**

Relevance of 'Macbeth' in our modern world.

This essay aims to explore how relevant Shakespeare's 'Macbeth' is on a modern society. 'Macbeth' is the infamous Scottish play written by William Shakespeare. The Bard's 'Macbeth' tells a story about a Scottish soldier's (Macbeth) quest to become King. He seeks the crown in an extremely immoral, villainous and corrupt way, resulting in murder of numerous characters to pursue his mission and keep his reign over Scotland.



Macbeth and Banquo encounter the witches for the first time

The 414 year old piece of art is still performed to this day; showcasing ideas surrounding power and misogyny. One of the central themes in 'Macbeth' is the use and abuse of power and how it can have a corruptive effect on the person who controls it. Although this play was written in 1606, it still holds relevance in today's society due to modern influences at a political and royal standpoint who believe their power makes them untouchable similar to Macbeth. The next theme that will be examined within this essay is the power and rights women have. Despite Lady Macbeth having the power in her relationship, she has little to no power or rights within society. This idea can be mirrored in a modern society due to the mistreatment of women within the music industry and how they have very little power or rights.

The eponymous character Macbeth commits multiple power-strived actions that have severe destructive consequences, such as his demise. When Macbeth becomes King, the power that comes with such a great responsibility leads him to be corruptive. A pivotal moment in the tragedy for Macbeth's behaviour is when he has "done the deed" (Macbeth 2.2.15) of murdering King Duncan. As he gains power, his ideas and self-morals deteriorate making him think he is capable and allowed to commit malicious actions. Macbeth believes he is

untouchable during the soliloquy of Act 3 Scene 1. He acknowledges the witches prophecies about Banquo's descendants inheriting the throne. However, Macbeth does not want his legacy of King to be cut short so orders for Banquo and Fleance to be killed. Macbeth "will advise [the three murderers] where to plant [them]selves" (3.1.133) so they can kill Banquo and Fleance to protect Macbeth's reign. Macbeth's role of king enables him to demand the three murderers to complete the immoral task at hand; something someone of a standard level within society would be forbidden to do. This portrays Macbeth to be abusing the power he withholds as he is using his reign to achieve completely corrupt and dishonourable actions that a person of a less powerful rank within society would be frowned upon for doing and disallowed to do in the first place. Macbeth's placement in the monarchy and the power he holds with his title seems to be the only reason why the three murderers agree to his wishes. Interestingly, at this point within the play, Macbeth also believes his power excludes him from the consequences that his actions may have. He experiences no guilt or remorse for what he has ordered to happen at that current time. This idea that power can make you feel untouchable is still relevant in a modern society as current influences like Prince Andrew believe power gives them excuses to act on their own freewill and be exempt from consequences.

Currently, in today's society, there are still examples of leaders at a royal and influential level within society abusing their power and believing that their status gives them a free way pass to act in a certain way. For example, Prince Andrew, who is 8th in line to the throne, held a close relationship with "the convicted peodophile Jeffrey Epstein" and has allegations surrounding sexual abuse and involvement in sex trafficking. The allegations have not been proved, but it is evident that Prince Andrew has been involved in a terrible and dishonourable friendship.

Because of Prince Andrew's power and status within the royal family, he has "not batted an eyelid at the systematic abuse of young women". Similarly to Macbeth, Prince Andrew believes his power excuses him from following general rules within society. Suzanne Moore from The Guardian believes that Prince Andrew is the way he is due to his "entitlement, money, women, the lifestyle he was bred into". This shows Prince Andrew to be corruptive as he is using his power for his own personal gain. At the time of Prince Andrew's friendship with "sex trafficker and rapist Jeffrey Epstein", he failed to realise the consequences his actions will have upon himself and the way the public perceive him.

The similarity between the two royal leaders, Macbeth and Prince Andrew, can help prove the relevance of the tragedy, 'Macbeth' in a modern society. They both believe the power they hold because of their status within the monarchy makes them untouchable and able to abuse their power. Both of the influential leaders have made some clear mistakes and at the time both failed to see their wrongdoing. Macbeth, when sending for the murder of Banquo and Fleance, did not see his terrible actions to be negative. Similarly, Prince Andrew failed to see the consequences of being friends with such an evil man that was a convicted sex offender and had involvements with sex trafficking and many others. The demise of the central character Macbeth can be seen as a warning for leaders, or anyone with power, to be careful how their power is used. Macbeth's downfall

is ultimately caused because of his incapability to see himself abusing his power. Macbeth is still relevant in a modern society as people such as Prince Andrew still use and abuse their power to be corruptive.

Secondly, the theme of women's power and rights can help prove the relevance of 'Macbeth. Lady Macbeth is an exceptionally controlling and manipulative character within the Bard's 'Macbeth'. Within her relationship with Macbeth, Lady Macbeth is the controlling influence which completely subverts the norms of a Shakespearean society. She manages to manipulate Macbeth to acting in a deceitful and villainous manner to complete "most hideous act of all; murder". After Macbeth has "done the deed" (2.2.15), Lady Macbeth's controlling nature is very much present. The exclamation "Give me the daggers." (2.2.55) displays Lady Macbeth to be the controlling force in her relationship. However, Lady Macbeth does not hold the power outside of their relationship in society. Macbeth is King so has a huge amount of power within society. Lady Macbeth has just a fraction of the power Macbeth, her husband, sustains. She is just seen as Macbeth's wife, despite arguably being the one holding Macbeth up. Lady Macbeth is the person primarily responsible for Macbeth's reign as she manipulates him into believing he is capable of becoming King, but is not given any credibility with society. In addition, Lady Macbeth's name can also show the absence of power she has within society. She is essentially just known as the King's wife and is not given anything to be worthy of on her own not even her own proper name or title. The absence of an actual name could symbolise her absence of power within society. This idea of Lady Macbeth's absence of power within society can help prove the relevance on 'Macbeth' in a modern society as still women don't have the rights and power that they rightly deserve.

One place where women are treated significantly immorally and unfairly is the music industry. The music industry, like any other work environment, should be gender equal, but it isn't, "men hold 67.8 percent of the jobs, and the vast majority of positions of power". This is an industry where misogyny still exists; current artists are fully aware of it. Sam Fender, a current singer-songwriter who is incredibly successful and "has won the Brits Critics' Choice award" quotes in his song 'White Privilege' that "The patriarchy is real". To have such an influential male artist recognise the patriarchy who has a heavy involvement in the music industry puts into perspective the severity of the mistreatment of women in the industry and the less power women themselves hold.

Despite rises in equality and numerous successful female artists, the music industry is dominated by men. 95% of record producers and sound engineers are men. Overtime, there has been numerous anecdotes of women in the music industry who have been mistreated as they have less power in society than men. Lady Gaga, throughout her time within the industry, has been sexually assaulted by a male music producer. She claims, "When I started in the music business when I was around 19, it was the rule, not the exception, that you would walk into a recording studio and be harassed". This shows that female artists, who should have the control in a recording studio, have been stripped of their rights because of their gender. Many female musicians are discriminated by authoritative male figures who hold the majority of jobs and power. "In Britain, countless women

who work in the [music] business testify to frequent cases of sexual misconduct and misogyny." Lady Gaga is one of the many women who have been mistreated by men in the industry; other women such as Kesha and Lauren Aquilina have all experienced sexism in work environments. Lauren Aquilina has been told by a man remarkably high up in the company to lose weight because her size isn't working at the moment. There is an abundance of evidence that shows women's lack of power and rights in the music industry. Female musicians are constantly being reduced of power that they should definitely withhold as the musician is ultimately the most important job in the music industry.

The idea that women in the music industry have a small amount of power and rights can help prove the relevance of 'Macbeth'. Lady Macbeth, despite being manipulative and controlling, she holds no power or rights within society because she is a female and is controlled by her husband. Similarly, female musicians, who should have the power as they are the ones making the music, do not hold any rights as the authoritative male figures in the business dominate them. This shows how ideas showcased in Shakespeare's 'Macbeth' are still relevant in our modern society.

In conclusion, Shakespeare's infamous tragedy 'Macbeth' is still very much relevant to our modern society as it cleverly comments upon actions and consequences that a current nation needs to consider. 414 years after the Bard's 'Macbeth' was written and some of the problems his characters encountered still arise now for people now. As said by Sam Fender, "the evil is still not gone". Women are still fighting for their rights just like Lady Macbeth; who was never given a proper title and any respect in society. Similar to Macbeth, current influences like Prince Andrew abuse their power by thinking their standing in society enables them to act in an immoral way for their own benefit. At some point in our lives, we will be given more power and responsibility from age or occupation. 'Macbeth' can be seen as a guide in how to use that power in the correct ways as the eponymous character Macbeth's abuse of power can be seen as a warning in how to control responsibility as Macbeth's misconduct ultimately led to his demise. Shakespeare's 'Macbeth' is still relevant in our modern society as it can teach everybody a lesson in how to become a better person and raise awareness of problems that are not yet gone.

Bibliography

D. Campoamor. 'Prince Andrew's BBC interview included apologies - but not to Jeffrey Epstein's victims' <https://www.nbcnews.com/think/opinion/prince-andrew-s-bbc-inter-view-included-apologies-not-jeffrey-epstein-ncna1085611>, NBC news, 19th November 2019
M. Claire 'How #MeToo shows that we need to acknowledge sexism in the music industry too' <https://www.marieclaire.co.uk/reports/music-industry-sexism-426585> 3rd October 2019.
Sam Fender, White Privilege, Hypersonic Missiles, Kobalt Music Publishing LTD. 2019.
S. Garvan 'Sam Fender wins Brits Critics' Choice Award' <https://www.bbc.co.uk/news/newsbeat-46470378>, BBC, 7th December 2018.
R. Johnson 'Macbeth power essay' <https://gcseenglishteacher.com/2014/03/07/macbeth-power-essay/> [10 December 2019]
Lady Gaga, The Actress Roundtable - The Hollywood Reporter. Interview. 28th November 2018.
A. Midlothian. 'Behind the Track : Mistreatment Of Women In The Music Industry' <https://www.theodysseyonline.com/behind-track-mistreatment-wo-men-music-industry> 1st May 2017.
S. Moore, 'Prince Andrew showed what true power is: turning a blind eye to abuse', <https://www.theguardian.com/commentisfree/2019/nov/17/prince-andrew-abuse-emily-maitlis-queen> 17th November 2019
R. Palmer, 'Prince Andrew desperate to move on from Epstein and feels locked in a straitjacket', <https://www.express.co.uk/news/royal/1205157/prince-andrew-jeffery-epstein-scandal-latest-bbc-newsnight-interview-emily-maitlis> 15th November 2019.

1 R. Palmer, 'Prince Andrew desperate to move on from Epstein and feels locked in a straitjacket' <https://www.express.co.uk/news/royal/1205157/prince-andrew-jeffery-epstein-scandal-latest-bbc-new-snight-interview-emily-maitlis> 15th November 2019.
2 S. Moore, 'Prince Andrew showed what true power is: turning a blind eye to abuse' <https://www.theguardian.com/commentisfree/2019/nov/17/prince-andrew-abuse-emily-maitlis-queen>, 17th November 2019
3 S. Moore, 'Prince Andrew showed what true power is: turning a blind eye to abuse', <https://www.theguardian.com/commentisfree/2019/nov/17/prince-andrew-abuse-emily-maitlis-queen> 17th November 2019
4 D. Campoamor. 'Prince Andrew's BBC interview included apologies - but not to Jeffrey Epstein's victims' <https://www.nbcnews.com/think/opinion/prince-andrew-s-bbc-interview-included-apologies-not-jeffrey-epstein-ncna1085611>, NBC news, 19th November 2019
5 R. Johnson 'Macbeth power essay' <https://gcseenglishteacher.com/2014/03/07/macbeth-power-essay/> [10 December 2019]
6 M. Claire 'How #MeToo shows that we need to acknowledge sexism in the music industry too' <https://www.marieclaire.co.uk/reports/music-industry-sexism-426585> 3rd October 2019.
7 S. Garvan 'Sam Fender wins Brits Critics' Choice Award' <https://www.bbc.co.uk/news/newsbeat-46470378>, BBC, 7th December 2018.
8 Sam Fender, White Privilege, Hypersonic Missiles, Kobalt Music Publishing LTD. 2019.
9 A. Midlothian. 'Behind the Track : Mistreatment Of Women In The Music Industry' <https://www.theodysseyonline.com/behind-track-mistreatment-women-music-industry> 1st May 2017.
10 Lady Gaga, The Actress Roundtable - The Hollywood Reporter. Interview. 28th November 2018.
11 M. Claire 'How #MeToo shows that we need to acknowledge sexism in the music industry too' <https://www.marieclaire.co.uk/reports/music-industry-sexism-426585> 3rd October 2019.
12 M. Claire 'How #MeToo shows that we need to acknowledge sexism in the music industry too' <https://www.marieclaire.co.uk/reports/music-industry-sexism-426585> 3rd October 2019.
13 Sam Fender, White Privilege, Hypersonic Missiles, Kobalt Music Publishing LTD. 2019.

Tutor comment:

"I really enjoyed my time exploring Shakespeare's Macbeth with the brilliant students of Harwich and Dovercourt High School. E.'s essay stood out among the final submissions for its originality. It's clear that a lot of extra research went into this piece, and I was particularly impressed by E.'s feminist analysis of the play. Her consideration of Macbeth's relevance today via a discussion of the modern music industry was a real joy to read."

Yinka Shonibare and Olafur Eliasson: Can art change the world?

Year 10, Key Stage 4

Pupil Name: N. Whelan

School Name: Wootton Upper School, Bedford

Supervised by: K. Morozova

Tutor University: The Open University

Course Title: Can art change the world: Contemporary art and politics

From stone carvings in caves, to exhibitions celebrating diversity, art has provided people with stories, debate and visual pleasure for thousands of years. During these years, it has been utilised to glorify powerful leaders, exemplify religious parables, and depict the events of war. Art continues to be influential today, with contemporary artists embedding their work with controversial political issues, generating debate. The works of two contemporary artists will be featured in this essay: Olafur Eliasson's *Green Light* (2016-17), and Yinka Shonibare CBE's *Nelson's Ship in a Bottle* (2010) and *The British Library* (2014-2019). Both aim to create a respectful public attitude towards those who come from different cultural, and national, backgrounds. This essay will argue that Shonibare's work is more successful in changing the world, as it explores how different cultures constitute conventional historical accounts, causing viewers to acknowledge the unison of these different cultures as part of their own heritage.



Nelson's Ship in a Bottle

Yinka Shonibare CBE is a British-Nigerian artist. His work illustrates cultural identity and colonialism; it often includes his motif of batik fabric, which causes people to question the abstract concept of nationality. The fabric is commonly recognised to be of African origin, but the pattern veritably comes from Indonesia. In the nineteenth century, the Dutch mass-produced the fabric, with the intention of selling it to the Indonesians. However, the Indonesians preferred their own home-made fabric, so the Dutch decided to sell the mass-produced fabric in West Africa. There the fabric became popular, as the colourful patterns highly appealed to the Africans. Compellingly, the context behind this fabric causes people to discuss the meaning of nationality, with the diverse background of the fabric contradicting its status as a national symbol. Batik fabric is used in Shonibare's *Nelson's Ship in a Bottle*, a work commissioned for display on the fourth plinth in Trafalgar Square in 2010.

Nelson's Ship in a Bottle highlights the presence of different cultures in the Battle of Trafalgar. The site-specific installation is a 1:30 replica of the HMS Victory, the British flagship upon which Admiral Nelson led the Royal Navy to victory during the Battle of Trafalgar in 1805. The replica, enclosed in a bottle, resembles the authentic HMS Victory, except for its 37 sails made from vibrant batik fabric. A variety of colour, shown in the ship's batik sails, takes the viewer's focus from the surrounding architecture, and impels them to acknowledge the formerly concealed roles of other cultures who have contributed to British history. "There were 22 nationalities on the ship, including Jamaican, Indian and even four French," (Goodwin, 2010), these nationalities were overlooked during the sculpture of Trafalgar Square. This disregard is challenged by Shonibare's sculpture, with its sails indicating the British empire's reliance on an amalgamation of skills and ideas from different cultures to keep the ship 'afloat'. This teaches British people that different cultures are part of their heritage, and that these cultures have played a role in forming the nation into what it is today. Therefore, the sculpture has the power to connect people, regardless of their backgrounds, by demonstrating how different cultures have interacted throughout history.

However, not all would agree that Shonibare's sculpture is enough for people to consider the effects other cultures have had on British history, not believing it

significant enough to change the world. According to Adrian Searle, an art critic for *The Guardian*, “Shonibare’s work is the sort of thing one might come across in a coastal shopping mall” (Searle 2010). Without knowing the context of the installation, people would be less likely to associate the bright batik sails with the collaboration of different nationalities onboard the HMS Victory. This could lead to viewers interpreting the art, like Searle, as if it were a novelty, instead of a “metaphor for cultural diversity” (Shonibare 2011). The flamboyant flags may be considered juvenile, and thoughts can be simply focused on how the artist succeeded in getting the ship into the bottle. Conversely to Searle’s argument, the ship’s complex design suggests to viewers that it has been made as representational art, made to mark an important event. This encourages people to research the boat’s history and discover the unison of different cultures, as far back as the reign of King George III. The placement of the ship inside a bottle illustrates to viewers how the presence of cultures, other than British, have been left out of the architecture of Trafalgar Square, having been hidden away, like the ship behind the acrylic. Consequently, a memorable experience is created, something the viewer can narrate to their acquaintances, or publish on social media, spreading what they have learnt to many others. This dissemination of knowledge can change the way British society perceive those coming from different backgrounds. Therefore, despite the argument that the sculpture could be misinterpreted as a mere novelty, its aesthetic appearance makes it memorable, and prompts viewers into gaining a better understanding on cultural history.



Green Light

Another artist who has produced work supporting those from different cultural backgrounds is Olafur Eliasson. Eliasson is a Danish-Icelandic artist who combines science and art to devise an interactive experience for viewers. *Green Light* is one of his projects. Unlike in Shonibare’s work, Eliasson’s *Green Light* workshops involve the participation of refugees. Groups of up to eighty refugees are invited to take part in a workshop for seven to eight weeks, part of this involve producing green lamps. The lamps are visually appealing with their stunning geometrical shapes. A green light from the LEDs makes the migrants feel welcome and accepted in a new country. Green can be associated with nature, and therefore growth, as the migrants themselves are given the chance to germinate and flourish in their new

environment. As well as making lamps, the participants engage in an educational programme, giving them the chance to exchange knowledge, learn a language and interact with university students. *Green Light* has travelled to places around the globe, such as the Moody Center for the Arts at Rice University in Houston, Texas and the 57th Venice Biennale in Venice.

It could be argued that *Green light* is more interactive, in comparison to Shonibare’s *Nelson’s Ship in a Bottle*, allowing it to physically impact people’s lives. *Green Light* incorporates action to help refugees, providing them with life skills. On the other hand, Shonibare’s *Nelson’s Ship in a Bottle* is raised upon a plinth, making it seem intangible to the public. Although the sculpture “causes us to pay attention to the original reason for this (Trafalgar) square’s existence” it is “just a bottled replica”, admits Charlotte Higgins, *The Guardian*’s chief culture writer (Higgins 2010). As stated by Higgins, albeit the sculpture has its merits, it doesn’t provide the viewers with physical interaction. In contrast, *Green Light* has benefitted the lives of those who have partook in its workshops. It has also raised over €100,000 for charities helping refugees by the sales of the green lamps. Contrarily, £264,000, which could have been sent to aid refugees, was raised for Shonibare’s sculpture to be bought by the National Maritime Museum, Greenwich. Eliasson’s *Green Light* would have connected purchasers of the green lamps with the refugees, making them consider how they looked at the same lamps, with their own pairs of human eyes. Education, support, and humanisation of minority groups from the *Green Light* workshops have had prodigious impacts on the lives of refugees; these could be viewed as more important, and therefore more successful at changing the world, than providing people with a history lesson, like Shonibare’s sculpture.

Although Eliasson’s *Green Light* workshops have achieved helping several refugees, Shonibare’s work highlights the positives of living alongside those from different ethnic backgrounds, rather than generating a sense of distance. The *Green Light* workshops allowed members of the public to step inside; this could be, as Eliasson describes it, looking into a “microscope” (Eliasson 2017), letting people observe the refugees as living people. However, Cristina Ruiz, former editor of *The Art Newspaper*, argues that “This is not art in service of migrants but migrants in service of an artist and curatorial vision,” (Ruiz, 2017). The likeness the workshops have to zoo exhibits gives an effect contrary to depicting the refugees as human, nullifying the potential thoughts of empathy. This could further estrange migrants from the public, making them seem completely unconnected to the rest of society, with their bizarre, alien-like green lamps.

Diversely, Shonibare’s *Nelson’s Ship in a Bottle* illustrates how different nationalities integrate with and strengthen society. Scivier, a lieutenant commander, states that “The sculpture epitomises the multi-ethnic nature of London,” (Scivier, 2010). This “multi-ethnic nature” is reflected in the batik sails; the fabric’s colour is potent which symbolises how an amalgamation of different people can create a community, strengthened by a broad range of ideas,

skills, and experiences. The large, serpentine rope at the end of the bottle depicts an image of concealment, trying to squeeze the bottle’s opening to keep the ship within. Viewers could thus associate the rope with the architecture of Trafalgar Square, which also hides the contributions of different cultures to British history. The lacklustre rope is contrasted with the colourful sails, demonstrating traditionalist and nationalist perspectives as stale and out of date. Another work by Shonibare, *The British Library*, celebrates the presence of different nationalities in British society. It is an installation consisting of books covered in batik fabric, each has the name of somebody who as influenced the nation as a title. Most of the names are connected to migration in some way, however there are also names of right-wing politicians, such as Oswald Mosley. By linking people, who have had beneficial impacts on Britain to different cultural and national backgrounds, Shonibare provides authentic examples of how diversity has positively affected the nation’s history. Hence, instead of alienating those from different backgrounds, Shonibare’s work draws the public’s attention towards how different cultures have contributed to the history of Britain. Accordingly, Shonibare’s work has the power to generate a public outlook that appreciates the combination of different cultures that have influenced Britain.



The British Library

A further difference between the works of Shonibare and Eliasson is how they recognise the significance of individuality. In Eliasson’s workshops, the refugees produce the same green lamps, identical in colour and geometrical patterns. This could cause people to imagine the refugees as a characterless mass, rather than a group of unique individuals. This diminishes the empathy felt by viewers, and results in them perceiving the refugees as a simple and defined category. Therefore, Eliasson’s work is limited in its efficacy as it creates a barrier between viewers and refugees by preventing viewers from relating to the refugees, who are portrayed as a dull and faceless mass, as individual people. Contrarily, Shonibare’s work reflects that having a variety of different cultures makes society more diverse and interesting. In *The British Library*, the viewer is impelled into feeling awestruck by the vibrant and potent colours of the book’s batik fabric covers. They generate a kaleidoscopic vision, causing viewers to feel as if they

are under a spell. This concept of being under a magical spell, combined with an array of books, can provoke thoughts of enigma, imagination, and knowledge; this reminds viewers of their childhoods, in which they felt a sense of magic, as they discovered the world around them. Consequently, diversity is demonstrated as something that can help people learn more about the world and bring new ideas into their lives. Individuality is also expressed by the library’s website, which shows stories entered by those who have visited the exhibit. Therefore, Shonibare’s work can humanise those coming from different backgrounds, portraying people as unique individuals, each of whom make society more diverse and interesting, unlike Eliasson’s work which illustrates refugees, from other countries, as a dull ant colony.

Although both artists have created works aiming to support those coming from different cultural backgrounds, it could be argued that Shonibare’s work is more effective at changing the world as it has the power to alter the way people perceive their peers, who are of different cultures or nationalities. His work fulfils this by teaching people how civilisations have been intermingled throughout history, using Britain as an example, and by recognising the contributions other cultures have made to British society. This also changes the way migrants feel about themselves, allowing them to feel accepted. In conclusion, Shonibare demonstrates that art has the power to change the way people perceive others, reveal concepts previously hidden from the public eye and create opportunities for people to express themselves, making it capable of changing the world.

Bibliography

- Arterritory, (2017), ‘An uncomfortable green light’, https://arterritory.com/en/visual_arts/articles/19426-an_uncomfortable_green_light/, [Accessed 7 March 2020]
- Art Fund, (2019), ‘Nelson’s Ship in a Bottle’, <https://www.artfund.org/supporting-museums/art-weve-helped-buy/artwork/11795/nelsons-ship-in-a-bottle>, [Accessed 6 March 2020]
- Art Fund, (2019), ‘The British Library’, <https://www.artfund.org/supporting-museums/art-weve-helped-buy/artwork/13834/the-british-library/>, [Accessed 9 February 2020]
- Art21, (2010), ‘Nelson’s Ship in a Bottle’, <https://art21.org/watch/extended-play/yinka-shonibare-cbe-nelsons-ship-in-a-bottle-short/>, [Accessed 6 March 2020]
- Azzarello, Nina, (2017), ‘Olafur Eliasson brings the green light workshop to the Venice art biennale’, <https://www.designboom.com/art/olafur-eliason-green-light-venice-art-biennale-05-11-2017/>, [Accessed 7 March 2020]
- Brown, Kate, (2018), ‘Olafur Eliasson Brings an Immersive Light Installation to Smog-Filled Beijing in His First Solo Exhibition in the Chinese Capital’, <https://news.artnet.com/art-world/olafur-eliason-red-brick-art-museum-1198112>, [Accessed 7 March 2020]
- Brown, Mark, (2012), ‘Yinka Shonibare’s ship in a bottle goes on permanent display in Greenwich’, <https://www.theguardian.com/artanddesign/2012/apr/23/yinka-shonibare-ship-bottle-greenwich>, [Accessed 6 March 2020]
- Brown, Mark, (2019), ‘Yinka Shonibare’s tribute to UK diversity acquired by Tate’, <https://www.theguardian.com/artanddesign/2019/apr/08/yinka-shonibare-tribute-uk-diversity-acquired-tate-british-library-books>, [Accessed 9 February 2020]
- E-flux, (2016), ‘Thyssen-Bornemisza Art Contemporary (TBA21)’, <https://www.e-flux.com/announcements/28148/olafur-eliason-green-light/>, [Accessed 7 March 2020]
- Eliasson, Olafur, (n.d), ‘Green Light an Artistic Workshop’, <https://olafureliasson.net/greenlight/>, [Accessed 6 March 2020]
- Gompertz, Will, (2010), ‘The Stories of Nelson’s Ship in a Bottle’, https://www.bbc.co.uk/blogs/thereporters/willgompertz/2010/05/yinka_shonibare_1.shtml, [Accessed 6 March 2020]
- Higgins, Charlotte, (2010), ‘Yinka Shonibare celebrates Victory on Trafalgar Square’s fourth plinth’, <https://www.theguardian.com/artanddesign/2010/may/24/shonibare-fourth-plinth-ship-bottle>, [Accessed 6 March 2020]
- Kennedy, Maev, (2011), ‘Message in a big bottle - appeal to save fourth plinth HMS Victory’, <https://www.theguardian.com/artanddesign/2011/nov/30/fourth-plinth-victory-yinka-shonibare>, [Accessed 6 March 2020]
- Lambert, Andrew, (2011), ‘The Battle of Trafalgar’, http://www.bbc.co.uk/history/british/empire_seapower/trafalgar_01.shtml, [Accessed 6 March 2020]
- London Assembly, (2020), ‘Fourth Plinth: past commissions’, <https://www.london.gov.uk/what-we-do/arts-and-culture/current-culture-projects/fourth-plinth-traffic-square/fourth-plinth-past-commissions>, [Accessed 6 March 2020]
- Middendorff, Paul, (2017), ‘Olafur Eliasson’s Green light Welcomes Conversation About Refugee Crisis’, <http://artsandculturex.com/olafur-eliason-green-light-welcomes-conversation-about-refugee-crisis/>, [Accessed 7 March 2020]
- Royal Museums Greenwich, (n.d), ‘The Background to Trafalgar’, <https://www.rmg.co.uk/discover/explore/battle-traffic-square-background>, [Accessed 6 March 2020]

Royal Museums Greenwich, (n.d), 'Nelson's Ship in a Bottle', <https://collections.rmg.co.uk/collections/objects/563014.html>, [Accessed 6 March 2020]
Searle, Adrian, (2010), 'Fourth plinth: Yinka Shonibare's message in a bottle', <https://www.theguardian.com/artanddesign/2010/may/24/fourth-plinth-yinka-shonibare-traffic-lights>, [Accessed 7 March 2020]
Sheerin, Mark, (2014), '10 Questions for Artist Yinka Shonibare MBE', <https://theartsdesk.com/visual-arts/10-questions-artist-yinka-shonibare-mbe>, [Accessed 9 February 2020]
Yinka Shonibare CBE RA, (n.d), 'HMS Victory Returns to Trafalgar', <http://yinkashonibare.com/press/past/hms-victory-returns-to-traffic-lights/>, [Accessed 6 March 2020]
Sorrell, Hanna, (2018), 'The British Library', [<http://thebritishlibraryinstallation.com> Accessed 9 February 2020]
TBA21 Journals, (2017), 'TBA21 with Olafur Eliasson Green light – An artistic workshop', <http://greenlightworkshop.org/>, [Accessed 7 March 2020]
The Lionheaded, (2016), 'GREEN LIGHT – OLAFUR ELIASSON AT TBA21', <https://thelionheaded.com/2016/05/green-light-olafur-eliasson-tba21/>, [Accessed 7 March 2020]
Wilkes, David, (2010), 'Still see no ships, Lord Nelson? Giant boat in a bottle unveiled on Trafalgar Square's fourth plinth in tribute to Naval hero', <https://www.dailymail.co.uk/news/article-1280834/Trafalgar-Square-Fourth-Plinth-Yinka-Shonibare-unveils-Nelsons-Ship-In-A-Bottle.html>, [Accessed 6 March 2020]
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Tutor comment:

N. is a fantastic student. Her always thoughtful and original contributions to our tutorial discussions made me wish that she was in one of my postgraduate student groups – she was definitely ready for the challenge! Her ability to think critically and independently, her brilliant writing skills (and amazing vocabulary!), her willingness to research outside of the course materials and her already very strong skills of argumentation mean that any highly-selective university will be all too lucky to have her. She chose artworks for this essay herself and convincingly argued that, by establishing dialogue and collaborating with their audiences, contemporary artists can indeed 'change the world'. I have learnt a lot from working with N. and wish her all the very best for the future."

Popular art: Making historical objects relevant in society today

Year 12, Key Stage 5

Pupil Name: T. Annison

School Name: Northwood School, Hillingdon

Supervised by: A. Ford Spora

Tutor University: University College London

Course Title: Ancient Nile Valley figurines: Making meaning today

Hello students and welcome to this part of the exhibition in which we will be discussing how the understanding and relevance of historical objects can be enhanced through the use of modern art. The redevelopment of artwork such as manga, collage and mural allows everyone, but especially the younger generation to gain a richer understanding of archaeology and the objects that have been, and continue to be, excavated in North Africa, more specifically from Egypt and Sudan.

Additionally, I have designed and created my own art piece, which I will take the opportunity to share with you later on in this lecture. I have uploaded it onto various social

media sites including Twitter and Instagram, so you will be able to examine it further in your own time if you so wish. As young, aspiring archaeologists, you have the privilege of studying these magnificent ancient objects. Hopefully you will not only be inspired by the legacy that these objects leave, but appreciate the power that modern art can bring forth in order to communicate the, sometimes hidden, meaning and message that the ancient object convey as well as reflecting on the people who used them and the people who found them. However, as you will discover throughout this lecture, there has been some controversy with regards to the excavation of these ancient artifacts as well as debate about who has the right to maintain and preserve them for future generations.

First of all, it would be useful for me to provide some historical background in order to establish the context of this particular lecture and the exhibition as a whole. My main focus throughout this session is shabtis which are one of the most common artifact types. Shabtis are small Ancient Egyptian figurines and their purpose was to serve the wealthier citizens of Egypt (mostly Pharaohs and Queens) in the afterlife; each shabti was made to provide or perform a certain service for that individual in the afterlife - such as cooking, fishing, farming, building, and so on. What do you think about when you look at these objects? What do the hieroglyphs mean? Who found them? How do we identify a connection with them? But most importantly, who has the right to own and maintain them? These are all relevant questions that require consideration and I will attempt to address them with a particular focus on their relevance to current ideas and concerns.

However, one of the first key points to raise is the role of museums. My research suggests that there remains a tendency within the more established museum community to avoid controversy and to attempt to limit the debate about ownership and cultural appropriation. In the early days of excavation in Egypt (19th and early 20th centuries) objects were excavated primarily for financial gain, although over subsequent years there was a move to appreciating the historical and cultural value of objects and many ended up in museums. However, the museums were often thousands of miles away from the actual place of discovery – namely Europe and the USA. The general populations of these nations had the opportunity to view and appreciate the legacy of Ancient Egypt, but the population of modern Egypt did not have that same opportunity. Instead, it was more commonplace for the country of origin to receive replicas of the original objects and be expected to display these rather than the originals.

We can explore this further by discussing the concept of the T-shirt campaign 'Museums are Not Neutral'. Many of you may not have heard about this campaign as it is more popular in America, but it plays a significant role there in raising awareness about how museums fail to communicate to us about the exploitation that occurred throughout excavations over the past two hundred years. In addition to this, it aims to bring communities together as well as educating people about their heritage

and relevance when it comes to the excavation of historical objects which museums sometimes fail to do. The fundamental basis of 'Museums Are Not Neutral' is to raise awareness about the exploitation of cultural heritage and indigenous archaeologists, by colonialists that museums often fail to mention to the general public, because they deem it too controversial.

However, it can be argued that more recently there has been a move away from the exploitation and colonisation when procuring ancient historical objects from places such as Hawara in Egypt and Nuri in Sudan. Instead, there is more emphasis on the ethics of excavating objects and objects found are treated with respect – no longer are archaeologists using shabtis as torches to help them navigate their way around a tomb or a cave!

Additionally, very recently the events in Syria have re-opened the debate about the safety of ancient artifacts and buildings in their country of origin. This is evident from the 2015 attack by Islamist militants in Syria who destroyed many of the ancient ruins of Palmyra and have deliberately waged a war of destruction on the region's cultural heritage. However, a counter argument could use the bombing of major cities in both Britain and Germany during the Second World War – how safe were the paintings, the relics, the artifacts housed in museums and galleries in these countries at that time? There are certainly difficult questions and issues to consider when discussing this subject and there are no easy answers.

Before I look more closely at the concept of modern forms of art and how it can help us to appreciate and understand shabtis I would like to present to you the piece of artwork which I have created myself and mentioned it briefly to you earlier on in this lecture. I am going to describe the piece of art to you and explain what it could mean with regards to communicating a critical narrative. This piece is an example of a collage (which is one of the examples I have mentioned earlier), a selection of different images that are combined together to create a critical narrative.

Here we have an aqua marine shabti in the centre of the canvas. The fact that it is in the centre conveys how common these Ancient Egyptian objects are to find throughout excavations. As you can see, there is a slight difference in the colour of the shabti as I am sure that the majority of the shabtis that you have seen over the years of studying this subject are of a variation of beige colours. I have chosen blue to represent the shabti's power and significance to archaeologists over the past two hundred years. As you know, the hieroglyphs are carved in order to conjure a spell in order for the shabtis to fulfil their purpose in the afterlife.

I find that the strangest part of the piece of artwork is the number of hands reaching for the shabti. As you can see, these hands are of different ethnicities and they are torn between the museums located in richer countries and their countries of origin (in this picture it is in Nuri) which (morally) is the area where they should rightfully remain.



This represents the controversy with regards to the rightful location in which the shabtis should be kept. There is an argument that the shabtis may be safer in an exhibit in a glass cabinet, however it is immoral to allow people from its country of origin to only merely glance at a 3D replica of the shabti that has been found local to them.

Furthermore, this piece of art represents the overbearing pride that archaeologists from western civilisations portray when they 'discover' these Ancient Egyptian artifacts.

What we all seem to forget is how sacred and important these ancient objects to the countries of origin, even if it is as something as small as a shabti.

These objects are supposed to be items that the country of origin should be proud of as well as having a chance to experience the objects first-hand, without other wealthier countries taking them away from the country of origin to show to their general public in museums.

This is where the use of 3D replicas come in. What I haven't told you is that the shabti pictured here, is in fact a replica of the shabti of Pharaoh Seti I. (As you can see, the shabti is holding two hoes, with hands crossed and is wearing a king's wig.) This can lead to another interpretation of my piece of artwork. It could suggest the argument which is who decides who should have the right to the 3D replicas and who should have the right to own the original object. The fact that the hands are diverting towards the object implies that the only way to really embrace the object is to be able to touch it and feel its texture. It may also suggest who has the authority to control where the objects are. There could be an argument suggesting that it is only right for the country of origin to gain the 3D replicas in order for people to visualise the shabti. Also, if they become damaged, they can easily be replaced. Some may see it as a way of returning the object to the original country.

However, there are other forms of modern art that have been used to communicate similar moral and ethical issues with regards to excavation, as well as transportation, of historical objects such as Ancient Egyptian artefacts. An example of this can be taken from Yukinobu H's Professor Munakata's British Museum adventure which is a form of mural artwork. Manga is a Japanese style cartoon or graphic novel. The combination of images and text means that it is able to engage with all audiences, especially younger audiences.

One of the most interesting aspect of this graphic novel is the mention of a marble lion, in which it has been said that around twenty people died in the effort of transporting it to the British Museum. It further conveys the exploitation of people in the world of archaeology particularly during the early years of archaeological excavations. This is yet another key example of art communicating the harsh reality of excavation and transportation of historical objects to younger audiences.

I trust that throughout this lecture you have gained a greater understanding of the relevance of artwork with regards to the excavation of historical objects. As you are no doubt aware, western civilisation has exploited archaeologists who are indigenous to the country of origin as well as their cultural heritage. As young aspiring archaeologists we must make sure that we bring this to the attention of the general public. We should be diligent in our efforts to communicate the importance of historical artefacts and creative in our attempts to make these objects relevant to the modern world. Art can be seen as a form of critical narrative in order for us to gain an understanding of the issues and debates in the field of archaeology. What some people do not understand, or fail to appreciate the importance of, is how sacred these ancient artefacts are to the source communities. Worldwide, this is an issue that requires educating the general public about it. Think carefully about the next artefact you see and remember that there is most likely a controversial story behind it.

References

James, T.G.H.J. 1982. Egypt Exploration Fund (EEF)/ Artefacts of Excavation . [Online]. [29 December 2020]. Available from: <https://egyptartefacts.griffith.ox.ac.uk/resources/egypt-exploration-fund-eeef>
Jane lydon and uzma rizvi, J.L.& U.R. 2017. Colonialism and archaeology: The legacy lives on. [Online]. [12 December 2020]. Available from: <https://www.middleeastmonitor.com/20150117-colonialism-and-archaeology-the-legacy-lives-on/>
Dean, K.D. 2016. Across the sea: the distribution of Egyptian objects from British excavations to Australia and New Zealand. [Online]. [29 December 2020]. Available from: <https://egyptartefacts.griffith.ox.ac.uk/blog/katee-dean-university-queensland>
La tanya autry, L.T.A. 2019. We are stronger together - Museums are Not Neutral. [Online]. [12 December 2020]. Available from: <https://www.museumsarenotneutral.com/learn-more/we-are-stronger-together>
Autry & murawski, L.T.A.M. 2019. Museums Are Not Neutral: We are Stronger Together Panorama Journal of the Association of Historians of American Art. [Online]. [29 December 2020]. Available from: <https://editions.lib.umn.edu/panorama/article/museums-are-not-neutral/>
Romey, K.D. 2015. How Ancient Palmyra. Now in ISIS's Grip, Grew Rich and Powerful. [Online]. [31 December 2020]. Available from: <https://www.nationalgeographic.com/news/2015/08/150826-syria-palmyra-islamic-state-isis-archaeology-history/>

Tutor comment:

"I thoroughly enjoyed working with all the pupils at Northwood School, they produced work that indicated their willingness to apply creative critical thinking to matters of heritage. T. worked diligently in class, as well as, with submissions of homework and the final assignment. T's essay showed a level of sophisticated critical thinking and in-depth understanding of the complexity of the issues of heritage. The essay displayed creativity and uniqueness, including the development of a collage about the key ancient artefacts and within the frame of a lecture delivered to Archaeology students. No doubt T. would be an asset within the undergraduate programme she pursues in the future."

How does horror fiction reflect and impact our culture

Year 12, Key Stage 5

Pupil Name: L. Ingham

School Name: Scarborough Sixth Form College, North Yorkshire

Supervised by: Dr M. Crofts

Tutor University: University of Hull

Course Title: Horror fiction's grave importance

Horror fiction is arguably one of the most popular genres of film and literature. A fascination with the monstrous and supernatural has had a startling impact on our culture. Some enthusiasts strive for a meaningless escapism from the mundane nature of reality, and others are allured by themes which implicitly echo social and political issues. Furthermore, the genre has a commitment to the present and a relationship with the past, which enables audiences to emotionally connect and invest in the narrative.

'Horror' is defined as a 'strong feeling of revulsion, fear, or shock' (taken from the 'glossary of keywords' in 'Horror Fiction's Grave Importance' handbook). Why then, has the genre engrossed audiences for centuries and grown so popular? One of the most influential features of horror fiction is its power to sharply critique and reflect our culture, which in turn has a gross impact on our society. In this essay I will particularly be looking at two texts: 'The Strange Case of Dr Jekyll and Mr Hyde' (Stevenson, 1999 Wordsworth Classics) and 'Good Lady Ducayne' (Braddon, 2013). 'Jekyll and Hyde', written by Robert Louis Stevenson and first published in 1886, is a 19th century gothic novella addressing the dual nature of man. 'Good Lady Ducayne' is a short vampire story, originally published in 1869, written by Mary Elizabeth Braddon. Whilst the texts are diverse, there is a similarity and resemblance between them and many other texts, both past and present, in the genre. One reason I chose these two texts is because of their diverse perspectives: whilst Stevenson's writing is masculine focused, Braddon writes more from a feminine perspective. Perhaps it could be argued that as well as the genre constantly adapting itself to connect with a current audience, there is a continuity within the vicinity of the horror fiction, with each text making use of similar techniques to frighten and intrigue audiences. Furthermore, the genre has the ability to represent the underrepresented and enlighten audiences on themes and ideas which are repressed in our culture. Throughout this essay I will be exploring how horror fiction is successful (if in fact it is), in evoking fear, reflecting society, and creating an impact.

One way in which horror fiction reflects our culture, is in its connection to history. Through the lexis choice, subject matter and perhaps more explicitly mention of historical events, audiences are able to gauge an understanding of history. For instance, 'Good Lady Ducayne', reflects the period in which it was written by the use of archaic language and the focal themes. Upon reading the short story I came across many archaisms. A few examples from chapter two include: "How too lovely" (p.13), "this day week at eleven" (p.13) and "a quarter before the hour" (p.13). Although the words themselves are not

outdated, it is how the phrases are structured which sounds archaic. Furthermore, the mention of 'Louis XVI' in chapter 4 ("I was born the day Louis XVI was guillotined" (p.41) enables modern readers to place the narrative at a time in close proximity to the French Revolution. By making readers aware of key historical periods, texts can begin to develop a timelessness - even as decades and centuries pass, our history remains of vital importance. Furthermore, horror fiction reflects our culture by echoing the fears present in society. It is widely known that the genre of horror evokes fear in audiences, however we are not always aware that this is because these fictional works often contain fearful truths. For example, one of the key themes in 'Jekyll and Hyde' is the relationship between science and religion. The 19th century was a time of great advancement in science, something which intrigued many, but provoked great fear in others. Charles Darwin was at the forefront of this advancement and published 'The Origin of Species' in 1859, not even thirty years prior to the release of 'Jekyll and Hyde'. Darwin's proposals contradicted the dominant and accepted belief that God created man, and thus created a polar divide between science and religion. Furthermore, there was also a divide between the biological sciences (more traditional) and the chemical sciences. It can be suggested that the characters of Dr Jekyll and Dr Lanyon represent this divide. For instance, in chapter 2 of the novella Lanyon remarks that Jekyll's experimenting is "unscientific balderdash" (p.9). Perhaps his dismissive nature could be disguising a deeper fear of this unknown field of science. This is an effective way to make an impression on audiences – teaching about the political and historical, through the personal.

Likewise, in 'Good Lady Ducayne', fears relevant to the time of the novella are portrayed. Similarly, there are suggestions of new advances in technology and medicine, however there is also a strong focus on health and age (and particularly the desire to live forever). The novella clearly reflects the obsession Victorian society had with good health. In chapter two health is mentioned numerous times (for example, "Have you good health?" (p.11), "I want a strong young woman whose health will give me no trouble" (p.12). The influence of health throughout the novella indicates its dominance in the 19th century. Furthermore, there is also a large focus on age and the desire to live eternally. Lady Ducayne represents this fixation and fascination. When reading chapter two, I found that within just one sentence the adjective "old" had been used four times – "Never has she seen anyone as old as the old lady sitting by the Person's fire: a little old figure, wrapped from chin to feet in an ermine mantle; a withered, old face under a plumed bonnet—a face so wasted by age..." (p. 11). The repetition of this qualitative adjective, within the composition of just one sentence linguistically reflects the dominance of age within the era. Furthermore, this leads me onto my next point about how the successful use of literary techniques within horror fiction aids the genre in its ability to hugely impact culture.

The use of complex literary techniques is another reason why horror fiction is so successful in making an impression on audiences and impacting lives and culture. When reading both 'Jekyll and Hyde' and 'Good Lady Ducayne' I noticed the use of foreshadowing. I believe this is an important feature in the horror genre, as it builds

tension and anticipation. In 'Jekyll and Hyde' this is particularly prominent in chapter 8 – 'The Last Night' (the chapter title itself is also foretelling). Stevenson sets the scene as a "wild, cold, seasonable night of March" (p.27), with the adjective "wild" arguably echoing Hyde's behaviour. Furthermore, nature is personified, for example, in the phrase the "pale moon lying on her back" (p.27), which uses pathetic fallacy. Immediately the adjective "pale" and imagery of "lying on her back" suggest weakness and a susceptibility to harm. Perhaps by suggesting that the great forces of nature are fragile and weak, it heightens the tension – suggesting that if nature is at risk to the forces of evil, then humanity does not stand a chance. Likewise, foreshadowing is used in 'Good Lady Ducayne'. This is particularly evident in chapter four, prior to the truth about Lady Ducayne being revealed. Stafford, a minor character, describes Lady Ducayne's appearance to have an "indescribable horror of death outlived" (p.38), and suggests that she should have "been hidden under a coffin-lid years and years ago" (p.38). This indication clarifies to the reader that there is an abnormality in living to her great age. At this point, readers may have a clear idea of how the plot with resolve – the discovery of her vampirish behaviour and her theft of life from the young and innocent. One argument is that this builds tension and unease in readers, thus increasing the impact a work of fiction can have. Conversely, the use of foreshadowing perhaps lessens the impact on the audience, as the reveal will not come as such a shock. It is interesting to note, that often more modern works of horror and mystery thrive on keeping the audience in suspense, often purposely directing audiences away from the truth. Overall, the effective use of literary methods is an essential part of fiction, both in providing a solid structure for the narrative to be built upon, and in driving and enhancing the plot.

Another way in which horror fiction impacts our culture is in the way it addresses themes often repressed in real society. Our culture is defined by societal rules and norms, many of which go unspoken. Sometimes known as 'taboo' topics, there are certain things we know not to discuss. However, fiction allows writers to break through these barriers; to express not only the spoken, but the unspoken, not only the seen, but the unseen. The British culture is often characterised by its reserve – a desire to keep self-contained and not impose oneself on others by prying in their business. 'Jekyll and Hyde' clearly highlights the evidence of this in Victorian society, and reveals the truths beneath the polished, seemingly flawless façade of the Victorian Gentlemen. For instance, in chapter one the character of Mr Enfield remarks that "the more it looks like Queer Street, the less [he] ask[s]" (p.6) and that he "had a delicacy" (p.6). Both quotations exemplify the reserve Victorian gentlemen had when encountering even the slightest suggestion of scandalous behaviour regarding another gentleman.

Furthermore, this reserve is also evident in how the Victorian gentlemen felt the need to disguise their less dignified habits, such as visiting public houses and indulging in alcohol. In the opening of the novella, the character of Mr Utterson is described to have only "drank gin when he was alone" (p.3), inferring he wanted to hide an undertaking which would be associated with 'common' people, rather than the upper and middle classes. Furthermore, when introducing his "very odd

story" (p.4)., Mr Enfield remarks how he was "coming home from some place at the end of the world" (p.4) at "three o'clock" (p.4) in the morning. His clear divergence from identifying his whereabouts implies that his evening's pursuit would damage his reputation. However, what is particularly interesting is Mr Utterson's acceptance with this concealment. I think this suggests the unspoken, but mutually beneficial agreement between the Victorian gentlemen to abstain from enquiring in one's business, thus protecting reputation, whilst remaining able to indulge in not so gentlemanly activities. Overall, I think that this demonstrates how horror fiction can reflect the way our culture behaves, whilst unveiling the truths beneath this etiquette which go unspoken.

Furthermore, horror fiction can create an impact by representing the underrepresented. Many themes, groups and pools of thought have lacked true (or even any) representation throughout history. Fiction can provide the key to opposing this discrimination and raising minority voices. For example, a feminist reading can be taken of 'Good Lady Ducayne', as it arguably challenges gender stereotypes. Upon reading I found it particularly interesting how there were no significant male characters within the first two chapters of the novella. The masculine characters who were mentioned, were not named, or even given a capitalised title –for example being referred to as the 'page' (p.10) and 'postman' (p.9). Likewise, one of the female characters is not given a name (and is referred to as the "Superior Person" (p.3), however her title is capitalised, which is markedly different to how the masculine characters are introduced. The phrase the "Person's smart page" (p.10) is possessive and juxtaposes the traditional (or perhaps more accurately, 'outdated') idea that men should have control and ownership over women. By the dominance of the female character, it suggests that Braddon wanted to emphasise the importance, authority (and often superiority) of women. Additionally, the sentence structure is linguistically interesting - by placing two titles both beginning with the letter 'p' so closely together, one capitalised and one not, it highlights the juxtaposition and contrast between them. This therefore shows how literature can be an expression of one's views and beliefs, whilst not shifting the central focus from the plot. Furthermore, texts such as these have an impact on readers, which can awaken awareness of different viewpoints and gradually begin to implement change in our culture.

An alternative explanation to why horror fiction evokes fear in audiences, is that rather than reflecting society, it is radically different and offers an escapism from real life. The genre is often characterised by its devotion to the supernatural and otherworldly creatures. For example, we do not usually come across werewolves or zombies whilst out shopping. However, rather than finding escapism through entertainment, many are unnerved by the frightening, unearthly creatures of the horror genre and experience severe emotional distress. It can therefore be argued that these works may have the adverse effect – the desired impact is created; however personal comfort is sacrificed, and emotional burden increased. However, the counterargument to this is that our perception and treatment of unearthly creatures, is of vital importance as it is reflective of our prejudice and discrimination towards those who are different; society's bad habitat of 'othering'. The Macmillan Dictionary defines 'othering' as "treating people from

another group as essentially different from and generally inferior to the group that you belong to". This is evident in many works of horror fiction, whereby the protagonists must succeed in stopping and killing terrifying monstrous beings. Moreover, it is noticeable that it is commonplace for the protagonist to be human, and villain or antagonist to be a supernatural creature. Therefore, this supports the argument that the creatures that audiences largely find frightening are those that appear to be vastly different to themselves. Perhaps through audiences engaging with horror fiction, they will gain a perspective view of our social norms and develop a desire to change and renounce the prejudiced nature of our culture.

In conclusion, drawing on divergent literary critical routes has allowed me to argue that horror fiction does reflect our culture to a large degree. Historical literary criticism reinforces my argument as an enabling tool in understanding the impact of history upon horror fiction and our culture. The argument is strengthened further when drawing on feminist literary criticism, such as the challenging of gender stereotypes, as I have identified in 'Good Lady Ducayne'. Horror fiction has an ability to sharply critique our society, whether consciously or subconsciously. Through its dedication to the past and engagement with the present, humanity continues to have a connection with the genre. Arguably what provokes the most fear in us, is seeing our own societal issues played out on the screen or through the medium of a novel. Furthermore, when in doubt we turn to fiction to provide the answers. Therefore, horror fiction is of integral importance, as it has the rare ability, not only to impact our culture, but to shape it. Throughout this essay I have indicated the timeless nature of horror fiction and its fundamental impact. Just as the filmmaker George A Romero said, horror is "the genre that never dies".

Tutor comment:

"All the pupils at Scarborough Sixth Form College were very impressive and produced fantastic assignments, especially against the backdrop of the pandemic! L. showed they were capable of writing at a university level with this piece, and they would be an excellent candidate for whatever course of study they pursue. From careful citation to a well-evidenced argument, L. showcased a whole range of skills and wrote a sophisticated exploration of what we can learn from horror fiction – above and beyond what we discussed in class."

Ancient criticisms of the Roman Arena were often focused on the negative behaviours of the arena crowd. To what extent can these ancient criticisms be applied to Susanne Collins's The Hunger Games?

Year 12, Key Stage 5

Pupil Name: [A. Khan](#)
School Name: [Ark St Alban's Academy, Birmingham](#)
Supervised by: [H. Barlow](#)
Tutor University: [University of Birmingham](#)
Course Title: [The Stoics and the Hunger Games: A Critique of spectacle society?](#)

The Gladiatorial Combats were arguably the most anticipated form of entertainment within the Ancient Roman era and were greatly favoured amongst the majority. However, it would be inaccurate to state that the Roman form of entertainment was liked by all when, in reality it received a significant amount of criticism from individuals such as Ancient writers and the Stoics. The Ancient Criticism of the Roman Arena were often focused on the negative behaviours of the arena crowd specifically. These individuals actively expressed their censure with arguments suggesting the mob mentality, excessive nature, and the immorality of arena crowds. Nonetheless, there is no doubt that the games are still prevalent through modern day films and arts. A particular example would be Suzanne Collins' *The Hunger Games*, which are a series of dystopian novels often perceived to have been influenced by the Gladiatorial games themselves. Suzanne Collins has stated in interviews that she 'researched not only the historical Spartacus and the popular media about him but many of the historical gladiators' pre-Christian times'. Through this, one can dispute that stoic ideologies can be affiliated with *The Hunger Games* to an extent, and it is this argument that will be explored further in depth within the essay.

Stoicism is the idea that happiness is found when a person is led by their mind in their understanding of the world around them. Their actions are controlled through logic rather than desires for pleasure or fears of pain. One could say, in other words, that they prioritise the duality of rationality over emotions. The Stoics were major critics of the Roman Gladiatorial Games and had prominent concerns that arena crowds often deploy a mob mentality when observing arena entertainment. This negatively impacts a person's ability to think and behave in a logical manner. One can evidence this through Seneca the Younger's seventh letter on the crowds where he states simply that 'That I go home more selfish, more self-seeking and more self-indulgent' and that 'the greater the mob with which we mingle, the greater the danger.' Here Seneca the Younger may be alluding to the fact that it is much easier to conform to the behaviour of a majority and let it influence or indoctrinate you and your goals such as becoming a better version of yourself. Thus, ultimately limiting stoic practice. Seneca the Younger is discrediting the existence of such crowds and the Gladiatorial games as they are an incentive to act more viciously and non-logically rather than with reasoning which is a duality that is not encouraged by Stoics. The idea of being more 'self-indulgent' and 'selfish' when in arena crowds is also translated in *The Hunger Games*, particularly through the concept of betting. One can argue that the Capitol's illogical behaviour as a result of watching the Hunger Games is clearly displayed through their heavy enjoyment in betting on the tributes. "They're betting on how long I'll live!" . Here Katniss may be subtly criticising the idea of trying to impress the arena crowd. She criticises further how the Capitol has lost all ethicality over betting as they place their chances on who is most likely to survive in their morally deprived system of inevitable deaths. This shows how the tributes have been stripped of an identity and dehumanised or reduced to a way for the Capitol to earn more money than they already have. It also reinforces the extent to

which their ability to act logically and in a humane way has been corrupted, as trying to gain from such a brutal and harmful event is not logical nor civilised. It reflects the type of corruption and selfishness in which Seneca the Younger and the Stoics in general allude to; the idea of people losing rectitude and indulging in activities which promote killing and brutality for their individual gain, controlled by a desire for pleasure or money, etc.

Another belief in which was deeply rooted into Stoicism was the idea that everything must be done in moderation rather than excess. The Roman Gladiatorial Games are, as we know, anything but moderate with arena crowds spending hours of their lives viewing bloodthirsty combats. Minimalism and moderation are incredibly valued by the Stoics as well as the duality of control rather than excess. For example, Seneca the Younger states in his seventh letter about the crowds that 'A single example of extravagance or greed does a lot of harm' and that 'a wealthy neighbour provokes cravings in one'. Here, Seneca the Younger is stating how one's wealth ('wealthy neighbour') entices another to be greedy and crave the same wealth for themselves. This is harmful as one's greed is activated and so their ability to behave in a rational and logical manner is overridden. Arena crowds display their greed through their dependency on barbaric entertainment as Seneca the Younger describes 'And when there is an interval in the show: "Let's have some throats cut in the meantime, so that there's something happening!" This presents the overindulgence of the crowd and their lack of control to stop viewing these sorts of entertainment one after the other. This idea of consuming in excess is also translated in *The Hunger Games* particularly through the duality of food. For example, the intake of food within the Capitol is of great surprise to Katniss Everdeen who is from District 12. In District 12, starvation is a common pandemic with Katniss even thinking of resorting to eating from bins to fill her and her family's desperation. An example of excess is displayed when Katniss exclaims that she stopped eating because she 'can't hold another bite' and the reply elicited from those in the Capitol is one of laughter as 'No one lets that stop them!' This reinforces that those in the Capitol consume in excess and shows their intemperance as despite being full, they will continue to eat more than they need to (a concept which is strongly criticised by the Stoics like Seneca the Younger). However, one could argue that Katniss and those in District 12 can also be criticised for acting irrationally. For example, we see that some in the districts will add their names more times or opt for a greater chance to be selected, in exchange for tessera and a year's supply of grain and oil for one person. Here Seneca the Younger's criticism of how people will act illogically in order to fulfil a single desire can be applied as one can question why those in the districts would act irrationally by opting for a greater chance of inevitable death just for a small supply of food for one person.

Another Ancient criticism that could be applied to *The Hunger Games* is the fear of decline in morals that many Stoics had in response to the Gladiatorial combats. Stoics were greatly concerned with how immorality is relished in arena crowds when using the barbaric

Gladiatorial games as provision for entertainment. Immorality is again seen as the act of behaving in ways that are irrational and without reasoning. Thus, a primal fear of ancient writers or philosophers such as Augustine of Hippo for example, was the increasing decline in morals in Rome. They saw the Games as the origin of the increase in immoral behaviour and this is particularly highlighted within the *Augustine of Hippo Confessions* 6.9 where Augustine of Hippo speaks about being a part of arena crowds and the effect that it can have on one's mannerisms. Augustine of Hippo describes how spectators become 'drunk on the pleasures of blood' whereby being 'drunk' reflects a state in which one lacks control and the ability to make logical and sensible decisions, as they unknowingly indulge in activities which corrupt and taint their soul. Moreover, the fact that he is drunk 'on the pleasures of blood' demonstrates how participating in such events destruct the morals of the innocent as well as their ability to care for more intellectual pursuits. Ultimately, Augustine of Hippo is portraying the dangers of adopting such behaviours and ridicules the concept of spectators gaining gratification and openly encouraging the destruction of another human being, just because it fulfils their need for entertainment. This concept can be applied to the modern Hunger Games, where much like The Roman Gladiatorial Games, are held for the purpose of entertainment and are treated like a festival by the Capitol. A particular scene showing the bloodlust of the crowds is where Katniss and Peeta arrive on the train in the Capitol. We see the extent of the crowd's excitement and desperation to see the tributes which is ironic as they are aware of the high chance of death of these very tributes. Moreover, the concept of the Capitol gaining pleasure and satisfaction from viewing the act of 24 tributes battling for the chance to live and to see another day further displays their 'lust for blood' nature. Although it is televised for viewers rather than requiring to be physically present in an amphitheatre like The Gladiatorial Games, it does not mean to say that those spectating are exempt from acting immorally. The idea of the arena crowd (the Capitol in this instance) watching other humans fight to death is still present and one could say even more barbaric due to the fact that they hold the power of whether to provide essential resources. These resources determine the chances of survival for the tributes. The adoption of such unprincipled behaviours are inevitable according to Augustine of Hippo who believes that you are not the same person you were before participating in such means of entertainment.

In conclusion, it can be said that Ancient Criticisms of the Roman Arena from groups such as the Stoics can be applied to *The Hunger Games*. From the immorality and selfishness of the crowds to excessiveness and greed, there is no doubt that there are active examples of each idea in *The Hunger Games*. Ancient writers such as Augustine of Hippo and Seneca the Younger had clear proposals as to the effects of arena crowds and how this can affect one's mannerisms and behaviours. The pockets of influence from the Roman Gladiatorial Games present in *The Hunger Games* as well as the similarities between both arena crowds, allow us to apply such ancient criticisms to a modern reconstruction.

References

- 1 Blasingame, J and Collins, S. 2009. 'An Interview with Suzanne Collins' <https://www.jstor.org/stable/27654337>
- 2 Seneca, L. A., & Campbell, R. (1969). Letters from a Stoic: Epistulae morales ad Lucilium. Harmondsworth: Penguin Books. (Accessed on the 15th of December at 22:01)
- 3 The Hunger Games-- Chapter 9, Page 140
- 4 Seneca, L. A., & Campbell, R. (1969). Letters from a Stoic: Epistulae morales ad Lucilium. Harmondsworth: Penguin Books. (Accessed on the 15th of December at 23:06)
- 5 Seneca, L. A., & Campbell, R. (1969). Letters from a Stoic: Epistulae morales ad Lucilium. Harmondsworth: Penguin Books.
- 6 Page 33-34, The Hunger Games
- 7 Catching Fire, page 94 – Suzanne Collins
- 8 The Hunger Games, Page 15
- 9 Augustine of Hippo Confessions 6.9

Tutor comment:

"It was a pleasure working with A. during my time at Ark St Alban's Academy. She impressed me with her clear and thoughtful comments during our discussions, and by her consistent effort and achievement throughout the tutorials. She dealt with the ancient philosophies and modern texts covered in this topic with insight and intelligence, and leaves me in no doubt that she would thrive in an undergraduate programme."

How seriously should we take comedy?

Year Group S3

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Supervised by: E. Sullivan

Tutor University: University of Edinburgh

Course Title: Taking comedy seriously

Greek philosopher Aristotle, claimed that "Comedy aims at representing men as worse and Tragedy as better than actual life." [1] Since its conception, comedy has acquired some negative views from certain philosophers such as, Aristotle (as mentioned above) and Plato, amongst many others. This is as a result of comedy portraying 'men as worse' or in other words promoting men to behave worse than they should. Although, as times have changed the general consensus on comedy too, has changed. It's no longer thought of as 'low brow,' and can be found everywhere, from TV to film and even adverts. Furthermore, many comedians are using comedy as a platform from which to project their opinions of the issues of today's mankind, some of these issues being gender or racial inequality or stereotypes. A couple superlative examples of such comedians are as follows: Amy Schumer, Russell Howard and the comedic duo Key and Peele. If comedy is thought of seriously rather than just as a temporary escape and a form of entertainment, it is a great tool for addressing controversial topics. As in accordance with the comical theory of comic relief, it can be used to alleviate tension on a sensitive issue. It can also be used to keep people interested in a point or argument, and even act as a way to persuade people of a viewpoint. Although, comedy can also cause problems if a joke is inappropriate or has gone too far.

One of the many great thing's comedy can do is persuade people of a viewpoint or educate them about an event or situation. A great, recent example of this is from Russell Howard's TV show "The Russell Howard Hour"

[2] where in the segment "The Big Issue" Howard begins to talk about the how poorly some people treat the British fire service. He begins by announcing "Last year firefighters saved 45,653 people" this results in a massive round of applause from the audience. Right from the beginning Howard shows off how good of a job the fire service is doing. Then after letting the crowd settle, he asks, "So why is it that some people treat them like sh*t?" This is a rhetorical question and is another persuasive technique to try and make people think about the topic. He proceeds to show a video of gangs of youths attacking firemen, and women with bricks, stones, and fireworks. This shows what horrible things are happen to the firefighter and consequences they have.

After the conclusion of the video, Howard begins a joke in which he imitates and mocks those who attack fire fighters by putting on an accent and saying, "You know what really p*sses me off, under-paid heroes, trying to save lives" this results in a laugh from the crowd which resets the atmosphere in the room, and relieves any pressure in addition to keeping the crowd interested in what he has to say. After this joke, Howard states what he thinks the worst thing about the situation is "People are just doing it as a prank, it's not a prank!" He then goes on to say "It turns out it's not just humans abusing firefighters, a parrot tolled a firefighter to 'f**k off' after getting stuck on roof" Howard pauses for a second as the crowd laughs once again alleviating tension, then he says "And do you know what they did, they rescued him. If it was me, I would've said 'You've got wings, you f**k off!'" This results in a massive round of laughter and applause. As the brief summary above shows, comedy can and is used to, first of all, relieve people of tension and second of all, to discuss the topic in a way that isn't boring to listen to resulting in people paying attention and caring about the argument over all being more persuasive.

A downfall of comedy is that it often plays off the back of stereotypes and preconceptions which are often wrong and group people up too much, an example of this being that all people who are gay speak in a certain way. Now, I think we can all agree that statement is wrong, but using it in a comedic piece could allow viewers to be educated to know that it isn't correct, and in a way that doesn't make the viewer feel like their being lectured to thanks to the humour.

Although, with that being said the, inclusion of stereotypes in comedy - if used correctly - can allow us to challenge them. An example of this is the Key and Peele skit "Phone call." [3] The skit starts out with a nameless character (played by Keegan-Michael Key) standing on the street talking to his wife over the phone about buying her opera tickets. Then a second character (played by Jordan Peele) comes along and starts talking on the phone to his friend. When the Key notices Peele walking over, he starts to talk in a deeper, stronger, more 'black' voice. As the two men continue their conversations their voices get even deeper, and they start using more and more slang, in an attempt to out 'black' each other. Eventually Peele walks away and as he does, he says to the person on the other end of the phone, in his normal almost 'gay'

sounding voice, "Oh my god Christian I almost totally got mugged just now." This final line reveals that they were both speaking in a deeper voice to seem stronger and tougher than they sounded otherwise so that they didn't get mugged. Although this is exaggerated for comedic effect, it demonstrates what quite a few people feel like they have to do this to stay safe. It also demonstrates that what people look like has nothing to do with how they sound or speak and shows that these things happen despite it being wrong to think that way.

Another stereotype this is showing is that black people are thought of as strong thugs, this is shown by how Peele was scared he was going to get mugged by Key because of what Key looked and sounded like; tough and strong, or in other words 'black'.

Although the use of serious comedy can have a number of positive effects, it can easily be misused and cause a serious issue if a joke is in bad taste or poorly timed. One such joke was told by American comedian Joan Rivers who made an ill-judged joke about the 9/11 disaster, [4] in which she claimed that if the firefighters who died in 9/11 ever returned to their families, they would be disappointed because of the \$5 million in compensation the families received. This joke went down poorly with a lot of people with one member of the crowd yelling "Too soon!" In addition, The International Association of Firefighters [5] condemned the joke saying, "It is a new low and cannot be tolerated." and claiming, "But, as you have proven, it can be made more painful with a resentful remark or a caustic comment." This very clearly demonstrates that these jokes can cause an awful amount of damage. Arguably the worst part is many think they can just get away with these sorts of jokes because they were, 'only joking,' this makes people think that they can get away with a plethora of offensive or downright malicious jokes and suffer no consequences.

In amongst all the benefits of taking comedy seriously comedy has another use, escapism. In spite of escapism being mostly responsible for comedy's 'low brow' status, unserious comedy can actually be quite beneficial. It can get people to listen, increases long term memory retention, improves understanding, aids in learning and helps communicate messages, among many other things, and all those benefits are backed with research, studies and real-world examples. So, if there are so many benefits why was it given such a low status? Well, it was thought to be something for those trying to run away or hide from the real world, rather than facing the issue. A form of procrastination for the scared and weak, however more recently comedy is a vital part of life as proven by the above list. Comedy is a great thing for escaping the worries and stress of life and just taking a break for a bit, but like other forms of escapism like alcohol it can't be abused, then there can be serious issues that follow. It needs to be taken in suitable doses to give us enough energy to get through the tough day.

One of the most common areas of comedy is satire - the idea of ridiculing or shaming people into improvement, a rather well-known example being "Spitting Image." The use of satire is very common in this day and age,

especially when it comes to politics. Currently anyone who wants to be involved in politics has to accept the satire that will inevitably follow. Take Boris Johnson as an example he has had his fair share of satirical comedy aimed his way.

Along with providing excellent material for stand-up comedians and comedic shows alike, satire also has a crucial role to play in our politics. It acts as the people's way of keeping those in power in check as it allows us to criticize their policies and decisions if we don't agree. In addition, the power of satirical comedy is in the way it functions, making people laugh at a specific person for whatever reason. The idea of thousands of people laughing at a mistake you made is often enough to make someone attempt to improve or make a change. An example of some satirical comedy is an extract from John Oliver's show "Last Week Tonight" [6] titled "Boris Johnson" where he talks about Boris Johnson. Oliver is talking about one of Johnson's plans for mitigating the effects of a no-deal Brexit. Johnson's plan is to suggest that if the UK misses the October deadline, they could simply trade freely with the EU under article 24 paragraph 5b of an existing trade agreement trade agreement. Oliver proceeds to show an image of the trade agreement, 'The General Agreement on Tariffs and Trade.' Oliver continued by saying, "But the very next paragraph, 5c makes it clear that it is simple not possible, and just watch as a journalist actually challenged him on it." Then a video of Johnson being interviewed about the problem begins. "You talk about paragraph 5b, so how would you get around paragraph 5c?" "I would confide entirely in 5b." Then the journalist repeats his question and Johnson replies with the same. Then the journalist asks Johnson whether he even knows what is in 5c and Johnson simply replies with a confident, "No." The screen cuts back to Oliver in utter disbelief, resulting in the crowd laughing. "Oh, for f**k's sake" Oliver screams resulting in even more laughter from the crowd. "That 'no' was delivered with the confidence of a man who doesn't know what he's talking about but thinks it doesn't matter" Oliver continues. "It's a no that says, yeah I'm full of sh*t. So what? Just walk a few feet behind me and clean it up with a shovel." The crowd once again erupts into laughter as the last statement was a reference to another joke from earlier on in the show where a news journalist says, "I spoke to one person who said working with Boris Johnson, is like walking a few feet behind a horse shovelling it's sh*t." Once again criticizing Johnson's ideas

Although, despite the supposed power of satire, Johnson has almost made himself immune by intentionally acting like an idiot so there's nothing comedy can make fun of to make him feel bad and make a difference.

The question of whether or not to take comedy seriously is a tough one. On one hand, serious comedy has great power whether it is satire or just the ability to openly discuss sensitive issues. But on the other hand, unserious comedy is essential to us. We sometimes just need some time to forget about any problems and have a laugh. It's almost our version of a reboot, it revitalizes us gives us the energy we need and like with all things there is a fine

line between the two. I personally believe that for the most part comedy should be taken seriously but there still needs to be room for the other side of the coin. However, there will always be a risk when it comes to comedy too, but as long as comedians apologise for any jokes that have gone too far and there is an attempt to right the wrong, I think it can be moved on from. Opposed to Aristotle, I believe that taking comedy (if taken seriously) makes all men and women better by letting us talk about and try to resolve tricky subjects while letting ourselves find entertainment simultaneously. I believe the benefits of taking comedy seriously out-weight the risks.

Bibliography

- [1] Good Reads <https://www.goodreads.com/quotes/53261-comedy-aims-at-representing-men-as-worse-tragedy-as-better> [3/1/20]
- [2] Youtube <https://www.youtube.com/watch?v=P5OnlwQyiwU&t=117s> [3/1/20]
- [3] Youtube <https://www.youtube.com/watch?v=qXH5CD3O7Oc> [3/1/20]
- [4] Economic Times <https://economictimes.indiatimes.com/magazines/panache/a-9/11-joke-that-went-too-far/articleshow/71160489.cms> [3/1/20]
- [5] Fire House <https://www.firehouse.com/historical-incidents/news/10574582/iaff-rebuts-joan-rivers-humor-on-911> [3/1/20]
- [6] Youtube https://www.youtube.com/watch?v=dXYO_MC9g3k [3/1/20]

Tutor comment:

"It was such a pleasure working with the pupils at Tynecastle: they were all so committed and engaged with the course and A.'s essay was one of several outstanding pieces of work. It's an excellent example of the clear thinking he demonstrated throughout the programme. The quality of A.'s critical analysis is really impressive, and the freshness of his insights and the depth of his thinking really shines through."

Social Sciences

Is there an external world?

Year 8, Key Stage 3

Pupil: **A. Hillman**

School: **Stoke High School Ormiston Academy, Suffolk**

Supervised by: **C. Boyd**

Tutor University: **University of East Anglia**

Course Title: **Is there an external world?**

Is There an External World?

Try to realise it's all within yourself
No one else can make you change
And to see you're really only very small
And life flows on within you and without you

Within You, Without You, The Beatles

There is a famous line from the film The Matrix, where Morpheus tells Neo "The Matrix is the world that has been pulled over your eyes to blind you from the truth".

The neuroscientist Susana Martinez-Conde feels that there is an external world, but we may experience a Matrix-like deception because of the untrustworthiness of our brain and senses.

Meanwhile, the contemporary philosopher Nick Bostrom asks the question 'Are you living in a simulation?' This seems a strange question, but no stranger than some of the claims made by renowned philosophers. How can

we know what is real? Is there an external world? Is it all a simulation? The American astrophysicist Neil deGrasse Tyson once quoted a radical idea. If we now have great computing power, in the future our computers are likely to have far greater capacity, and perhaps can create simulated characters with free will. If one of those characters wants to use his free will to create a character with free will, we might get endless simulations within each other. So, are we already in an advanced creature's simulation, or are we really on a rock floating its way through eternity?

Another modern-day philosopher whose aim is to decipher the question of whether there is an external world is Rupert Read. In essence, Read argues that "The question is meaningless." He goes on to further emphasise that we "cannot escape our skins in order to see what we are missing, or to assert that we are not missing anything". In my opinion, this, unfortunately, will have to be the reluctantly accepted truth, until further technological advancements provide sufficient evidence to overthrow this theory, consequently removing it altogether.

A much earlier philosopher called John Locke came up with his own theory. He put forward the idea that there are primary and secondary qualities. In his argument, he stated that primary qualities are definite; they are perceived the same by every person. These include the size, figure, motion, solidity and number of external stimuli. On the other hand, the secondary qualities are subject to variation. They are perceived differently by different individuals. These include colour, taste, smell, and sound. For example, a colour-blind individual will see a different coloured football right in front of him, as opposed to his eagle-eyed companion adjacent to him. The primary qualities exist in the external world, and they exert a power which leads our mind into generating the secondary qualities.

However, it seems not to be entirely true that there is such a distinction between primary and secondary qualities. A near contemporary of his, Bishop Berkeley, identified what he saw as a flaw in Locke's theory. He pointed out that primary qualities such as size and density of objects cannot be perceived without also a perception of secondary qualities like colour and texture. Furthermore, one observer could be standing 100 miles away from a mountain and conclude that it is very small, while another observer standing next to it will see it as enormous. The same is true with motion. Someone on a non-stop intercity train with good suspension may experience the train as slow, while a person standing in a station watching it speed past has a very different perception. Even supposedly dense objects have been shown by science to have enormous spaces between their atoms.

Bishop Berkeley proposed his own radical idea that there was no such thing as an external world. He further expanded his theory by stating that without any one of Locke's primary qualities, it is impossible to imagine an object. You cannot imagine a colourless apple. If you try, chances are you are thinking of the colour black, white or a transparent apple, which therefore means you are perceiving the background. This led him to a startling

conclusion; nothing apart from your mind exists. The question in your mind may link with how time moves if no one is there to perceive it, but Berkeley had the answers. He suggested that God is always watching over every corner of the world with his eyes, thus time can move on.

A near carbon copy of Bishop Berkeley's theory was devised much later by Karl Friston. In summary, he argues that "The reality we experience is an inherent aspect of our own brains. It has no existence in any external sense." In theory, no human being can gather sufficient proof to argue otherwise. Therefore, this theory can technically not be discounted, like all other theories. As for my opinion, I do not believe that our brains would deceive us by devising a 'fake' world. This is because our brains are hard-wired by evolution to protect us and help us to adapt to this world.

The theories of Berkeley and Friston are very similar, but with one major difference – the role of God. This variation between the two theories can be attributed to the fact that their proponents lived in different epochs. Bishop Berkeley lived in an extremely religious society, where anything contradictory to God would be rejected. On the other hand, Karl Friston is living in a world where many individuals do not believe in God, and this massively affects his viewpoint.

But is everything in the mind? Rene Descartes (1596-1650) asked the question as to how we can be sure that we know anything. He noticed that many of the things that he had believed as a child had turned out not to be true. He wondered if his current set of beliefs about the world would similarly later be shown to be false. He observed different ways in which our minds can be tricked into believing falsehoods. One way to be tricked is through the fallibility of human perception, such as with optical illusions. Also, if we are having a dream, and then wake up, how can we know that the reverse isn't true, and we are now dreaming? He also suggested that there is a possibility that a demon is deceiving us into misperceiving an external world.

Descartes decided that it would be prudent to try to attain only absolute or certain knowledge. He did this by discarding all previous beliefs and instead building up from first principles. And what he came up with was the one thing he could be sure of: 'Cogito ergo sum' – I think, therefore I am. This was the one sure thing - he was doubting, and thus he was thinking, and so there must be a thinker having this thought – himself. From this starting point, Descartes reconstructed his world, but it seems to me that, apart from proving to himself that he existed, he did not rebuild his world view on much surer foundations than before.

Perhaps a more balanced view is that of Hilary Lawson, who argues that we should not assume that things, or even ourselves, can be known in their essence. The more we try to capture the essence of things, the more it slips away from us. We can make sense of it for the benefit of our ability to manoeuvre in this world, but we cannot agree about the nature of a particular thing because there are many available perspectives on it,

each of which have their own validity. Thus, our internal interpretation of external reality can be useful but is necessarily limited to the set of characteristics which we ourselves contain, far more than the essence of the external reality itself.

If a tree falls in the forest, does it make a sound as it whooshes through the air and hits the ground? Only if there is a hearing apparatus to detect it, perhaps. What is released is energy at a certain frequency, and the waves reach the ear, which sends signals to the brain, which interprets this as sound. The same happens with vision, and for example colour. What the brain understands as different colours can be measured as waves of light vibrating at different frequencies.

According to the way of thinking of Lawson, there was an event that occurred in the forest. If there is no auditory system to hear it, it may have fallen silently. But it still fell.

In conclusion, the question 'Is there an external world?' is a simple one, which becomes complex the moment we start trying to answer it. In my essay, I have looked at the ideas of several renowned philosophers, all of whom have laid claim to answering this question that tormented them. They come from different epochs, yet some contemporary philosophers choose to rebuild ideas centuries old. There are some, such as Bishop Berkeley and Karl Friston, who are idealists. Locke, on the other hand, thinks that we are perceiving an external world based on primary and secondary qualities. Then again, Rupert Read and Susana Martinez-Conde are sceptical that we can ever truly know the external world. Descartes saw a dualistic world of inside and outside, and our mind can provide the first principle towards knowledge. I believe, along with Hilary Lawson, that there is an external world, albeit difficult to know. Even if this external world is not as it seems, and our minds are floating off somewhere, they are still floating off somewhere. In an external world.

References

The Scholars Programme Booklet "Is There an External World?" Key Stage 3 Programme, published by thebrilliantclub.org
Bostram, Nick "Are You Living in a Simulation?" [Published in Philosophical Quarterly (2003) Vol. 53, No. 211, pp. 243255. (First version: 2001)]
VSauce3 "Are You in a Simulation?" Youtube, Kurzgesagt, last accessed 8 Jan 2021
VSauce3 "Is Reality Real" Youtube, Kurzgesagt, last accessed 8 Jan 2021
Larry King Now Interview, "Neil deGrasse Tyson: It's Hard to Argue That We Aren't Living in a Simulated World" Youtube, produced by ora.tv, PBS Studios, last accessed 9 Jan 2021
philosophyvibe.com "John Locke's Primary and Secondary Qualities" Youtube, last accessed 9 Jan 2021
Crash Course "Locke, Berkeley and Empiricism" Youtube, Published by PBS Studios, last accessed 10 Jan 2021
Philosophyvibe.com "George Berkeley's Idealism" Youtube, last accessed 9 Jan 2021
BBC4 and Open University "Esse et Principium" Youtube, published by bbc.co.uk/historyofideas with open.edu, last accessed 10 Jan 2021
Crash Course "Cartesian Skepticism – Neo, Meet Rene Crash Course Philosophy No.#5, Youtube, Published by PBS Studios, last accessed 11 Jan 2021
Lawson, Hilary "On the Cusp of the Unnatural" IAI News Changing How the World Thinks Issue 92, 6 Nov 2020

Tutor comment:

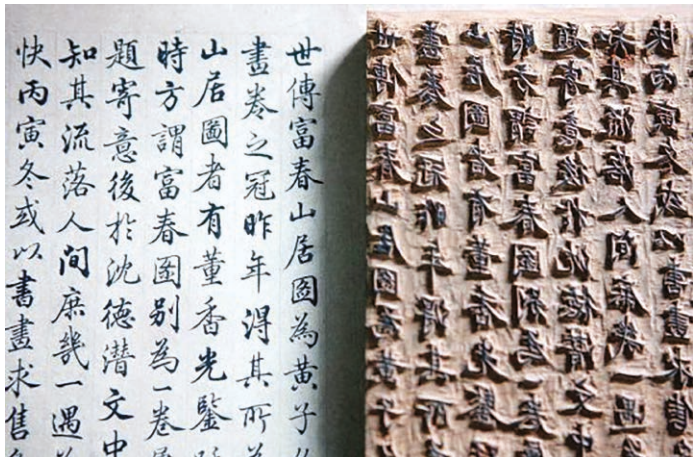
"This term presented a number of challenges due to the ongoing pandemic. This included quickly moving to online tutorials after having our first class in person. There were a few technical glitches with moving online, but I was highly impressed by the resilience and enthusiasm shown by all of the students at Stoke High. There were insightful comments offered to class discussions, and the standard of written work far surpassed my expectations. The contribution of A. was particularly outstanding throughout, and the academic skills he demonstrated could easily compete with some undergraduate students. His essay is constructed nicely, with a strong appraisal of key philosophical debates, and a well-informed conclusion. It was a pleasure to have A. in the class and I really enjoyed reading his essay."

Do technologies cause changes in society?

Year 9, Key Stage 4

Pupil: G. Batenga
School: Cardinal Newman RC School, Rhondda Cynon Taf
Supervised by: D. Cserzo
Tutor University: Cardiff University
Course Title: Technology and society: a chicken or egg problem?

Technology has surrounded humanity ever since prehistoric eras, dating back to before more-discussed digital technology such as mobile phones and laptops and to analog technologies such as the tools of the stone age and the earliest, most ancient languages such as Sanskrit and Hebrew. However, people possess many differing views surrounding its depth of involvement within society's development and whether it is even appropriate to hold the belief that it holds any responsibility whatsoever. The term 'determinism' denotes the philosophical viewpoint that events are determined by previously existing causes - and by extension, specifically 'technological determinism' is the concept that technology can and does cause direct change in society.



Woodblock printing

There are many technologies that people with the technologically deterministic viewpoint may use as examples of having caused change. One example is the printing press, traditionally known as having been invented by Johannes Gutenberg in the 15th Century (1440 AD) but in actuality dating back further to the woodblock printing initiated in the Tang Dynasty of

China in the 6th to 10th Century AD. The printing press inspired major revisions, primarily around the continent of Europe that we continue to feel the impacts of today - historically, it played a key role among other technologies in the birth of the Renaissance movement, allowing for expedited research and scientific publishing [1]. Consequently, this caused a butterfly effect where the Renaissance movement greatly advanced human intelligence and culture. In this historical era, inventions which we use in everyday life such as the microscope and eyeglasses were founded, and culturally-significant art by artists including Leonardo da Vinci, Rafael and Michelangelo was produced. This particular art is held in such high regard, in particular, due to its increased realism compared to previous artistic works and the important perspective it gives us into the time period. The Renaissance is even considered to be where we view to be the true beginning of modern times as we know them. [2] Furthermore, without the printing press, free speech and expression would be much more difficult to practise as these are often presented within literature, such as educational non-fiction and/or more expressive poetry or fiction books. Free speech is extremely fundamental and imperative in functional society today. It maintains and reinforces all human rights as a paramount subcurrent, allowing for the constant development and progression of human civilisation. [3] The ability to express opinions and speech freely is necessary for us to be capable of accomplishing change constructively. It is thought of as a basic human right [3].

There are also examples of more modern technologies that have just as much of an impact and are more applicable for an updated argument - the controversial mobile phone revolutionises life as we know it in various ways, such as allowing for users to call, text, email, follow the news, and listen to music alongside many other things [4]. Their 'affordances', which are essentially functions that a certain technology makes us capable of doing or using, are endless, and with this, come innumerable impacts. In fact, since their inception, the impact has been so extensive that smartphones always have and forever will continue to spark heated debate surrounding whether they are more so a force for positivity or for negativity, particularly due to the affordances of constant connectivity (social media, which will be further elaborated upon due to the expansive list of its own affordances, Bluetooth, GPS, etc.) and access to information [4].

Leading on from smartphones is a perhaps even more controversial yet impactful technology: the aforementioned social media. Its allowance for people even thousands of miles away to stay in contact through only a few clicks of buttons and almost ridiculously easy spread of information and news causes huge ripple effects that can lead to tremendous fallout. For example: the 2016 American general election, wherein the primary competitors were Donald Trump and Hillary Clinton. [5] Facebook came under fire for their involvement in this. The company has been accused of failing to counter the spread of false, biased, and dramatised news and the echo chamber that eventually led to the electoral result of increased support and an ultimate win for

Donald Trump. [5] Nonetheless, the false news echo chamber did not only work in his favour. Facebook allowed the spread of a quote-- namely, 'If I were to run, I'd run as a Republican. They are the dumbest group of voters in the country. They believe anything on Fox News. I could lie and they'd still eat it up. I bet my numbers would be terrific.', which was attributed to an interview with Trump in the People magazine in 1998. However, he never actually said this statement. [5] Throughout the election and even in recent time, Facebook has been said to be more divisive than social as it proclaims itself to be. And Facebook is not the only social media said to be causing ripples: in general, studies have shown social media exposure as a whole causes expansively negative impacts on adolescents and children, developmentally promoting anxiety and low self-esteem and stunting essential progression within the appropriate development of their social and communication skills. [6] Even adolescents aged 14-24 themselves acknowledge that these concerns are not unfounded. A survey was carried out in the UK wherein people falling inside of this age bracket were asked about how social media platforms affected their wellbeing and results found that the platforms Facebook, Twitter, Instagram and Snapchat all led to increased feelings of poor body image, anxiety, depression, and loneliness [6]. With the unfaltering rise of social media use - in 2019, a study by company Emarsys found approximately 3.5 billion people used various social media platforms (around 45% of the world's population at the time) and the trend remains positively increasing in the present year [7] - it is fair to conclude that these many impacts will only multiply and continue to affect society more and more both in the present and as the future comes.

Conversely, however, it is possible to say technology is not changing society: it is inverted, and society is changing technology. When the Sony Ericsson Z1010 flip phone was introduced in 2003, its affordance of a front-facing camera accidentally revolutionised our present-day digital culture as we know it. [8] But not in the ways it was intended or expected to do so. Initially developed and advertised as being for the enhancement of business meetings, Sony effectively invented the 'selfie age'. In fact, 'selfies' became so popular and commonplace that, by far, the fact that the front-facing camera was invented for video calling was overshadowed. When later on, Steve Jobs, in 2010, unveiled the iPhone 4 and demonstrated the video calling function, it served only to further the notion of the camera being used to take pictures of oneself. So much so that Oxford Dictionaries named 'selfie' as the 2013 word of the year. 'Selfie', a word coined online by a young Australian drunk [9] who was posting on an internet forum to describe a self-portrait photograph - one that was made possible through society's effect on the camera technology developed to make business video conferences more accessible and effective. Eventually, it was formally acknowledged by Apple just how widespread and culturally-significant selfies had become: by 2015, they had introduced a selfie folder within iOS 9, therefore quantifying just how big of an impact society had had on this technological invention [8].

The forward-facing camera is not the only example of a technology impacted by society as opposed to it affecting society itself-- human languages, for instance, are constantly evolving with time, created by us and playing a hugely key role as typically the widest form of communication within society but in actuality are moulded around the ways humans use them. This is evident when you look at the Oxford English Dictionary. They follow and document the human language as a notably reputable dictionary and are constantly adding new words - for example, in 2019, among over 650 that were officially added were slang words such as 'sumfin' and 'whatevs' [11]. This diverts from actual rules in the English language, rerouting from conventional spelling and grammar fundamentals: nevertheless, they were added simply due to the fact that people use them and have slowly built up the language to suit their own personal preferences. Or perhaps, at times, we shape technology through simply electing not to use it at all - often, humans' actions lead to the initiation of 'desire paths', created through walking where there is not a designated path and eroding the ground, typically stopping grass and other plants from growing there. Whether in parks, areas of natural beauty, or simply on urban grass patches, people often ignore the designated path as a man-made affordance despite potentially increased ease of travel and many other technologies endure the same fate. [10, 12]

Perhaps attributing change in society to technology is too ambitious and an incorrect analysis of just how large and responsible it is for the role it plays. As explained previously - humans create technologies and their affordances, and humans are to be held responsible for both further impacting these technologies and using this technology to affect our own society. [10] It is through our own actions surrounding technology that lead to impacts. By itself, technology is not able to change situations, and it is surrendering too much liability to them to say this is so. We must acknowledge that us humans are very present in the equation and the fact that distancing ourselves from technology, giving it its own apparent sentience in saying it can change our society single-handedly, is labelling technology as an active agent. [10] Within sociology, agency is the ability to exercise free will to make independent decisions and possess free choice. Therefore, assigning active agency to technology is not only incorrect, but again distancing ourselves from the fact that technology cannot hold the blame when we are the sentient active agents within society. We ourselves are practising active agency through using technology according to our own free will [10].

Humanity and technology, by default, go hand-in-hand. From the dawn of time, humans have been using it to help make life as a whole easier and more effectively carried out - technology always has, and particularly with our fast-paced, quickly-developing modern times, always will play an essential role in how we as people live our lives. Its role will likely only increase as time continues to move on. Technically, technology does impact society, if you opt for a more elementary or even superficial viewpoint. Once we create a technology, we shape it, and its role in turn is moulding us. However, you cannot say technology

is the one effectuating its aforementioned role: humans are the active agents, and so while technology may be aiding in creating change, it is humans who created this technology, humans who choose to use their agency in order to use the technology, and humans electing to change this technology. Humans enable technology. We are accountable for giving them all the power that they hold over our culture and society. It is imperative we maintain our connection to our inventions and do not treat them as though they are responsible for how we as people and creators decide to use them. While technology plays a role, it is only a role made possible by us. Ultimately: humans impact technology, and society impacts society.

References

[1] Christopher McFadden 2018, 'The invention and history of the printing press', <https://interestingengineering.com/the-invention-and-history-of-the-printing-press> [3 December 2019]
[2] The Telegraph 2015, 'The Renaissance - why it changed the world', <https://www.telegraph.co.uk/art/london-culture/renaissance-changed-the-world/> [2 December 2019]
[3] Josie Timms 2016, 'Why is free speech important?', <https://www.indexoncensorship.org/2016/04/free-speech-important/> [2 December 2019]
[4] Yudhijit Bhattacharjee 2019, 'Smartphones revolutionize our lives—but at what cost?', <https://www.nationalgeographic.com/science/2019/01/smartphones-revolutionize-our-lives-but-at-what-cost/> [1 April 2020]
[5] Olivia Solon 2016, 'Facebook's failure: did fake news and polarized politics get Trump elected?', <https://www.theguardian.com/technology/2016/nov/10/facebook-fake-news-election-conspiracy-theories> [1 April 2020]
[6] Rachel Ehmke, 'How Using Social Media Affects Teenagers', <https://childmind.org/article/how-using-social-media-affects-teenagers/> [1 April 2020]
[7] Maryam Mohsin 2020, '10 Social Media Statistics You Need to Know in 2020 [Infographic]', <https://www.oberlo.co.uk/blog/social-media-marketing-statistics> [1 April 2020]
[8] Anne Quito 2017, 'Front-facing cameras were never intended for selfies', <https://qz.com/1104742/front-facing-cameras-were-never-intended-for-selfies/> [1 April 2020]
[9] Australian Associated Press 2013, 'Selfie: Australian slang term named international word of the year', <https://www.theguardian.com/world/2013/nov/19/selfie-australian-slang-term-named-international-word-of-the-year> [1 April 2020]
[10] Dawn Walter 2019, 'Opinion: Technology doesn't change society, we do', <https://www.techspark.co/blog/2019/01/28/opinion-technology-doesnt-change-society-we-do/> [1 April 2020]
[11] Olivia Petter 2019, 'Oxford English Dictionary Adds Slang Words And Star Wars Terms In Latest Update', <https://www.independent.co.uk/life-style/oxford-english-dictionary-update-new-words-slang-star-wars-latest-a9156126.html> [1 April 2020]
[12] Robert Moor 2017, 'Tracing (and Erasing) New York's Lines of Desire', <https://www.newyorker.com/tech/annals-of-technology/tracing-and-erasing-new-yorks-lines-of-desire> [1 April 2020]

Tutor comment:

"G. wrote an outstanding essay, achieving a 1st despite missing two tutorials. She was actively engaged in discussions and was quickly able to grasp complex concepts. She used original examples to illustrate her points, demonstrating a nuanced understanding of the issues and an ability to think critically and creatively, crucial skills in higher education."

How I would rebuild an educational system in a post-conflict situation

Year 9, Key Stage 4

Pupil: **E. Darie**

School: **Sacred Heart of Mary Girl's School, Havering**

Supervised by: **M. Melcher**

Tutor University: **King's College London**

Course Title: **How to rebuild a country - Decisions & dilemmas in post-conflict reconstruction**

In an ideal post-conflict situation, I would rebuild the educational system by introducing a sustainable program that focuses on long-term solutions and gains. In this essay, I will examine the impact of conflict on youth, and also the importance of proper schooling in a fragile environment; I will also discuss the process of reintegrating students back into institutions and the assimilation of teachers in this system and their training; furthermore, I shall review the dilemma of mental health in post-civil war situations. I will also deliberate the type of curriculum required, the type of educational system and the goal of a country and finally, the issue of further education.

The impact of conflict on a country is absolutely devastating, and the effect on its education systems is more crucial to consider. In a war-torn area, the idea of school is increasingly of more importance than it was in times of peace and is fundamental for teaching skills that can help youths protect themselves and their family. For example, in El Salvador, throughout the 1980s, military confrontations and shelling damaged classrooms substantially, which prevented the children from attending class and the quality of basic teacher training declined as said institutes closed or were simply neglected. These events happened in the late 20th century to the early 21st century, and the source I used does not give any insight to what would happen in this time and age, therefore due to these gaps we might not know the extent of any damage made if civil wars would occur today. In Liberia, they faced many challenges such as 'maintaining a sufficient educational corps, recruiting educators and ensuring they are properly trained and also rebuilding the demolished framework left' with the little resources they had. The ongoing violence affected the wellbeing of children, rid them of their resources and prevented them from receiving a proper education. Subsequently, these events illustrate the devastating impact of war and the dire need for teaching those mostly affected by the tragedies around them. Therefore, in order to successfully combat all of these dilemmas, a sustainable and legitimate schooling system that focuses on long-term gains is preeminent.

After civil unrest has ceased, the next most crucial problem is the reintegration of students in schools. In Guatemala, the illiteracy rate after their civil war was 39 percent, and primary enrolment was only at 78 percent, secondary enrolment at 23 and post-secondary enrolment was listed as 'not applicable'. However, as this was in 1989, we are not sure whether these digits will be seen again, and the source, being written in 2003, does not have any information on what could happen today, therefore we may not know the true numbers if a civil dispute were to happen. To start this process, I would place the main focus on obligatory primary school, with slogans depicting the benefits of education to children. I would arrange a PTFA to ensure that the relationship between the school and the family is well-established to provide a sense of unity in the society.

Once they have decided to join primary school, I would make secondary school compulsory up to the age of 16, where students would decide to continue their education in college and either continue to university or

be offered apprenticeships, or they would drop out and choose a career choice beyond school. This is similar to what Liberia did with their Liberia Project: 'they increased their focus on quality education and their promotion at primary-school level with the slogan 'back-to-school' efforts and towards 'stay-in-school''. At the time, child soldiers were also being reintegrated into school, so the success of these efforts was crucial. In addition to this, Liberia introduced a system called the 'Parent-Teacher Associations', which became a part of the official school structure, as they viewed 'the support of solid family-school linkages has been increasingly and widely viewed as an indispensable component of strategies to improve students' educational outcomes.' The source I used does not specify if these measures actually worked but it rather praises the plan, and due to this gap and possible bias in information I am not sure if my method-influenced by this- would actually work. My PTFA arrangement is an example of this, as is my emphasis on primary school education with the slogans Liberia placed out. All of this planning shows the importance of a steady reintegration process into a new system to ensure sustainability.

When reintegrating students, one of the greatest concerns is the how to help people that have experienced the conflict and to help them through their time at school. A proper mental health system would be able to support those affected by these incidents and guide them through their adolescence and even through adulthood. So, I would focus on a shift from specialised mental care to more local and community-based care within society so to remove the stigma of mental health treatment. I would also provide many different access points of treatment, such as mental health care helplines, citizenship lessons and counselling in secondary school to teach about these issues, private and group therapy, and prescriptions in local healthcare sites. My mission would be to make the treatment widespread and accessible to the most vulnerable. In Bosnia and Herzegovina and Kosovo, each country focused on a 'shift from institutional specialized mental health care outside of society to community mental health and mental health care within society' and also worked on the 'establishment of new ambulatory mental health services like community mental health centres and protected apartments (houses with some mental health services for chronic psychiatric patients)'. Organisations such as the World Health Organization (WHO), Partners in Health (PIH) and the International Medical Corps (IMC) have all provided evidence of what to do with mental health care in post-conflict situations, and as shown by the PIH in countries such as Rwanda, Haiti, Liberia and Peru, many interventions are available that focus on prevention, case finding, treatment, follow-up, and reintegration, all of which I have included in my own plan.

As we have now established the reintegration of pupils, I would now like to discuss the curriculum. A mixture of core subjects and leisurely yet meaningful lessons must take place. I believe that these subjects must be Literacy (basic reading and writing), Numeracy (basics, and maybe some technological elements applied), Science (Chemistry, Biology, Physics), History (the history of the country) and Citizenship/Peace studies/Human

Rights studies (basic life knowledge). I believe these are important as they ensure the coming students know the basics of education and are also introduced into further areas of knowledge which will prove useful to them as future leaders of their country. An example of Peace studies in a country's curriculum was Sierra Leone, which drew together a peace studies/education course after their ten-year civil war, in which they focused on dealing with trauma, communication, conflict management and human rights and democracy. Also, history would be especially important as it would offer them valuable life lessons from the past. In Liberia, history was a key subject in the development of youth and the educational sector. Their Liberia Project aimed to give students 'a sense of place and a foundation for society where they live.'

Similar to the Liberia's educational reform, in Nicaragua, the Alemán and Chamorro administrations wanted to improve education efficiency and focused on better achievement tracking systems, better textbook distribution and greater parental involvement – this shows us the importance of choosing the right curriculum, thereby halting ideological propaganda and sectoral thinking through places of learning. Schools should be safe havens for traumatized children, not indoctrination camps. Basic literacy would also provide a great importance along with English as it would allow youth to expand their vocabulary and give way to learning the language of business, entertainment, travel, and international communication. Thailand also focused on 'providing access to English language learning to primary school first grade pupils' in an effort to reform the learning of foreign languages so that their students would be provided with more skills. I would teach these subjects in a community-based educational system, as it is very easy to create and maintain as it does not require a government (so can be put in place easily) and curriculums may be different in certain areas, but that allows for variety in the future workspace and more collaboration between students. However, some may argue that community-based schooling can create and sustain divisions and inequalities, something that must be certainly avoided in a post-conflict situation. However, I still believe it is the right choice as it promotes great collaborative work due to the differences in education and in the future, everyone will be able to learn from each other. Finland has a community-based system and has been rewarded for having one of the best educational systems in the world, thereby proving my point.

In order for lessons to be taught well, you require good teachers. Teachers are the most crucial resource to any educational system. So, in order to commence teacher return, I would test their abilities in a baseline assessment that examines them on their ability to use new technology, teach comprehensively, maintain a connection with students and parents and also their ability to deal with conflict inside the classroom. This would be held with a specialist in the room. If they pass, they will be sent to a 6-week teacher training course help by an external organisation. In Thailand, they used a different approach to mine- whilst I focused on connections within the classroom, they used more holistic methods

and concentrated on developing and maintaining a set character for their teacher, using personality training as an integral part of their system. Nevertheless, Thailand's method is still similar to mine in the way that they used new technology to test a teacher's capability in modern situations and using it to further their teacher learning, similar to my baseline test. The source I used, however, does not say whether these methods truly worked.



International Rescue Committee: Sierra Leone Photo: Tom Saater/IRC

'In Sierra Leone, the International Rescue Committee (IRC) trained teachers in camps but the trainees struggled to get recognition of their qualifications and experience when they returned to the system.' However, whilst the teachers are training, we would be left with 'ghost teachers': unqualified or underqualified teachers that come in unfortunate supply during early reconstruction. So, in order to tackle this, I would allow the 6-week teacher training period to give way for reconstruction of any facilities, so that when the teachers arrive, schools will be rebuilt and ready for them, therefore hastily speeding up the educational reform. As to what I would teach, I would train them with basic writing, reading and numeracy skills and any material by the curriculum, along with how to engage students in the classroom to allow a fulfilling educational experience. This is similar to what Liberia did, as with agreements with the IBIS organization, their teachers were taught 'how to teach basic reading and writing, and pedagogical methods that engage the children actively in the classroom, and more importantly encouraging dialogue between teacher and student.' However, the source I used does not state whether these methods truly worked. So, I believe that comprehensive teacher training is required to maintain and sustain an educational system that focuses on long-term solution and gains.

My final paragraph will discuss another neglected issue: higher education. Primary education is fairly easy to re-establish, as it is able to compensate quickly for the basic education missed, but secondary school and onwards is much more advanced and requires more attention. Whilst primary school does focus on kickstarting a good education, further education will definitely help a country's goal; mine being that the country itself benefits the most. The World Bank 'warns against prioritising basic education at the expense of higher education' and says that it 'directly affects economic and social development in the longer term.' My system is based on long-term solutions and gains, so I believed this was a great subject to talk about; I feel that many countries

choose to rebuild their basic educational systems, but neglect the more important institutions, those that will help 16-25 year olds develop further and become future leaders of their country. After barely any humanitarian aid is spent on educational reform, universities become the most affected by that. So, I believe that external involvement and collaboration from different countries with highly acclaimed universities is direly required as most efforts for educational system rebuilding, especially higher education, are isolated, small-scaled, and only focus on the short term. Higher education establishments from the USA, South Africa and Europe can help provide funding for universities, collaboration on research and help set up support networks in the fragile environment. For example, with their Iraq Education Initiative (IEI), the Iraqi allocated \$1 billion to fund 50,000 students to study for 5 years at mainly US- and UK- based universities so that they would return and 'rebuild Iraq's knowledge infrastructure and contribute to long-term reconstruction of Iraq's higher education and society.' However, this didn't fully work as the Iraqi government lacked the proper implementation skills to enforce this. The source I used does not specify why the plan didn't work, therefore I cannot be completely sure what steps to take, but they are influenced by this.

There are very few examples of rebuilding higher education, and that goes to show how neglected the area really is. So, in order to overcome this challenge with my own method, I would conduct the same approach as I did with basic education: send teachers to a 16-week course (as university-style teaching is more demanding), send the older students abroad to countries with better facilities for the 16-week period so as to jumpstart their education in a favourable way, and then allow them to come back to continue their education in their own country. This applies for those have finished at least 8 years of education, primary and secondary, and for those who haven't, I would send them back to secondary until they have the minimum requirement of education, after which they can continue to university, apprenticeships or employment. As for the subjects, I would incorporate STEM, social sciences and subjects that focus on stabilisation and peacebuilding. The reason I place my emphasis on higher education is that primary and secondary education and preeminent for the well-being of youths but are not sufficient by themselves and cannot properly contribute to the development of the country. However, many sources I used to influence my ideas do not discuss the specific statistics of the events caused by the lack of higher education, and therefore without any proper basis, I must rely on my own intuition. So, this is why, in a post-conflict society, I believe that higher education, however much neglected, is the key to long-term solutions and gains.

Overall, I believe that there are many points of both interest and conflict when deciding how to rebuild an education system after a civil war. In this essay, I argued about the importance of properly reintegrating both students and teaching staff, the issue of mental health, the devastating impact of conflict, the basic curriculum and type of educational system I would use. The importance of education, especially in war-torn areas,

is very great; the development, learning and normal lives of these students and the staff must be dealt with maturity, care, and respect.

Bibliography

- ¹ Marques, José, Bannon, Ian, "Central America: Education Reform in a Post-Conflict Setting, Opportunities and Challenges," *CPR Working Papers*, no. 4, (2003): 8, 9, <http://documents.worldbank.org/curated/en/660591468775819162/pdf/266670Conflict0prevention0wp0no-04.pdf>
- ² Barrios-Tao, Hernando, Siciliani-Barraza, José, Bonilla-Barrios, Bibiana (2016), "Education Programs in Post-Conflict Environments: A Review from Liberia, Sierra Leone, and South Africa", *Revista Electrónica Educare* 21 (1), 1-22, <https://doi.org/10.15359/ree.21-1.11>
- ³ Marques, José, Bannon, Ian, "Central America: Education Reform in a Post-Conflict Setting, Opportunities and Challenges," *CPR Working Papers*, no. 4, (2003): 7, <http://documents.worldbank.org/curated/en/660591468775819162/pdf/266670Conflict0prevention0wp0no-04.pdf>
- ⁴ Barrios-Tao, Hernando, Siciliani-Barraza, José, Bonilla-Barrios, Bibiana (2016), "Education Programs in Post-Conflict Environments: A Review from Liberia, Sierra Leone, and South Africa", *Revista Electrónica Educare* 21 (1), 1-22, <https://doi.org/10.15359/ree.21-1.11>
- ⁵ Barrios-Tao, Hernando, Siciliani-Barraza, José, Bonilla-Barrios, Bibiana (2016), "Education Programs in Post-Conflict Environments: A Review from Liberia, Sierra Leone, and South Africa", *Revista Electrónica Educare* 21 (1), 1-22, <https://doi.org/10.15359/ree.21-1.11>
- ⁶ De Vries, Albert K, Klazinga, Niek S, "Mental health reform in post-conflict areas: A policy analysis based on experiences in Bosnia Herzegovina and Kosovo," *The European Journal of Public Health*, no. unknown (2006): 5, https://www.researchgate.net/publication/7253297_Mental_health_reform_in_post-conflict_areas_A_policy_analysis_based_on_experiences_in_Bosnia_Herzegovina_and_Kosovo
- ⁷ Marquez, Patricio V., Walker, Melanie, "Mental health services in situations of conflict, fragility and violence: What to do?" *World Bank Blogs*, November 1, 2016, <https://blogs.worldbank.org/health/mental-health-services-situations-conflict-fragility-and-violence-what-to-do>
- ⁸ Bretherton, Diane, Weston, Jane, Zbar, Vic, "Peace education curriculum development in post-conflict contexts: Sierra Leone," *unknown no. unknown (unknown):* 9, 10, <https://pdfs.semanticscholar.org/5e56/00624aa8abd5c78997cb1cbaa40f50c0638.pdf>
- ⁹ Barrios-Tao, Hernando, Siciliani-Barraza, José, Bonilla-Barrios, Bibiana (2016), "Education Programs in Post-Conflict Environments: A Review from Liberia, Sierra Leone, and South Africa", *Revista Electrónica Educare* 21 (1), 1-22, <https://doi.org/10.15359/ree.21-1.11>
- ¹⁰ Dachakupt, Pimpan, "The current innovation in curriculum development in Thailand," *Curr. Dev. and Prac* 1, no. unknown (1999): 97, https://www.jstage.jst.go.jp/article/jcrdaen/1/1/1_KJ00006742072/_pdf
- ¹¹ Dachakupt, Pimpan, "The current innovation in curriculum development in Thailand," *Curr. Dev. and Prac* 1, no. unknown (1999): 97, https://www.jstage.jst.go.jp/article/jcrdaen/1/1/1_KJ00006742072/_pdf
- ¹² Dachakupt, Pimpan, "The current innovation in curriculum development in Thailand," *Curr. Dev. and Prac* 1, no. unknown (1999): 97, https://www.jstage.jst.go.jp/article/jcrdaen/1/1/1_KJ00006742072/_pdf
- ¹³ Bank, The World, "Reshaping the Future: Education and Post-conflict Reconstruction," *The World Bank*, no. unknown (unknown): 73, documents.worldbank.org/curated/en/860731468138857154/pdf/344190PAPER0Re101OfficialUseOnly1.pdf
- ¹⁴ Bank, The World, "Reshaping the Future: Education and Post-conflict Reconstruction," *The World Bank*, no. unknown (unknown): 73, documents.worldbank.org/curated/en/860731468138857154/pdf/344190PAPER0Re101OfficialUseOnly1.pdf
- ¹⁵ Barrios-Tao, Hernando, Siciliani-Barraza, José, Bonilla-Barrios, Bibiana (2016), "Education Programs in Post-Conflict Environments: A Review from Liberia, Sierra Leone, and South Africa", *Revista Electrónica Educare* 21 (1), 1-22, <https://doi.org/10.15359/ree.21-1.11>
- ¹⁶ Heleta, Savo, "How to rebuild higher education is countries torn by war," *The Conversation*, October 14, 2015, <https://theconversation.com/how-to-rebuild-higher-education-in-countries-torn-apart-by-war-48791>
- ¹⁷ Heleta, Savo, "How to rebuild higher education is countries torn by war," *The Conversation*, October 14, 2015, <https://theconversation.com/how-to-rebuild-higher-education-in-countries-torn-apart-by-war-48791>
- ¹⁸ Heleta, Savo, "How to rebuild higher education is countries torn by war," *The Conversation*, October 14, 2015, <https://theconversation.com/how-to-rebuild-higher-education-in-countries-torn-apart-by-war-48791>
- ¹⁹ Milton, Sansom, *Higher Education and Post-Conflict Recovery*, (New York: Springer, 2017), 69-70
- ²⁰ Heleta, Savo, "How to rebuild higher education is countries torn by war," *The Conversation*, October 14, 2015, <https://theconversation.com/how-to-rebuild-higher-education-in-countries-torn-apart-by-war-48791>

Tutor comment:

"E. was thoughtful, creative, and dedicated from the first moment of the course, through to her exemplary final assignment. It was an absolute joy to work with the whole cohort and engage in enthusiastic discussions. E.'s final assignment responds to complex problems with a combination of clear writing, a consistent and nuanced point of view, and highly effective research skills. She would fit right into undergraduate classes immediately."

Critically explore the effectiveness of Intelligence-led Policing in the UK police forces

Year 9, Key Stage 4

Pupil: J. Harris
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Supervised by: P. Keningale
Tutor University: University of Surrey
Course Title: Preventing terror attacks

This essay will explore how intelligence-led policing is effective in the fight on crime. It will focus specifically on the idea of preventing crimes and terrorism threats to our nation as well as globally, through locating essential information, targeting high-crime areas or crimes that have a high impact and sharing information on a world-wide basis to help prevent crimes being committed in more than one country. It will also explore the devices that need to be looked at to ensure that intelligence-led policing reaches its full potential and does not become a 'blame' culture.

Following the death of Stephen Lawrence in 1993, major flaws were highlighted in the investigation that followed. This led to a call for a review of the current policing procedures that had predominantly led to the failure 'to recognise that Stephens's murder was a racist crime, amongst many other critical errors that occurred.' (Macpherson Inquiry as cited in Savage, 2007). Failing to gather intelligence on potential suspects in the surrounding area, meant officers failed to identify suspects straight away, even though those who were responsible had prior charges for the similar offences. This led to a breakdown in the family's trust in the police.

Further mistakes were recognised in the Soham Murders and the tragic deaths of Holly Wells and Jessica Chapman (2004) where critical information was not taken into account. The exchange of information between police organisations may have meant that available crucial information could have prevented their demise. As stated by Macpherson, there became an 'inescapable need to demonstrate fairness, not just by Police Services, but across the criminal justice system as a whole' (1999).

It was therefore essential to introduce Intelligence-led policing to address the weaknesses that had been emphasised when the system had been reviewed following the deaths of these individuals. Although there had been a previous model for 'intelligence function in the late nineteenth century' (Grieve 2004 as cited in Rogers, Collins, et al, 2011), Kent Police were the first to introduce the intelligence-led policing (ILP) during the 1990's. This then led to the National Intelligence Model (NIM) which was fully supported by the Chief Constable. This model has now been accepted and adopted worldwide.

The main aim of the ILP is to address policing from the 'social, technological and political' standpoint (Bullock as cited in Brown, 2014) to ensure that crime is dealt with

in a manner that addresses the public and government needs, using critical information that is shared across every organisation thereby helping to assess 'criminal capability' and 'criminal intention' (Harfield and Harfield, 2008 as cited in Rogers, Collins, et al 2011). In doing so, the ILP allows for police organisations to then intervene in issues that could result in tragedy or to assist in investigations, so they are conducted correctly. It also allows for the police to allocate resources to gather and analyse data to create crime fighting strategies to enable them to target specific crimes. This means resources are used more effectively to target crimes specific to certain areas.

ILP is also instrumental in acknowledging the need to work in a digital age where traditional policing methods prove more challenging. This is therefore moving away from the previous 'ad-hoc intuitive and largely unstructured mode of analytic work' (Rogers, Collins et al, 2011) to a system of data gathering from local, regional and national levels to ensure no intelligence is missed. This also allows for the police to work in an environment that not only protects themselves but also safeguards the public, as the data being accessed is approved lawful data unlike surveillance, where police are at risk of abusing the human rights of the person.

However, for intelligence led-policing to work, the information they gather must be trustworthy and useful. Heur (1998) explores the negatives of using analysts to assess the intelligence data. The first being the inconsistencies and worries they face in analysing data that they are uncertain of due to denial or deception. Analysts can also face problems when using 'higher levels of critical thinking' that is dependent on information that may not be reliable. Another challenge for intelligence-led policing is that analysts can often make assumptions as to what information means and they can also interpret information differently. To combat this, Heur (1998) encourages a system to be put in place to ensure assumption and own interpretation of data is eliminated to reduce uncertainty in its validity and that 'procedures that expose and elaborate points of view' (Heur,1998) are consistently used to review information.

Heuer (1998) also goes on to question the use of 'mental models' being used in intelligence-led policing as the processing of the information can be influenced by their own social and cultural experiences. This could then lead to biased (negative or positive) analysis of the data or may distort the images that are seen (Heuer, 1998). He goes on to refer to these images as lenses to include 'mental models, mind-sets, biases or analytic assumptions. The Audit Commission (1993) also acknowledge this flaw in the intelligence-led policing system as they believe that some intelligence learnt from street experience, is easily influenced. It is also believed that analysts can possibly 'pick up bad habits from other officers' due to learning their techniques from other colleagues (Audit Commission, 1993). In 2001, Manning (as cited in Johnson, 2010) raised concerns from his research into 'crime mapping.' He felt that it could fail based on poor communication (especially in the areas of the interpretation of information gathered), the

distribution of that information and, in addition, that the systems being used were not accessible to all (Manning as cited in Johnson, 2010).

In 1997, the European Union recognised the increase in organised crime and its threat to society. To combat this, they formed a 'High Level Group' that created an action plan to 'fight against organized crime and terrorism in a never-ending endeavour' (Council of the European Union, 1997). Following on from this, today, Europol share information with the intelligence agencies of other countries to combat "cross-border criminal activities" (Europol, 2020). Within the United Kingdom, MI5 now declassifies and shares information on terrorist sympathisers (MI5, 2020). Key data (biographical) is given to police, councils, and charity commissions in three key areas so there are "no safe spaces" for them to hide (MI5, 2020). This results in faster reactions and notifications of possible threats. MI5 identify that new technology makes it difficult to get information to stop attacks abroad, but by working with agencies in other countries, this helps to reduce this threat (MI5, 2020). Collecting intelligence to build up detailed knowledge of threats to the country is at the heart of MI5's work, with communications service providers accessing call and text information in order to protect national security (MI5, 2020).

In contrast, although Dahl agrees that intelligence agencies are necessary to avoid surprise attacks, 'strategic surprises (black swans)' highlight the failures in intelligence-led policing. One failure being a breakdown in collection, or the data being collected within time (Lowenthal cited in Dahl, 2013). However, Shulsky and Scmitt (as cited in Dahl, 2013) believe that the failure lies with not acting on it appropriately. Dahl believes both contribute to surprise attacks: 'failing to see warnings that were right in front of them' and 'not enough clues to go on'. As seen in 2011, 'the unrest in the Middle East' could have been seen if the warnings had been acted upon or at least 'listened to' (Dahl, 2013). This was seen in 2001, when both 'inter and intra-police [...] failed in preventing an act of terrorism' of which they had prior intelligence but was not shared between them in a timely manner and therefore leading to no action being taken (Johnson, 2010). This highlights the importance of agencies sharing information in a timely manner, no matter how trivial it appears, to allow for it to be acted upon to prevent tragedies from occurring. Johnson (2010) also highlights that police agencies failed to communicate effectively across borders and with each other leading to the same crime being committed in many counties within the UK. Intelligence-led policing is now addressing this problem.

Intelligence-led policing is also thought to be integral in the fight against organised crime. The ability to locate the best evidence to support a case, providing conflicting evidence in cases where there is only a suspect's confession and allowing the police to access more sophisticated surveillance and technical information (James, 2013) is a major asset in this fight. Chan (as cited in James,2013) supports this opinion, as he feels intelligence-led policing assists with 'solving increasingly sophisticated crimes and identifying prolific offenders.'

This view is also supported by the Audit Commission (1993) who felt intelligence-led policing is a 'proactive use of intelligence, resources and surveillance techniques' to allow the police to target and investigate crimes. The Audit Commission (1993) also acknowledge the use of informants as a good intelligence resource especially as this keeps the costs low as they are a 'cost-effective source of detection.' This means the police acknowledge that intelligence information can come from many sources and a close partnership between themselves and the community is essential, thus ensuring the public are part of the process, so as to build confidence in the police's ability to solve and prevent crime.

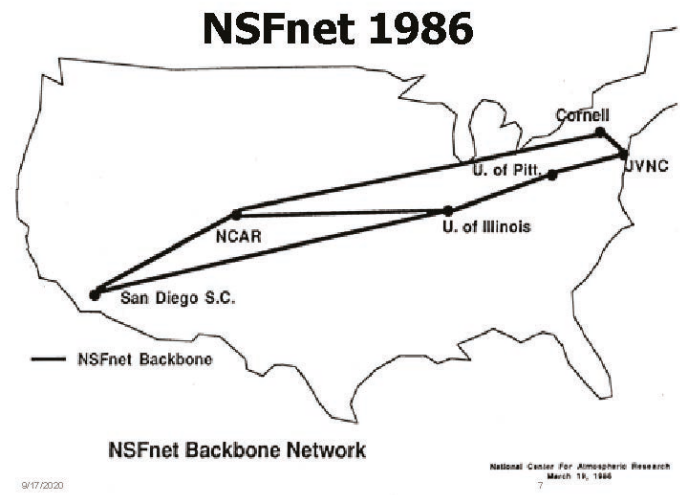
In contrast, the costs to train and follow-up information from an informant can be costly (The Audit Commission, 1993) and newer detectives can sometimes be manipulated by the informant through inexperience. It was found that many officers 'learnt through their mistakes' (Audit Commission, 1993) on how to recruit and deal with informers but these lessons were not shared with anyone due to the secrecy needed to protect them. This placed the blame of the failure of informers, in intelligence-led policing, with the police officers. This 'blame' of analysts and police is also highlighted by Hedley (2007), when he recognises that any failure that causes a tragedy is always attributed to the intelligence systems. Even though it is acknowledged that intelligence-led policing will not be able to predict or prevent all tragedies (Hedley, 2007), the analysts and police are held accountable for any failure in the performance of intelligence. Hedley (2007) also raises the issue of politicians and public servants despising being caught 'off-guard' especially if there has been prior intelligence that could have either prevented it or highlighted it as a potential problem, but was not acted upon. Some people even go further in believing that if there is a failure in intelligence-led policing, it means that the government are attempting a 'cover-up,' which again leads to mistrust between the police and the public (Hedley, 2007).

In conclusion, the need for a change in policing was essential and necessary in the light of the tragedies mentioned. With intelligence-led policing, crime trends can be highlighted, and resources can therefore be used more efficiently in order to target them. It also allows for police to utilise the digital age in which we live to ensure their working reaches its full potential. In addition, it is safeguarding the human rights of the public by addressing the 'inescapable need to demonstrate fairness' for crime prevention (Mapherson, 1999). However, Heuer (1998) recognises the factors that can make intelligence-led policing unreliable due to the bias of some analysts and their prior life experiences. Dahl also highlights that, unless information is collected within time and acted upon, it is useless in the fight against crime and terrorism. The 'blame' placed upon the analysts if they fail to prevent crimes and tragedies (Hedley, 2007) is also a factor to consider. However, if information is challenged, refined, and challenged again, and the analysts revise the models they use, it can reduce the hazards to the system. In addition, the constant sharing of information between agencies, will allow all countries to

act effectively to prevent tragedies and organised crime from becoming an ever-increasing world-wide issue.

References

Audit Commission. (1993). Helping with enquiries: tackling crime effectively. Audit Commission London.
Brown, J. (2014). The Future of Policing. Oxfordshire: Routledge Publishing.
Council of the European Union. (1997). Action plan to combat organised crime. EUCouncil.
Dahl, E. (2013). Intelligence and Surprise Attack: Failure and Success from Pearl Harbour to 9/11 and beyond. Georgetown University Press.
Europol. (2020) European Counter Terrorism. Available at: <https://www.europol.europa.eu/about-europol/european-counter-terrorism-centre-ectc> (Accessed 15 February 2020)
Hedley, J.H. (2007). Learning from Intelligence Failures. International Journal of Intelligence and CounterIntelligence, 18(3), 435-450.
Heuer, R. (1998). Organisational Pathologies in Police Intelligence Systems. European Journal of Criminology, 207-213.
James, A. (2013). Examining Intelligence-Led Policing: developments in research, policy and practice. Palgrave MacMillan.
Johnson, C.L. (2010). Police use of intelligence networks for reducing crime. Retrieved from <http://ebookcentral.proquest.com> Created from Surrey on 2019-10-10 01:20:35
Macpherson, W. (1999) THE STEPHEN LAWRENCE INQUIRY Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/277111/4262.pdf (Accessed 21 January 2020)
MIS. (2020). Counter-Terrorism. Available at: <https://www.mi5.gov.uk/counter-terrorism> (Accessed 15 February 2020)
Rogers, Colin, et al (2011). Police Work: Principles and Practice. Surrey: Willan Publishing.
Savage, S. (2007). Police reform: forces for change. Oxford: Oxford University Press.



the domain name system and created the underpinnings of the internet as we know it today.

At this point, internet access was partial and only accessible by official commercial entities as late as 1990. The revolution came when Tim Berners-Lee, a British computer scientist, was conducting research at CERN, the European Organization for Nuclear Research, in Switzerland. The findings of his research resulted in the World Wide Web by linking hypertext documents which are accessible from any node on the network.

The laws of responsible internet use

As the years have passed since the introduction of the internet, several areas of concern with regard to personal data, safety, and wellbeing have been exposed as risks to individuals and companies operating online.

On the 8 April 2019, the UK government unveiled tough new measures to ensure the UK is the safest nation in the world to be online. These measures are listed in what is known as the Online Harms White Paper, a proposal produced jointly by the Home Office and the Department for Digital, Culture, Media and Sport. It was also announced that a new independent regulator will be created or appointed to ensure online companies meet their responsibilities with regard to this legislation.

This will include a duty of care ensuring that they take reasonable steps to tackle illegal and harmful activity and keep their users safe. The newly created or appointed regulator will use enforcement tools, which are yet to be determined.

These proposed laws will regulate any company that allows its users to share or discover user generated content or interact with each other online, and therefore encompasses a wide variety of companies of all sizes, including search engines, social media platforms, file hosting sites, open discussion forums and messaging services.

It is intended that the UK government will have the power to issue large fines and block access to sites, and individual members of senior management of these online companies could be held liable for breaches of this legislation.

When interviewed, the Prime Minister at the time, Theresa May stated:
“The internet can be brilliant at connecting people across the world - but for too long these companies have not done enough to protect users, especially children and young people, from harmful content.

That is not good enough, and it is time to do things differently. We have listened to campaigners and parents and are putting a legal duty of care on internet companies to keep people safe.

Online companies must start taking responsibility for their platforms and help restore public trust in this technology.” There will also be requirements for companies to ensure that they tackle terrorism and child sexual exploitation and abuse in the most serious ways possible. As well as this, the Online Harms White Paper will cover governance of a range of threats to safety and security including cyber bullying, children accessing inappropriate material, inciting violence and violent content, encouraging suicide and false information.

So, does this affect our ability to have freedom of speech and expression in the UK whilst online? To quote Amnesty International, freedom of speech is:

“Freedom of speech is the right to seek, receive and impart information and ideas of all kinds, by any means. Freedom of speech and the right to freedom of expression applies to ideas of all kinds including those that may be deeply offensive. But it comes with responsibilities and we believe it can be legitimately restricted.”

When can freedom of speech be restricted?

In certain circumstances free speech and freedom of expression can be restricted. This is due to the fact that whilst online organisations will have a legal duty of care in the future, it is important to recognise that in most instances online abuse, cyber-bullying, misinformation and character deformation et cetera, are generated by ordinary users operating on the platforms of online organisations.

Governments have an obligation to prohibit hate speech and incitement and restrictions can also be justified if they protect specific public interest or the rights and reputations of others.

Any restrictions on freedom of speech and freedom of expression must be set out in laws that must in turn be clear and concise so everyone can understand them. People imposing the restrictions (whether they are governments, employers, or anyone else) must be able to demonstrate the need for them, and they must be proportionate. All of this has to be backed up by safeguards to stop the abuse of these restrictions and incorporate a proper appeals process.

So how can internet users infringe on other users' rights and freedoms?

Individuals do have the freedom to express themselves online and to access information and the opinions and expressions of others. This can include religious and

political speech and/or views that would be regarded as inoffensive, but also those that may shock or offend other users. You should, however, consider the reputation or rights of others and their religious or political views, including their right to privacy, by not doing so you could potentially infringe their rights.

Individual users are free to re-use and distribute content as long as they respect the rights of intellectual property, including copyright. Under the Computer Misuse Act 1990 there are three criminal offences under sections 1-3 as follows:

Unauthorised access to computer material, punishable by twelve months' imprisonment (or six months in Scotland) and/or a fine “not exceeding level 5 on the standard scale” (since 2015, unlimited).

Unauthorised access with intent to commit or facilitate commission of further offences, punishable by twelve months/maximum fine (or six months in Scotland) on summary conviction and/or five years/fine on indictment. Unauthorised modification of computer material, punishable by twelve months/maximum fine (or six months in Scotland) on summary conviction and/or ten years/fine on indictment.

If you breach any of the three terms above, such as accessing or modifying secure online data, then it would be considered that you have infringed the rights of others, especially if you have accessed personal data of numerous individuals that is stored online by trusted companies.

As well as the Computer Misuse Act 1990, there was further European legislation introduced on 25 May 2018 under the General Data Protection Regulation (GDPR). This legislation came into force to give data within the European Union (EU) greater governance and protection, not only within its member states, but also to protect the data shared with non-EU countries during trading of information. The GDPR is a tightening of the previous law on data protection in two important aspects:

1. It gives individuals more control of their own personal data.
2. It simplifies the legal framework in relation to data protection rules across the EU.

The new legislation was brought in to supplement the Computer Misuse Act 1990 as this was considered to have been rushed into place following the case of *R v Gold & Schifreen* (1988) 1 AC 1063 and not completely adequate to protect users in the modern online world. The UK government is now working on similar legislation to continue governance of the above following their exit from the EU.

As well as complying with the legislation above, users must avoid defamation, libel, or slander against either an organisation or an individual. Defamation is a false statement of fact which could harm the reputation of an individual or company, whereas (cyber) libel is

Tutor comment:

"It was an absolute pleasure working with J. during The Brilliant Club tutorials on 'Preventing Terror Attacks'. I was very impressed with J.'s work ethic, the level of input in class and his witty character. Through extensive knowledge and understanding of intelligence and how this operates, J. has been able to provide a clear and coherent essay and the issues surrounding this topic. In result, he received a very high mark for this piece of work, meaning he is already performing to a good standard A-Level. No doubt, J. would be an invaluable presence to any undergraduate programme, and I wish him all the best."

Are the laws on the responsible use of the internet sufficient in protecting our freedoms of right and expression?

Year 9, Key Stage 4

Pupil: H. Rolls
School: Ormiston Sheffield Community Academy, Sandwell
Supervised by: R. Asumda
Tutor University: Birmingham City University
Course Title: Social media, mental health and you

An introduction to the internet

The internet has its origin in the 1950s when research started into the possibility of interconnecting computer networks. This began in the United States of America (USA) although research was conducted in collaboration with other countries, in particular the United Kingdom and France.

Over the next few decades, research was continued by several different people and organisations into the development of packet switching and the protocols for internetworking. In the early 1980s, the NSF (National Science Foundation) funded national supercomputing centres at various universities in the USA and in 1986 provided them with interconnectivity with the NSFNET project. This established important architecture such as

defamation written on a web site, such as writing a false bad review which could harm a business or in some cases, an individual. Slander is essentially defamation that is broadcast verbally on platforms such as online videos, podcasts or audio files. Any of these activities would be deemed an infringement of rights.

However, if you consider yourself to be the victim of internet defamation or think you are being wrongly accused of online defamation, you must understand the law. For a comment, post, or article to constitute internet libel, the following elements must be met:

1. You must prove is that the statement constitutes a false statement of fact.
2. The false statement of fact must harm your reputation in order to constitute libel. Just being false is not enough constitute this.
3. The false statement of fact causing harm must be made without adequate due diligence or research into the truthfulness of the statement. In other words, it must be proven that it was known to be false when posted online.

...and when it can't

Restrictions that do not comply with all these conditions violate freedom of expression.

People put in prison solely for exercising their right to free speech are considered to be prisoners of conscience, and not to have actually committed a crime.

Conclusion

Having considered all of the above information, I do feel that imposing these proposed laws on companies that allow its users to share or discover user generated content or interact with each other online will to some degree limit the user's rights to freedom of speech and expression.

However, I do not personally feel that this legislation, when introduced, will have much of an adverse effect on legitimate users of online sites and forums, and in most instances, I do not think that it will affect their freedom of speech and expression in any way at all.

For example, most of the scenarios where legislation is intended to be imposed, such as children accessing inappropriate material, inciting violence, and violent content, encouraging suicide and false information are not situations where opinions or facts are being expressed or sought, but more just situations where illicit activity is being promoted or arranged, or where there is intent to influence consumers thoughts and opinions in a false or harmful manner.

One scenario where I do feel that the proposed legislation will restrict freedom of speech and expression is with regard to cyber bullying. As the legislation in this area of internet misuse is specifically designed to prevent users from publishing content that is either a harmful personal opinion of another individual, or intended to cause fear and anxiety to others, then it does essentially affect the authors' freedoms of content if they are

unable to publish it. However, I feel that the legislation is crucial as there would be no positive situation that I could envisage arising from publication of such matter, and when the amount of potential harm that this can cause to consumers and their families is considered it is essential that restrictions are imposed.

It could also be considered that some other areas affected by this proposed legislation do in some way become restrictions on freedom of speech and expression. For example, while it is my overall opinion that encouraging suicide is not an expression of fact, but simply an activity intended to cause harm to other individuals, it is arguable that not allowing a user to publish such material is restricting their freedom of speech. However, once again I consider this to be absolutely essential legislation to protect the safety of potential consumers as absolutely no good can come from this.

To summarise, while I recognise that there are certain scenarios where this proposed legislation will restrict the content of what individual users are legally able to publish online, I don't see any situation where anyone using these sites or forums in a moral way will feel that they are restricted by any governance.

It is only those users who are publishing content with the intention of causing harm to other individuals, damaging personal reputations, or those attempting to exploit other people for financial reasons or personal gratification that would potentially feel that their rights to freedom have been restricted.

When you consider the harm that these activities could impose on other people, and how this could potentially affect the victims' freedoms, then it is surely perfectly acceptable for the perpetrators to feel that they are the ones suffering restrictions to their civil liberties.

References

Wikipedia: https://en.m.wikipedia.org/wiki/History_of_the_Internet - An introduction to the internet.
UK Government: <https://www.gov.uk/government/news/uk-to-introduce-world-first-online-safety-laws> - The laws of responsible internet use.
Amnesty International: <https://www.amnesty.org.uk/free-speech-freedom-expression-human-right> - When freedom of speech can be restricted.
Council of Europe: <https://www.coe.int/en/web/freedom-expression/freedom-of-expression-and-information> - When freedom of speech can be restricted.
Wikipedia: https://en.wikipedia.org/wiki/Computer_Misuse_Act_1990 - When freedom of speech can be restricted.
Minc Law <https://www.minclaw.com/slander-libel-someone-lies-internet/> - So how can internet users infringe on other users' rights and freedoms?
Traverse Legal – Attorneys & Advisors: <https://www.traverselegal.com/defamation-libel-slander/> - So how can internet users infringe on other users' rights and freedoms?

Tutor comment:

"It was an absolute joy to work with H. during The Brilliant Club tutorials. I was particularly impressed with her outstanding level of engagement, his comprehensive essay writing skills, her deep understanding with the topic of social media and mental health, and constant generosity in sharing ideas when contributing to tutorial discussions. No doubt H. would be an invaluable presence to any undergraduate programme at university. Well done H.!"

Analysing the extent to which our outdated Education Paradigm is the most important influence on education inequality

Year 10, Key Stage 4

Pupil: **N. Kaliita**
School: **King Alfred's Academy, Oxfordshire**
Supervised by: **H. Mozley**
Tutor University: **University of Southampton**
Course Title: **It's not fair! Fighting inequality in education**

Abstract

This is a brief examination of the extent to which the outdated education paradigm is the most important influence on education inequality. The grading system is the main factor within the education paradigm that is considered.

Education is the acquisition of knowledge and experience. The positive impact of education is an improvement in economic stability, by producing a stronger, more capable workforce, therefore ensuring future generations' success. A virtuous circle is created, where a continuation of development is beneficial to everyone [1]. Contrarily, when there is an unequal distribution of educational resources and outcomes within the system, this is known as education inequality. In this context, the academic grading system does not incorporate all the different types of intelligence effectively. It caters primarily for three kinds, and many aspects of divergent thinking are also not considered. This causes education inequality, because many students feel marginalised if unable to follow the ideal social construct.

Self-efficacy is another factor which may have an important influence on education inequality. It can be strengthened by vicarious experiences from social capital, as well as mastery experiences derived from cultural capital. Educational inequality may stem from the internalised beliefs of the student, as motivation to succeed may differ between pupils.

To conclude, due to the extent that the education paradigm affects every student, it is the most important factor.

Keywords:

Cultural capital; Divergent thinking; Education inequality; Education paradigm; Examination; Intelligence; Self-efficacy; Social capital

Inequality sourced from the examination system:

One reason why our outdated education paradigm is an important influence on education inequality is due to the current style of testing and examination. The origins of assessment by competitive examination were for entry to prestigious and lucrative government positions, 2000 years ago in China. The only way to enter was to pass difficult examinations that were designed by Emperor Zhang of Han. Male candidates were given a series of exams mainly dealing with Confucian texts [2]. The pass rate was very low, because the purpose of these examinations was to identify

candidates with a specific skillset, such as rote learning. This selectivity is an early example of educational inequality [2]. In 1858, the first public examinations for schools were introduced to the UK for young boys as a method of marking their pupils' attainment, and to form comparison between other prestigious schools [2].

Now the education system has evolved; it caters for every demographic, not only elite and wealthy males, and a broader range of subjects are tested. The grading system, on the other hand, has not altered correspondingly. It remains outdated and unsustainable for future generations [3], because our perception of human intelligence has changed since. It is more expansive, broad, and diverse. A theory proposed by Howard Gardner suggests that there are at least nine different areas of proficiency, including intra-personal, existential, bodily-kinaesthetic, and spatial [4]. Of the nine only spatial, verbal, and mathematical are found in examination. Gardner also stated his categorisations differentiate intelligence into specific 'modalities', rather than a single general ability [4]. Based on their grades, pupils categorised into two oversimplified groups: 'academic' or 'non-academic'. Good grades elevate and validate those deemed academic, while bad grades are non-academic. These enforce the disparity between the one-dimensional character of grades against the multi-faceted attributes of the student [5]. A narrow spectrum of achievement is measured, thus incompletely measuring a student's abilities. The consequence of this is that young impressionable minds are taught that intelligence is conformity to academic standards. Consequently, this causes education inequality because intelligent, capable pupils will not discover their true potential beyond grades, and as a result have difficulty integrating into society.

Rather than aiming to cultivate a good student, the system marginalises the characteristics and personalities that are considered important in an individual today. Divergent thinking, which refers to having many solutions to a problem, is not embedded within the grading system [6]. Experiments have tested kindergarten children on their divergent thinking, with 98% scoring at 'genius' level. The same children were tested at ages 8-10, and only 50% scored 'genius' level [6]. While demonstrating a direct correlation with age and reduced divergent thinking, this experiment shows divergent thinking is an inherent ability everyone possesses. In secondary education, however, institutions demand formulaic approaches to answering problems, which tends to suppress creativity and imagination. The value of divergent thinking is often undermined. Albert Einstein, for example, was considered a divergent thinker. Initially, his teachers regarded him as a mentally handicapped student due to his inability to speak until the age of five [7]. Despite this, he was a perceptive child and had a keen fascination for learning. The way he expressed his concepts was by a novel form of divergent thinking: gedankenexperiment (German for 'thought experiment'). Conceptual rather than actual experiments would be visualised [8]. Part of Einstein's theory of special relativity was developed using this thinking process. For example:

In a theoretical setting, imagine you are chasing a beam of light. Supposing you catch up with it, and you can

observe light motionless in space. However, light cannot be motionless, because then it is not light. To resolve this dilemma, the proposition was that light can never be slowed. Light always moves at a certain constant speed [9].

Einstein revolutionised our outlook on space and time using simple, everyday concepts. It was an approach that other physicists had not considered, yet with hindsight, it seems very apparent. This is applicable to any subject and reveals how valuable divergent thinking may be for human progress.

At school, accuracy, speed, and memorisation is prized, not learning or experience. This causes education inequality because it does not act as ideal preparation for beyond the classroom, since pupils are tested on skills that are irrelevant within the workplace [5].

The effect of self-efficacy

On the other hand, the outdated education paradigm may not be the most important influence on education inequality. A pupils' accomplishments are based on a range of factors, not exclusively the education paradigm. Self-efficacy, a theory proposed by Alfred Bandura, is a person's belief in their capabilities to succeed in a specific situation or accomplish a task to a certain level [10]. The possession of a self-efficacious mindset means that individuals view challenging problems as tasks to be mastered, rather than threats to be avoided. Pupils can develop deeper interest in activities and form a stronger sense of commitment [10]. The absence of self-efficacy is often characterised as self-doubt, which negatively impacts achievement.

One determining factor of self-efficacy is vicarious experience, defined as exposure to an influential figure [10]. It strengthens belief in an individual's abilities, thus inspiring them. For example, parents, who are considered the first 'socialising agents' [11], nurture their child's sense of self through core values such as compassion, discipline and respect. Even basic tasks that young children copy unconsciously, like walking, are first exhibited by their parents.

In theory, the accumulation of social capital is another factor which could affect self-efficacy. Social capital is defined as developing and maintaining relationships to form social networks of like-minded individuals [12]. Observation of people around us, particularly those that are considered role models, can raise our beliefs that we possess capabilities to master activities [10]. In this circumstance, the collection of social capital is a form of vicarious experience.

Additionally, cultural capital, a term popularised by the French sociologist Pierre Bourdieu, may also affect self-efficacy. It is defined as knowledge and skills. According to Bourdieu, cultural capital comes in three forms—embodied, objectified, and institutionalised [13]. Embodied may refer to accent and mannerisms, objectified towards tangible objects like books or art. Institutionalised alludes to acquiring degrees or other qualifications [13]. These forms of capital are pertinent

to self-confidence because the greater the collection and use of knowledge, the more self-efficacious the practitioner. This is similar to mastery experience – the more you successfully practice the use of cultural capital, the more self-efficacious an individual becomes [10]. The student feels empowerment about their ability to achieve, which builds resilience.

Self-efficacy can cause education inequality because those that are willing to apply themselves towards education are more inclined to want to learn. These will find themselves educationally advantaged.

Bourdieu also commented that cultural capital is a major source of social inequality. Certain forms of cultural capital are desirable and are capable to assist or hinder one's social mobility in a stratified society [13]. This theory also may be the premise for education inequality. Some forms of capital are more pertinent to education than others. A pupil's self-efficacy may vary from skill to skill; different forms of cultural capital are valued differently in education. Even if each pupil has the same quantity of self-efficacy, it is highly unlikely to be deployed by each and every one in the same way.

Conclusion

The education inequality stems from the institution, and not from the psychological processes of the pupil. Whilst intrinsic beliefs about success contribute to self-efficacy, they cannot solely be based on internalised beliefs. External factors can play crucial roles in establishing a pupil's self-efficacy, such as parents, teachers, and school colleagues. A student's identity is related to their respective environments [14]. As students in the UK spend around 7 to 8 hours at school daily, the institution has a major impact on students' motivation to succeed.

As mentioned above, examination is biased towards those with specific types of intelligence. Despite the artificiality of being grouped as 'academic' or 'non-academic', if categorised as the latter on the basis of the inability to obtain high grades, then belief in success is lowered. The grading system attempts to classify every child into a narrow range of abilities, often belittling capabilities that are truly valuable, like divergent thinking. Furthermore, the outdated education paradigm has far-reaching effect on every child, despite of factors like ethnicity, socio-economic background, and gender. This is due to the fact that the grading system imposes education inequality beyond the classroom, as, for example, employers look for a strong academic background in an individual. Society's structural dependence on grades leads employers to ignore important qualities in their applicants [5].

Change

A useful approach would be to personalise education. This attempts to tailor education to meet the different needs of students. Rather than categorising pupils as 'academic' or 'non-academic', schools should differentiate students by type of intelligence and learning style. In order for personalised education to be effective, students are monitored by teachers from an early age, as pupils mature at different rates. Teachers can help

students decide an appropriate mix of subjects.

While this is a concept has not been developed by school systems, it has been trialled in pilot studies by service providers, such as Teach To One, a math platform now used in 37 schools across the US [15]. Children first "check in" to see which station they are assigned to, and then work through individually customised combinations of activities, including the likes of studying with computers, using printed materials, collaborating with peers or with the teacher [15]. At the end, students take a quiz, called an "exit slip" [15]. Embedding frequent periodic reviews has been demonstrated in the Finnish education system, where there is less emphasis on tests and the final grade [16]. Rather than examination results seen as the end product of good education, they are the by-product [17].

Tending to each specific students' needs offers equity, rather than equality. Catering for a range of intelligences and learning styles is expected benefit students, as they can improve in their areas of proficiency. This should act as suitable preparation for the future; knowledge of strength in a subject can direct pupils into possible career paths, linking into the concept of building self-efficacy.

References

- [1] Merriam-Webster, <https://www.merriam-webster.com/dictionary/virtuous%20circle>, [6 January 2020]
- [2] 'How have school exams changed over the past 150 years?', <https://www.cambridgeassessment.org.uk/news/how-have-school-exams-changed-over-the-past-150-years/>, [6 January 2020]
- [3] Ken Robinson, 'Do schools kill creativity?', <https://www.youtube.com/watch?v=iG9CE55wbTY>, [6 January 2020]
- [4] Kendra Cherry, 'Gardener's Theory of Multiple Intelligences', verywellmind, 1 July 2019
- [5] 3 Reasons Grades Are Bad For Education, <https://www.thnk.org/blog/3-reasons-grades-bad-education/>, [6 January 2020]
- [6] Ken Robinson, 'Standardisation broke education. Here's how we can fix our schools', Wired, 22 April 2019
- [7] Albert Einstein Biography, <https://www.notablebiographies.com/Du-Fi/Einstein-Albert.html#ixzz69iWo5Xrl>, [6 January 2020]
- [8] Gedankenexperiment, <https://www.britannica.com/science/Gedankenexperiment>, [6 January 2020]
- [9] Ali Sundermier, 'These 5 mind-melting thought experiments helped Albert Einstein come up with his most revolutionary scientific ideas', Business Insider, 27 July 2016
- [10] Miriam Akhtar, 'What is Self-Efficacy? Bandura's 4 Sources of Efficacy Beliefs', Positivepschology.co.uk, 2008
- [11] Ginsburg & Bronstein, 'Family Factors Related to Children's Intrinsic/Extrinsic Motivational Orientation and Academic Performance', Society for Research in Child Development, 1993
- [12] Will Kenton, 'Social Capital', Investopedia, 14 June 2019
- [13] 'Cultural Capital', <http://routledgesoc.com/category/profile-tags/cultural-capital>, [6 January 2020]
- [14] R.C Morris, 'The Inequality of Self-Efficacy between Junior College and Traditional University Students', Current Issues in Education, (Volume 19, Issue 2), 23 May 2016
- [15] A.K Thomson, 'Personalised learning starts to change teaching methods', Financial Times, 5 February 2018
- [16] 'Why is Finland's Higher Education System Is the Best in the World', <https://theculturetrip.com/europe/finland/articles/why-finlands-higher-education-system-is-the-best-in-the-world/>, [6 January 2020]
- [17] Rod Grant, 'Education is damaged by mindless obsession with testing', 6 March 2019

Tutor comment:

"As her essay demonstrates, N. is a thoughtful, reflective and critical student, who will undoubtedly continue to excel as she progresses through her academic career. Her contributions to The Scholars Programme tutorials were always valuable; her convincing embodiment of the Minister for Education during a memorable (and challenging!) role play was seriously impressive. Congratulations, N., for this richly deserved accolade."

Why does homophobia exist in sport and what is being done to stop it?

Year 10, Key Stage 4

Pupil: **K. Kuziara**

School: **Magna Academy, Poole**

Supervised by: **R. House**

Tutor University: **University of Brighton**

Course Title: **Homophobia in sport: why does it exist and how can we stop it?**

Did you think discrimination against homosexuality was a thing of the past? Homophobia is still very prevalent in sport to this day, despite the campaigns, the charities and laws that battle to abolish the fear of variance in sexuality. Society seems to be distancing oneself from biological and psychological divergence, instead of harbouring the community. Homosexual athletes still find it very difficult to accept their sexual orientation, let alone worrying if others will too, however, homophobia is capable of changing heterosexual behaviour too, due to the negative associations attached to certain physical traits and interests. To ascertain why it is so challenging to embrace one's diversity, we need to examine where the opposition sourced. Subsequently, in determining an approach to abort that source, we must ask - are attempts to eradicate homophobia being established as more sportspeople declare their sexuality?

Due to Britain's industrial revolution (1760-1840) [1], in families, women were needed more in the home to care for their children while men took up rising paid jobs in factories, both requiring hard work, but a woman needed more mental resilience and a man more physical strength. As a result, there was a general understanding that a woman should play the expressive role of '*Kinder, Küche, Kirche*' [2], while a man should play the instrumental role of earning money [3]. Therefore, there is no surprise that the traditional view is that women are more suited to less aggressive sports than men, or no sport at all (since they were not originally expected to be physically strong for anything other than cooking). Similarly, men are often expected to participate in more physically demanding activities to mirror their capability of performing hard labour. Consequently, a woman playing a masculine associated sport, or a man playing a 'feminine' sport is a shock from normality. Women, in particular, Heidensohn argues, who go against their feminine, gentle stereotype are seen as absurd [4] because they are not the typical, warm and gentle female, especially if they have a muscular build. However, the chivalry theory [4] would suggest that, because women are stereotyped as weak and vulnerable as a population, female athletes are let off the hook more often, whilst male athletes are the worst hit by homophobia, due to the assumption that they can deal with some 'advice' to 'man-up' because they should be less emotional. This means that homophobia can exist, not only due to someone's sexuality being openly different but largely because of an athlete's physique and interests.

Furthermore, since 'habit-breaking' is unpleasant.

We prefer the familiar' (Allport 1954), it is difficult to overcome the unfamiliar, so the revealing of various sexual orientations can lead to a feeling of alienation of the minority, both for heterosexuals and homosexuals. To deal with the fear, perhaps jealousy, of people who can turn against traditional propriety and social values, no longer fitting into the 'normal' population, people naturally categorise certain traits into segregated groups. For example, a woman playing rugby may be classified as a lesbian, since masculine women and lesbians both go against traditional social norms; consequently, a negative connotation is attached to being either one. However, the linking of Allport's research to homophobia could be too disconnected, since his study was on a small group of children, and in a different context. The unreliability of the study of children, due to a more prominent observer effect, and the difference in results between contexts does indeed make the connection questionable. However, since 'antipathy based upon a faulty and inflexible generalization' [5] will frequently lead to discrimination, as a result of predetermined ideals, e.g. a sportsman should be ultra-masculine and straight, being seen as superior to 'oddities'. Because they are from a minority, it is easy to parallel their difference in interests to other differences such as their sexuality. Perhaps it can be argued that their minority may instil fear in the majority due to disconnection from the heteronormative 'species' and cannot be fitted into society's jigsaw. Some, particularly religious groups believe any unconventional interests are a malfunction in God's ideal. The effect of this thought process is one of the various sources of homophobia in sport.

To remove themselves from immediate harm, sportspeople can become homohysteric. (Anderson, 2011). Due to the original stereotypes of 'normal' and 'abnormal' men and women, they acknowledge that homosexuality is in existence, but with high cultural homophobia, (particularly during the 1980s-90s [6]), they change their behaviour. To absolutely separate themselves from being prejudiced gay, sportspeople often become ultra-masculine or ultra-feminine, perhaps due to personal hatred of homosexuality, or because of the disadvantages of being part of a minority group. Unfortunately, many researchers consistently found 'rates of suicide attempts among gay and lesbian adolescent populations to be two or three times higher than their heterosexual peers' [7]. Halpert (2002) concluded this was 'not due to a homosexual orientation per se, but to the social hatred and prejudice' which Allport (1954) had described. A well-known example of this is the suicide of Justin Fashanu (1961-1998), the first footballer to be openly gay, experiencing traumatic levels of homophobic abuse and racism, combined with a troubled, poor childhood, and two charges of sexual assault [8]. As a result, there is clear evidence of the mental and physical strains of homophobia and could be a major factor that causes sportspeople's separation from homosexuality, especially due to the younger, more vulnerable average age of athletes compared to other careers and activities.

Although methods such as law-making and charity work attempt to reduce discrimination, it can be argued that campaigns are among one of the most effective in reducing, and eventually abolishing homophobia particularly aimed in sport. 'Kick It Out' and 'Rainbow Laces' are just two

major campaigns that have kick-started a discussion on the topic. Campaigning may have a much greater effect on people. This is because, compared to other methods, they improve knowledge retention, are engaging and involved [9] as well as money and awareness raisers (like charities). Additionally, they improve the conduct of people (like laws) on a deeper, idiosyncratic level. Campaigns work to prevent discrimination, including homophobia, so that sport is a place where the LGBTQ community feels safe from abuse and encouraged to participate on the same sporting level as would an untargeted individual.

Rainbow Laces is an appealing, colourful method of promoting LGBTQ+ rights across all sports, which is perhaps why it is such a far-reaching international representation. The popular, eye-catching stripes are recognised worldwide, and for many, it is a symbol of hope for the future, which hence shines a light that can psychologically – and literally – defeat the opposition. The campaign, beginning in 2013, encourages athletes to be 'active allies' [10] by standing up for LGBTQ+ equality in fans and players so that all participants feel welcome, significant and free from homophobic language. On a selected day, fans and players wear rainbow-coloured laces to promote inclusion and acceptance for all [11]. The sheer simplicity of wearing multicoloured laces makes the campaign very accessible, and the more people accessing it, the more recognisable the stand for LGBTQ+ is, helping to prevent homophobia in sport as mutual beliefs about homosexuality improve for the better. Compared to other campaigns, 'Rainbow Laces' is exceptionally singled out by the media, for its rainbow of positivity; a great example is the campaign's partnership with the 2019 Premier League, where teams and fans illustrated a warm welcome with the securing of a bow [12].

However, the extent of the campaign's actual effectiveness can be questioned. The issue of needing money to support the campaign can be refuted by the huge kick forward it gives the LGBTQ+ community, however, there are problems outside of finance. Firstly, the campaign does not specifically educate people regarding the presence of homophobia [13], why it exists and methods to stop it if encountered. This is because 'Rainbow Laces' does not offer the substantial information observers need to fully understand the importance of abolishing homophobia, only providing materials to help support the feelings and beliefs of participants of sporting events and gaining publicity. As a result, it could be said that the 'Rainbow Laces' campaign is not an adequate method to specifically stop homophobia in sport, and can be more appropriately termed as an approach of giving the LGBTQ+ community positive identity in sport. Furthermore, another issue, which links to the first issue, some attitudes may not align, despite participants taking part [13]- as with anything, most people will join in to please the crowd and 'fit in'. This is controversial, with the idea being based around the right to be unique and diverse, but it is very prevalent. As a result, homophobia in itself is not necessarily reduced, even if it has the appearance of absolute achievement, appearances are deceiving. To an extent, the campaign may instead have an opposite result, participants being an easy target for any homophobic predators.

'Kick It Out' is a campaign to enable, facilitate and work with the movement of anti-discrimination "football authorities,

professional clubs, players, fans and communities" [14]. In doing so, the 'Kick It Out' campaign can work towards football being a sport where all people can "flourish" [14] due to fairness being enforced for the good of all sportspeople. They aim to promote awareness, expose and challenge discrimination, share successes and support individuals [14]. Because the campaign only focuses on football and is not international, it may not be an effective method to stop homophobia because it does not take into account discriminative behaviours in the multitudes of other sports and countries. The specificity of this campaign is vital to effectively execute some major 'Kick It Out' interests. They focus on taking action, allowing victims or observers of homophobia in football to report abuse anonymously, meaning there is literal prevention of homophobia, instead of simple suggestions, without compromising anyone's safety. However, since it is difficult to gain evidence of homophobia, because more is needed than someone's word, and the anonymity of the system makes it harder to track incidents, not a lot can be done to physically stop homophobia in football. Moreover, 'Kick It Out' cannot administer sanctions, having to leave it in other's hands to decide what should be done. This causes problems such as trusting outside organisations to investigate incidents. Even so, one of the campaign's main advantages over other procedures is its provision of educational courses to schools, universities and clubs. This is beneficial as it reaches people on a personal level and be achieved anywhere.

It could be argued that 'Kick It Out' is a superior technique to the general focus of the 'Rainbow Laces' campaign, because it can thoroughly examine and defeat specific cases and, if more campaigns were set up to align to specific sports, overall, there may be better outcomes and progress. Moreover, the more impressionable younger generation are likely to take action, with less traditional beliefs, solving the problem 'Rainbow Laces' has of not specifically educating how participants can individually prevent homophobia in sport. Despite this, until 'Kick It Out' is able to effectively deal with reported cases of homophobia, the 'Rainbow Laces' campaign is conceivably the more successful method of eliminating homophobia in sport, because the weight of its recognition and easy access that has a powerful effect on sports observers and players.

Allport (1954) found that children felt their town (the 'in-group') was superior to another town (the 'out-group'), simply due to having no connection with the outside group. Therefore, the segregation of the homosexual minority from the heterosexual majority could be a major source of social inequality and homophobia, if Allport's results reflect multiple situations. Perhaps building bridges and removing the barrier that segregates homosexuals from heterosexuals would eliminate the hierarchy of sexuality and encourage society to embrace their individuality instead of being homohysteric. Most importantly, it would abolish homophobic cultures so that we can accept and celebrate the existence of variation - as sporting audiences, as sports players and as a population.

References

- [1] 'Industrial Revolution', <https://www.britannica.com/event/Industrial-Revolution>, [30/04/20].
- [2] Robert Wilde, 'The Nazis and Women: Kinder, Küche, Kirche', <https://www.thoughtco.com/nazis-and-women-1221068> [30/04/20].

- [3] Sara Horrell and Jane Humphries, (2009) The Origins and Expansions of the Male Breadwinner Family: the case of Nineteenth-Century Britain, 29-31.
- [4] A2 sociology - Crime and Deviance Unit 4 (AQA), <https://www.memrise.com/course/359883/a2-sociology-crime-and-deviance-unit-4-aqa/12/>, [13/05/20].
- [5] Gordan W. Allport, (1954) The Nature of Prejudice, 40-46.
- [6] Eric Anderson, (2011) Masculinities and Sexualities in Sport and Physical Cultures: Three Decades of Evolving Research, Journal of homosexuality, 565-569.
- [7] Halpert, Suicidal behaviour among gay male youth, <https://psycnet.apa.org/record/2002-06834-009>, [14/05/20].
- [8] Daniel Harris, 'John Fashanu on brother Justin: 'He was my shining light. He became my arch enemy'', Guardian, 01 May 2017.
- [9] Harry Cloke, What are the 12 benefits of Campaign Learning?, <https://elearningindustry.com/campaign-learning-12-benefits>, [14/05/20]
- [10] Josh Challies & Liam wood, 'What is the Rainbow Laces campaign? Premier League and EFL prepare for 2019 launch', <https://www.grimsbytelegraph.co.uk/sport/football/football-news/rainbow-laces-campaign-launch-2019-3591795>, [10/03/20].
- [11] Goal, 'Rainbow Laces campaign: What are they, which players wear them', <https://www.goal.com/en/news/rainbow-laces-campaign-what-are-they-which-players-wear-them/56bl0ljpbp21b0uhb3f16dz7> [10/03/20].
- [12] Rainbow Laces, <https://www.premierleague.com/RainbowLaces>, [14/05/20].
- [13] Rebecca House 'Homophobia in Sport: Why does it exist and what is being done to stop it'.
- [14] 'Who We Are', <https://www.kickitout.org/aims-and-objectives>, [10/03/20]

Tutor comment:

"I really enjoyed my time teaching at Magna Academy, where the pupils were enthusiastic and worked hard during the programme. K.'s excellent effort, attention to detail and in-depth understanding of the topic is evident in her final assignment, where she was graded with a 1st. K. demonstrated an excellent understanding surrounding the area, showed evidence of applying academic research skills, can critically analyse and evaluate relevant topics, and can appropriately structure an assignment with the use of academic language. K. consistently produced high-quality homework tasks throughout the programme and was very independent in learning and applying new skills needed for university. It is clear that K. has many of the essential skills needed to thrive at a university. Overall, this is an excellent piece of writing for a KS4 individual, and K. should be very proud of what she has achieved. A big well done and congratulations to K. for being published in The Scholar! This is an outstanding achievement that is very much deserved. Well done K.!"

Reflections on why people fail to commit to acting against climate change

Year 10, Key Stage 4

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Course Title: Reimagining our future

Introduction

At the start of 2020, the President of America vowed to continue to ignore the upcoming threat of climate change. "Federal agencies no longer have to take climate change into account" [1]. Climate change is epitomised by fluctuation in climate patterns since the mid-20th century, arguably because of global emissions of greenhouse gases. Humanity had an enthusiastic approach to combatting climate change, when first it was acknowledged, but this enthusiasm has much dissipated. I aim to discuss why the climate movement is not attracting the traction and actions needed to bring global emissions down. Therefore, this essay covers the role of linear motivation, the long-term effect of positive and negative reinforcement, how capitalism has influenced climate change and how some groups have

been able to use social media to attract public attention to the problem.

Linear motivation

Eating out every Saturday will increase your weekly budget. This is a linear trend and is relatively easy to pinpoint because of the clear connection between cause and effect. Non-linear motivation is, for example, when someone has a poor diet for years and then only suffers from associated problems in middle age. In other words, when a function drastically accelerates after a slow start, which makes the link between the catalyst and the outcome harder to anticipate.

In modern history, it took approximately 50 years before signs of climate change were even visible, and while most in the global north are not suffering as a result of climate change, in as little as 20 years [2] coastal cities will flood due to a 1.5 degrees Centigrade rise in temperature. Another reason people are reluctant to engage with the issue is because climate change also involves sacrificing present benefits for future benefits. Markman’s article on climate change states “massive investment of effort by 2030, just about keep the warming level below 1.5degrees centigrade. This is bad, but manageable”. Typically, people with the most influence live in the global north and will not yet be experiencing climate change as it is foreshadowed: countries with a high Gross Domestic Product (GDP) will be able to build an infrastructure capable of resisting the lesser impacts of rise in sea levels and overall temperatures. So, greenhouse gases are the byproduct of an industry that is greatly beneficial today; for example, 10% of Canada’s GDP comes from its oil sand [3].

The global north cannot reason why they should invest a massive sum of effort to achieve “bad, but manageable” when the situation here now appears to be fine. The Global temperature rise is 0.8 degrees C over the last decade [4]. For temperate climates such as the UK, this slight rise does not have a drastic effect. Jonathan Safran Foer argues that climate change is a crisis of belief- “excruciatingly, tragically difficult to talk about the planetary crisis in a way that is believed” [5]. How can this be explained?

Research on Construal Level Theory (CLT) suggests that humans speculate on what is conceptually distant from them based on three factors of distance: temporal, social and spatial [6]. CLT in social psychology is when a concept is abstract or concrete in thought based on psychological distance - defined in the previous distance dimensions. Climate change is both temporally, spatially, and socially distant from us. It is presented as horrific flooding in the global south and ravaging forest fires across the seas. For most, it is not near us but distant and it is in turn conceptualized as something abstract. Furthermore, the future will always be more ambiguous than the present and climate change is often staged to people as a catastrophe of the future. In addition, it is not near us in the moment and because many people are not living with it in the present, they are not compelled to grapple with its consequences. For example, 1/3 of UK adults “have no private pension provision” [7]. As a result, CLT predicts that people will not be motivated to fight it since it is so psychologically abstract.

Nonetheless, there are established methods for trying to

motivate people to change their patterns of behaviour.

The Guilt Game: positive and negative reinforcement

Positive and negative reinforcement are two ways in which to persuade someone to act; either by encouraging and rewarding them when they do well or by attempting to inflict guilt and punishing them when they fail. The latter has been most common during persuasion for climate action, but studies have shown that positive reinforcement can have a better effect. One such study was “the fun game”- an initiative of Volkswagen [8]. This study had the intention of reducing car speed by turning driving legally into a game. All those who drove too fast would be recorded and fined, and all those who did not would be put into a lottery to win the accumulated fine money. The study brought down the average car speed from 32mph to 25mph, a 22% decrease which demonstrates how gamification can be successfully used as a method of persuasion.

Negative reinforcement as a means of coercion may work. For example, making people pay for plastic bags in Ireland – people thought twice before buying plastic bags and instead brought their own reusable bags. This 15 cents levy in Ireland brought down the use of bags by 90% and generated \$9.6 million for a green fund [9]. This is also an example of linear motivation. Members of the public could see it was cost effective to buy a reusable bag. On the other hand, in cases like fining people for dropping litter, negative reinforcement has often failed. Governments cannot afford to keep enough officers patrolling to catch people dropping litter, and if they do catch a kid throwing litter because he cannot be bothered to find a bin, then probably he will not be able pay the fine and taking him/her to court would cost more than the fine itself.

It could be argued that the lack of positive reinforcement given to the public to encourage good practice in combating the climate crisis is making it difficult for people to see a bright side to the situation with which they are presented. An example of this working is with The Reverse Vending Machines scheme designed to reduce littering. The concept is that people give their plastic bottles to the vending machine and it pays them a small fee (varying based on size of bottle) for the plastic bottle. In Germany, a deposit return scheme was initiated in 2003 resulting in 99% of plastic bottles now being recycled [10].

Generally, the people who need convincing are either those who just do not care or those who care but need prompting to act upon it. Positive reinforcement is a better candidate because those that care will be receptive to positive feedback based on their actions and they are also the type of people that are more likely to lend their support. If the candidate does not care, then they will not feel guilty but might be susceptible to a positive approach. In addition, to use negative reinforcement on those who care may shame them. These tactics may work at a personal level, but there is an argument that the real problem occurs at the level of society and government.

The effect of capitalism

In a capitalist society, profit motive dictates actions and so most companies are not incentivised to be environmentally friendly because environmentalism costs

more and so either the company will lose their profits, or their competitors will take their market share. Green energy is in high demand, so some fossil fuel companies or even countries present themselves as investors in renewable energy. This tokenism is called greenwashing. One example of greenwashing was EasyJet claiming their planes used 22% less carbon emissions than other planes travelling that route. This claim was refuted as it suggested that the planes were more environmentally efficient when, in fact they just carried more passengers [11]. Another example of greenwashing is the case of major clothing brands, such as Zara. In Inditex’s annual report, on page 28, they claimed 88% of their waste is reused or recycled. On page 282, they state that their group factories do not involve ones located outside of Spain [12]. Zara owns nine stores across Spain and Inditex (Zara’s owner) owns over 6400 stores worldwide [13].

Moreover, capitalism produces huge irregularities between those who have access to resources both globally (ex-colonial powers versus post-colonial powers) and nationally (rich v. poor). Organisations with access have power and can stack the odds in their own favour. With this much power, they also have influence over the decisions of the general public. This makes it extremely difficult for like-minded climate change activists to rally and make a difference. An alternative perspective is that we should be wary of rushing into climate change prevention measures. In the U.S., proponents of the green new deal demand zero emissions in the U.S. by 2030 [14]. Companies counter that it would be very costly and require a great downgrading in living standards which will be very unpopular.

Capitalism also inadvertently diverts the blame away from itself. For example, the U.K has reduced CO2 emissions by 42.1% since 1990 [15] which seems like a good statistic. In fact, the U.K stopped mining coal in the 1970s because it was cheaper to import from abroad. Back in the 1990s we still burnt a lot of coal to manufacture goods; whereas now, we import our goods from Low Income Countries (LICs) whose carbon footprint goes up in our place. Since capitalism and the market economy pervades so much of modern society, some climate change activists have taken to avoiding targeting governments directly and adopted a “grass roots” approach, bringing the issue back to the people.

A different approach

Climate activist groups such as Extinction Rebellion (XR) aim to combat climate change without using the “the traditional systems like petitions” [6]. Their aim is to find the most effective way of attracting attention to their cause. They publicly promote civil disobedience (in some cases arrest) but no violence. Extinction Rebellion vow to remain “apolitical” which means they refuse to take a stance on the traditional left/right divide and so present climate change as a pre-political issue. In turn, they cut themselves off from exploring the economic and political causes of climate change. On the other hand, their purpose is open to everyone. As their initial aim was to gather as much support as possible, it is tactical of them not to take a side and force away potential supporters of that political mindset.

The campaigns of young activist Greta Thunberg have brought her international fame through her #fridaysforfuture movement – a 72 Fridays student climate strike demanding

world leaders act against climate change for the younger generation. Great Thunberg was labelled a “next generation leader” (Time Magazine, 05/2019) and awarded the Times young person of the year award. Her and her team have demonstrated how social media can be utilized as a force for good in spreading awareness and rallying support.

Conclusion

In conclusion, this essay covers how linear motivation and CLT suggest why people are not forced to address climate change, how established methods such as positive reinforcement can be applied to help draw more people to the cause, how capitalism and action against climate change cannot co-exist and how some groups have utilized social media to attract attention to the issue at hand. The reasons above are my reflections on why climate change is not being whole-heartedly recognized as the problem that it is: a global crisis. Yet it is a problem. I believe it is not enough to merely discuss the theory but clearly, we must make practical changes. Jonathan Safran Foer suggests something as personal as giving up animal products in two meals a day may be enough to make a significant change in the right direction by reducing the negative impact of animal agriculture - harmful greenhouse gases that contribute to global warming. I believe optimism is the key to engaging peoples hope but it is still important to have a plan.

Bibliography

1. Donald Trump on ignoring climate change. Lisa Friedman. Trump would exclude climate change in infrastructure planning. Available at www.nytimes.com/2020/01/03/climate/trump-nepa-climate-change.html[5.1.2020]
2. Art Markman. 2018. Why people aren't motivated to address climate change. Available at: br.org/2018/10/why-people-arent-motivated-to-address-climate-change [03.01.2020]
3. Energy exchange. Energy and Canada's GDP. Available at: www.energy-exchange.net/fuel-electricity-canadian-gdp/ [02.01.2020]
4. Temperature rise in Independent. UK hotter than it has been for 100 years. Josh Gabbatiss. Available at: www.independent.co.uk/news/uk/home-news/uk-weather-heatwave-climate-change-rain-sun-hottest-wettest-met-office-a8470876.html [5.1.2020]
5. Jonathan Safran Foer. 2019. We are the weather – saving the planet begins at breakfast. Hamish Hamilton, Penguin. P.31
6. CLT Yacov Trope. Available at www.ncbi.nlm.nih.gov/pmc/articles/PMC3152826/ [4.1.2020]
7. Guardian on pensioners pensions. One in three UK retirees will have to rely solely on state pension. Available at: www.theguardian.com/money/2017/oct/21/uk-retirees-state-pension-financial-future [03.1.2020]
8. Speed camera Lottery. Volkswagen. Available at: www.youtube.com/watch?v=iynzHWwJXaA [06.01.2020]
9. Ireland Environmental Committee. plastic bag levy. Available at: www.irishenvironment.com/iepedia/plastic-bag-levy/
10. Bottle and can deposit return scheme. Reverse vending machine. Available at: <https://www.theguardian.com/environment/2018/mar/27/bottle-and-can-deposit-return-scheme-gets-green-light-in-england> [31.12.2019]
11. What is green washing? Colin Marrs. Available at: <https://www.feedough.com/what-is-greenwashing-types-examples/> [05.01.2020]
12. The ugly truth of fast fashion. Hasan Minhaj. Available at www.youtube.com/watch?v=xGF3ObOBoc [01.12.2019]
13. Guardian on Inditex. Spain's fashion powerhouse you've probably never heard of. Available at: www.theguardian.com/fashion/2013/dec/15/inditex-spain-global-fashion-powerhouse [2.1.2020]
14. World economic forum. Is capitalism incompatible with effective climate change action. 2019. Available at: <https://www.weforum.org/agenda/2019/09/is-capitalism-incompatible-with-effective-climate-change-action> [02.01.2020]
15. Roger Harrabin on BBC news. Available at: <https://www.bbc.co.uk/news/science-environment-47121399> [5.1.2020]
16. XR homepage. Available at: <https://rebellion.earth/the-truth/about-us/> [05.01.2020]

Tutor comment:

“It was a real pleasure to teach L. during my placement. I was particularly impressed by his continuous engagement throughout the course, be it in form of contributions to group discussion or the dedication put into homework assignments. L. wrote an outstanding essay, drawing on findings from the complex fields of behavioural and cognitive psychology, and I’m sure that L. would be an invaluable presence to any undergraduate programme.”

What are key factors to young people’s wellbeing, and why are they important?

Year 12, Key Stage 5

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Course Title: Promoting wellbeing in young lives: The importance of space, connection and voice

Wellbeing refers to psychological, physical, emotional, social and spiritual health. The New Economics Foundation’s theory is that wellbeing itself stems from functioning well and feeling good. Wellbeing can be affected by numerous contextual factors. These factors may have positive or harmful impacts on our wellbeing, it is, therefore, important to understand what elements of our lifestyle and surroundings protect or threaten our ability to lead a good quality life. This essay will discuss the factors that have the most significant impact on the wellbeing of young people, and why that is.

In general, factors that affect young people’s wellbeing are considered to be split into three main sections: their community (who and what they are surrounded by daily), their family and the environment in which they learn. There are individual factors (including their lifestyle or major life events) which intertwine with the main factors, as lifestyle and life events may be heavily influenced for example, by the person’s family. Each factor can on one hand act as a protective factor, meaning they are factors that support our wellbeing. For example, when a young person is surrounded by a stable family, are supported through their place of education and feel accepted in their community. On the other hand, they can also become risk factors, for instance, if a young person were to have negative relationships with the important people in their lives, or if they felt they were victims of prejudice in their community. However, how are we able to understand the true impact that these factors have on young individuals? There are two main methods of research which are used to understand these effects. The quantitative method of research focuses on statistics such as asking yes or no questions, whereas the qualitative method aims to obtain a wider understanding of the context of the questions asked.

One particularly significant factor to young people’s wellbeing is their community. There are numerous different points under the category of a young person’s community, including the support they receive from society, equality or discrimination they may face or perhaps whether they feel safe in their community. It is crucial that a young person feels supported in their daily environment, without a sense of community it may feel as if there is no one to turn to. When a young person feels they can trust the people in their community, they feel comfortable in being themselves which would undoubtedly improve their outlook on life, in particular their social wellbeing, as it would act as motivation to meet new people. Nonetheless, when an adolescent

does not feel safety or comfort in their community it can be detrimental to their mental health. An important example to consider when looking into the risk factors that are presented is the effect that violence has, directly on the wellbeing of adolescents but also the people around them.

Seeing as adolescence is a key developmental stage, traumatic experiences during this period can have lifelong repercussions on the mental and social wellbeing of a young person. There are multiple forms of violence, from domestic abuse to civil wars. One example of how violence in a community which does not offer enough social support can be harmful is from the perspective of 14-year-old Lamar from Jerusalem, the centre of religiously motivated conflict between Israeli Jews and Palestinian Muslims. Many innocent citizens are caught in the crossfire between Israeli and Palestinian forces. Lamar describes how she ‘doesn’t feel like she has spaces to do things she loves’. Without these spaces how are adolescents able to express themselves in a way that they can find peace and happiness amongst their sorrow?

In terms of witnessing violence directly, young people are highly likely to mirror the violence that they see, or perhaps believe it is the correct way to handle situations. Furthermore, this exposure to violence puts adolescents at risk of ‘injury or threat’ and can harbour ‘long-term emotional’ damage.¹

Therefore, the community plays a significant role in posing as a threat as well as supporting a young person’s wellbeing. Violence, in particular, has a crucial effect on the way that a young person leads their life concerning their ability to handle their emotions and the threat that they could pose to people around them if these emotions are continuously repressed.

Another vital factor (both protective and risk) is the family. The term family refers to a range of things. For instance: the relationship that a young person has with their family members, the stability of their familial situation, the health of their family members and the lifestyle that they may be exposed to. Relationships, whether that be familial or with a friend, are a crucial element of a young person’s development and therefore their wellbeing. Having positive familial relationships enables a child to experience the best quality of life possible before the troubles of adulthood. However, negative relationships with family members can have a detrimental impact on the development of a child’s social skills and emotional intelligence. In my opinion, young children must be surrounded by a caring and supportive family, particularly a family that are a good role model for the young person. This is as it is during childhood when behavioural patterns begin to develop, many of which are mirrored from their parents or other people they are surrounded by. This idea is backed up by the 2016 article by Mental Health Foundation UK, explaining that strong relationships and emotional support within a family are “essential for healthy development in children”².

Further examples of the importance of supportive family

relationships are when established from a young age, they enable the young person to form skills that I feel are crucial for creating relationships with people outside of the family, and to be able to sustain those relationships. Having discussed the ways family can support wellbeing, I will now cover the ways that problems regarding the family can hinder a young person’s wellbeing. Unfortunately, it is not rare for a youth to live in an unsupportive or abusive household. In my opinion, this is something that leads to self-depreciative thoughts or loneliness. I understand how negative experiences of relationships with family members in a young person’s life would make it difficult for them to want to create relationships with other people, as they have been set a poor example of how relationships function.

This is backed up by the same 2016 Mental Health Foundation’s article, stating that “poor relationships are a common trigger for self-harming behaviours”³. Familial relationships have a significant impact on the wellbeing of youth, as it directly impacts a young person’s ability to function well. However, there are other aspects of the family which may act as a threat towards someone’s wellbeing. For example, the physical and mental health of family members. Having lived with a terminally ill father myself, I understand the strains that living with an ill family member may have on a family. Financially illness can be very straining on parents, watching your parents go through financial struggles without the ability to help can make a child feel guilty or hopeless. Emotionally however, the strain is far more pressing. As mentioned previously, it is crucial to create bonds with family members to function well and lead a happy life. However, when a family member whom a young person has a strong bond with, passes away, it can have a detrimental effect on their wellbeing. I would say that losing my father to illness has changed the way that I function emotionally, I found that it leaves young people with a feeling of loneliness, combined with having to watch other family members grieve which results in that young person feeling powerless over what happens in their lives. Although, there are many ways in which young people can support their wellbeing after the death of a family member. For instance, group counselling or mindfulness practices, to help adolescents process their confusing and powerful emotions rather than bury them. Nevertheless, it can be extremely difficult for a young person to feel happy mentally or socially after significant life experiences such as family illness or deaths. Consequently, each aspect within the factor of the family has the capability of supporting or hindering a young person’s wellbeing depending on the circumstances.

In addition to the community and family, learning environments also significantly impact young people’s wellbeing. The term learning environments can be split into several different aspects, such as the educational environment, the engagement in learning, relationships with teachers or other pupils and the support or perhaps pressures that young people are exposed to in a learning environment. Education is paramount for the development of a young person’s brain, as well as establishing social links and mental strength. It is important for a young person to feel that they are supported

within their school environment, whether that be from a member of staff or another pupil. Lack of support from an academic environment may decrease the motivation for a young person to push themselves academically. This is as many young people (particularly those who do not find comfort in their own homes), view school as their safe space. This makes it crucial for young people to build positive relationships with members of staff who may act as the role model they are missing at home. Concerning relationships, it is additionally paramount for students to be able to build friendships with other pupils in schools to develop their social skills. Meeting new pupils can support a young person’s wellbeing as it enables them to build and deal with challenges within new friendships.

On the other hand, according to the Department of Education, 63% of bullying from 2017 to 2018 took place within a school⁴. I would say that it is very difficult to remain optimistic in an educational environment when you do not feel accepted there, as schools can provide a sense of community, meaning that risk factors to young people’s wellbeing within a school may mirror factors I have previously discussed under the community as a whole. Although friendships can act as protective factors of young people’s wellbeing, school is a place where young people are more vulnerable to bullying. Public Health’s theory on school relationship’s effect on young people describes that good relationships within school decrease the likelihood of risky and antisocial behaviours out of school⁵. I thoroughly agree with this as I would say that feeling confident socially, stimulates academic performance. There are facilities available to students through schools which offer opportunities to discover new passions, such as music or art, that adolescents may not otherwise be able to access. I feel these opportunities are instrumental for maintaining motivation and optimism in an academic environment. Within school, a routine is established which is essential for implementing organisational skills in a young person, helping them with problem-solving throughout the rest of their lives. Pressures placed on pupils whether scholarly stresses or friendship stresses can often become overwhelming for young people, it can be very challenging to build resilience against stress from such a young age. Seeing as the majority of young people spend significant time in schools, it is clear that numerous aspects of their learning environment would significantly affect their wellbeing, both positively and negatively. This highlights the importance of support within a learning environment.

Overall, I have discussed three main factors concerning young people’s wellbeing and their importance. I would say that each factor (the community, the family and the learning environment) go hand-in-hand regarding the effect they have on a young person’s wellbeing. Although feeling supported and happy within a community, if a young person’s life at home is a negative experience, that still poses a threat to their wellbeing. Additionally, the individual factors such as significant life events or lifestyle are aspects of wider themes, in particular, it is strongly linked to family. It is important to recognise the way that each of these factors impacts a young person’s wellbeing, to improve their quality of life and help them

gain the most from their life experiences to support their wellbeing. In my opinion, the psychological and emotional aspects of a young person's wellbeing are highlighted as the most vulnerable within all three of the factors that I have discussed. This consequently hinders a young person's ability to fully function or maintain balanced wellbeing.

Bibliography

1 Call, K.T, Riedel, A.A. Kein, K., McLoyd, V., Petersen, A. and Kipke, M (2002) Adolescent Health and Well-Being in the Twenty-First Century: A Global Perspective

2 Paula Lavis, Why relationships are so important for children and young people <https://www.mentalhealth.org.uk/blog/why-relationships-are-so-important-children-and-young-people> [20 March 2020]

3 Paula Lavis, Why relationships are so important for children and young people <https://www.mentalhealth.org.uk/blog/why-relationships-are-so-important-children-and-young-people> [20 March 2020]

4 Department of Education - Bullying in England April 2013 - March 2018 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/754959/Bullying_in_England_2013-2018.pdf [25 March 2020]

5 Public Health England - The link between pupil health and wellbeing and attainment 2014 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/370686/HT_briefing_layoutvFINALvii.pdf [25 March 2020]

Tutor comment:

"D. was a very hard working and committed student. Throughout the course, D. showed an excellent ability to think critically and apply the learning to her everyday life experiences. She demonstrated good teamwork and problem-solving skills and most of all D. was a drive, friendly and kind student and was valued by her peers and tutors. D.'s essay is very well written with excellent structure, punctuation, introduction, body and conclusion. D. has focused her essay on significant points and explained them by providing examples from everyday life. The essay shows engagement both with the text/reading but also with in-class discussions. It shows a good understanding of the topic and a good ability to discuss it from her own understanding and perspective. I really enjoyed working with D. and wish her all the very best in her future endeavors. I think she has a lot to offer, and I have no doubt there is a brilliant future awaiting her!"

Using the Propaganda Model, and Critical Discourse Analysis, explain how Saudi Arabia have justified their war in Yemen to various audiences?

Year 12, Key Stage 5

Pupil: E. Lovatt
School: Richmond School, North Yorkshire
Supervised by: T. Walsh
Tutor University: Durham University
Course Title: Propaganda, power politics, and the Middle East

Saudi Arabia justified their involvement in the war in Yemen to both an international and local audience through the use of propaganda in both local newspapers and online media outlets with millions of viewers. Through the use of the five filters of the Propaganda Model and Critical Discourse Analysis, this essay will evaluate multiple sources of propaganda and explain how they achieve this. The Propaganda Model has five filters (ownership, advertising, the elite, flack and the enemy/ other) which can be used to explain the different facets

of media and how they are used in the production of government-approved propaganda. Critical Discourse Analysis looks more closely at individual articles and analyses the language used, the audience and the owner to explain the intent of the particular article and how and why it is achieved. To begin, this essay will give some detail on what exactly is happening in Yemen, with both the war and the humanitarian crisis that has occurred as a direct result of it. It will then move on to explain the Propaganda Model and Critical Discourse Analysis in further detail, before beginning to use these tools to analyse three different examples of propaganda that have been produced in relation to the crisis in Yemen. It will then conclude that Saudi Arabia is using propaganda to divert the audience's attention away from their involvement in the war and instead towards their 'humanitarian efforts' to help Yemen and towards the enemy that they have created of Iran.

Yemen has been suffering since the Arab Spring of 2011, when the president of 20 years Ali Abdullah Saleh was overthrown. The Gulf Cooperation Council (GCC) then installed the former vice president Abd-Rabbu Mansour Hadi into the presidential position. From then on things only got worse for the Yemenis, and in 2015 a rebel group known as the Houthis (who had formerly been involved in the Arab Spring) joined forces with Saleh and his remaining military allies and took control of the largest city in Yemen, Sanaa. Hadi fled to Saudi Arabia, and the Saudi Arabian led intervention began, bringing with it the greatest humanitarian crisis of all time. The three main aims of the intervention are to: restore the government of president Hadi, contain its southern border and prevent Yemen from fragmenting, and control the perceived Iranian influence in the area. (Al Jazeera English, 2019) However, the main impact of the intervention has been the destruction of millions of civilian lives. Air strikes from the coalition and responding attacks from the Iran-backed Houthis have done irreparable damage to schools, hospitals and homes. Along with this, an ongoing famine and land, sea and air blockades, put in place by Saudi Arabia and the USA, preventing the receipt of aid have led to 24.1 million people (80% of the population) in dire need of help, and 58% of the population currently live in poverty. (United Nations, 2021)

Throughout this essay I will be using the concept of the Propaganda Model (Herman and Chomsky,1988) to analyse a variety of sources. It is widely known that Saudi Arabia closely monitors and censors both the internet and their press and allows no freedom in the media. They were ranked 170th out of 180 countries in the World Press Freedom Index (reporters without borders, 2020) Due to this, the majority of news produced by the Saudi Arabian media is likely to be propaganda. Propaganda is produced by the media in conjunction with the government as a way of manipulating the opinion of the people, and five key filters are used to ensure its success. One filter is ownership - all popular media outlets are owned by huge corporations and conglomerates. Their key motive is to generate as much profit as possible, which means that their articles will always fall in line with whatever creates the most money for them, and true journalism takes the back seat. Because of this,

generally all journalism produced by such companies will be heavily influenced by those in power and will therefore enforce whatever agenda they are currently pushing. The media also generates revenue by selling their audience to an advertiser. The advertiser then gains a profit when the audience buys their product. By generating money for the media, advertising allows companies to continue expanding and producing more content (and therefore propaganda). The majority of content produced by the media is in line with what the establishment wants as it is produced by the Media Elite. A few large conglomerates, corporations and institutions, dominate the media by producing a constant flow of articles, interviews and opinions that are printed and fed to the audiences. Flack is used to ensure that any story produced that doesn't fall in line with the desired opinion is instantly discredited and destroyed. The media will take the article and refute the sources used, dispute facts / evidence and use other stories to divert the attention of the public away from the article in question.

They will often do this by exploiting a common enemy - the media will use false information and exaggeration to create a common enemy for the people. By doing this they create a scapegoat(s) that can be blamed for failings within the government. They then use this hatred of the enemy to increase support of the government and its actions against the thing in question, or to cause uproar about things that may be happening that the administration disagrees with, for Saudi Arabia, this enemy is Iran. This essay will also use Critical Discourse Analysis (CDA) to delve further into sources by looking at who produced the article, the language within the text itself, the audience it is targeted at and the context that it is being written in. Critical Discourse Analysis is 'a methodology that enables a vigorous assessment of what is meant when language is used to describe and explain' (Institute for the Public Understanding of the Past and Institute of history, 2007). The use of Critical Discourse Analysis will allow a deeper understanding of the sources to be developed.

The first source looks at both a local and international audience and is titled "why Yemen's Iran-backed Houthi movement should be designated as a terrorist group" it was produced by Al Arabiya, an Arab news source that is Saudi owned. It broadcasts on television to an Arab/Middle Eastern audience, but they also have an online newspaper that is written in English and therefore broadens the audience they reach. It is probable that all articles produced by this media source will be heavily censored and influenced by the Saudi Arabian monarchy so that it stays in line with the message they want to be spread. Failure to comply with this could lead to arrest for 'inciting chaos', 'jeopardising national unity' or 'harming the image of the king and the state.' (Reporters Without Borders, 2020) By threatening them with arrest and likely torture or even death - such as in the case of Jamal Khashoggi - the Saudi Arabian monarchy ensures they are shown only in the best light possible by reporters and journalists. This complete control of the media in turn gives them immense control over what information the people consume and therefore believe, and their influence on news sources such as Al Arabiya, that have a reach far

beyond the Middle East, allows them to spread their propaganda far beyond the borders of their country. By broadcasting this kind of information to western society they create an opportunity to gain misguided support from the people of powerful countries such as the UK and the USA. It is already known that both the USA and UK have been providing the Saudi coalition with weapons, with the UK having partaken in more than £4.7B-worth of arms deals since 2015 (The Guardian, 2020) , and the USA having sold an approximate \$8B-worth (The New York Times, 2020), despite backlash from human rights groups and protestors who believed that there was a 'clear risk of such arms being used in breach of human rights and international humanitarian law in Yemen'. (Amnesty International UK, 2019). By spreading their messages to these western countries, they are allowing their governments to find justification for their actions and slowly manipulate the audiences into believing them - causing people such as the protesters to look like speculative rebels rather than speakers of the truth.

The article aforementioned is one of many that speaks of the 'Iran-backed Houthis'. It would appear that the authors take any opportunity to remind the reader that Saudi Arabia (and therefore they) are on one side of this fight, and the Houthis and Iran are firmly on the other. It is especially frequent in articles that refer to atrocities that have been committed towards Saudi Arabians or the people of Yemen, such as 'Iran-backed Houthi launched a ballistic missile from within Yemeni territory that then fell among civilians' and 'Iran-backed Houthis are behind Yemen's problems' (Al Aribaya, 2020). This approach ensures that Iran and the Houthis are viewed as 'the enemy' that deserves to be done harm, rather than a group of people, just like them, that are on the other side of a seemingly unending struggle for power between their leaders. The article "Why Yemen's Iran-backed Houthi movement should be designated as a terrorist group" repeatedly compares the Houthis to a 'gang cartel' and describes them as 'criminals and opportunists' who are 'violent' and 'oppressive'. The use of this language to describe them is likely being encouraged as it makes the Houthis seem as terrifying as possible to the reader. They are painting a picture of 'violent' and 'oppressive' monsters that are trying to force their 'sectarian and hostile ideology' onto the world through any means necessary, including 'corruption, theft and blackmail'. It is probable that anyone reading this article would immediately be filled with fear and anger towards the Houthis for what they are doing and would believe that they should be stopped by any means possible. In comparison, the actions of the Saudi Coalition may appear entirely justified and necessary.

In contrast to the propaganda produced against the Houthis and Iran is something entirely different; the articles that praise every action the Saudi Arabian monarchy makes. These often revolve around military success in the fight against the Houthis or how much aid they have provided to Yemen, such as 'Arab Coalition destroys Houthi air defence system in Yemen's Sanaa' and 'Saudi Arabia's KRelief donates 2,000 cartons of dates to displaced Yemenis' (Al Arabiya, 2020). Both articles are praising the actions mentioned, with no

mention of why they are necessary - the choices made by the Saudi Coalition have in part been the reason why, five years on, there is still constant fighting, death and destruction around Yemen, and this has in turn continued to prolong the suffering of the Yemeni people and their need for masses of aid. An article titled 'Saudi Arabia is biggest donor to Yemen' (Arab News, 2020) sings the praises of the Saudi Arabian establishment and primarily the amount of money they have donated to aid for Yemen. While it may be factually correct that they have donated millions of dollars to the cause, more than any other country, they fail to mention that it is in part due to the fact that land, sea and air blockades put in place by the Saudi Coalition have blocked the receipt of aid from other countries. The author also drew attention to 'the enemy' of Iran by saying 'Iran is "providing nothing but killing, destruction, smuggled weapons, ballistic missiles...and explosive devices that kill Yemenis every day."' The stark contrast between the praise to the Saudi Government and harsh words towards Iran is jarring and certainly achieves the desired effect - no one could read this article alone and believe that Saudi Arabia would've ever intentionally done any kind of damage to the country or the people of Yemen.

To conclude, propaganda has been heavily used by the Saudi Arabian government to influence the understanding that the people have of the war in Yemen and justify their involvement in warfare. Iran and the Houthi rebel group have been branded as the enemy, and the media releases a constant stream of news about every poor action they make, while hiding every one of theirs. The enemy are painted as brutal monsters that threaten everyone's lives with their ideologies that must be stopped at every cost - and the Saudi Coalition are the 'heroes' that are stopping them. They also use propaganda to divert attention away from the destruction they cause by focusing on their humanitarian efforts and further brand themselves as 'the good guys'. Their influence on online and social news sources has allowed them to spread their reach towards a western audience and gain support. In essence - they have taken their power struggle with Iran to the media and won't stop producing this flood of propaganda until they 'win', even if it means that Yemen gets destroyed in the process. If we consume only what the media produces, we will look on blindly as millions continue to suffer.

Bibliography

Al Arabiya. "Why Yemen's Iran-backed Houthi movement should be designated as a terrorist group." Al Arabiya, 2020, <https://english.alarabiya.net/en/views/news/middle-east/2020/12/04/The-US-should-designate-the-Iran-backed-Houthis-as-terrorists>.
Al Arabiya english. "Arab coalition destroys Houthi air defense system in Yemens Sanaa." Al Arabiya, 2020, <https://english.alarabiya.net/en/News/gulf/2020/09/26/Arab-Coalition-destroys-Houthi-air-defense-system-in-Yemen-s-Sanaa->.
al arabiya english. "Saudi Arabia's KSR relief donates 2,000 cartons of dates to displaced Yemenis." Al Arabiya, 2020, <https://english.alarabiya.net/en/News/middle-east/2020/08/29/Saudi-Arabia-s-KSR-relief-donates-2-000-cartons-of-dates-to-displaced-Yemenis>.
Al Jazeera English. "Why is Yemen at war?" Youtube, 2019, <https://yemen.un.org/en/about/about-the-un#:~:text=UN%20in%20Yemen-,The%20United%20Nations%20in%20Yemen,political%2C%20humanitarian%20and%20developmental%20crisis.&text=The%20United%20Nations%20is%20represented,the%20Secretary%2DGeneral%20for%20Yemen>.
Amnesty International UK. "56,000 people called on the UK to stop arming the Saudi-led coalition." 2019, <https://www.amnesty.org.uk/thankyouforacting-UKstoparmingsaudi>.
Edmondson, Catie. The New York Times, 2020, <https://www.nytimes.com/2020/05/28/us/politics/congress-saudi-arabia-arms-sales.html>.

Herman, Edward S., and Noam Chomsky. Manufacturing Consent. Pantheon books, 1988, <https://msuweb.montclair.edu/~furrgh/hj/chomskyhermanpropmodel.pdf>.
Institute for the Public Understanding of the Past, and Institute of Historical Research. "Critical Discourse Analysis." 2007. <https://archives.history.ac.uk/1807commemorated/media/methods/critical.html#:~:text=Critical%20discourse%20analysis%20is%20a,the%20development%20of%20the%20methodology>.
"KSRelief chief: Saudi Arabia is biggest donor to Yemen." Arab news, 2020, arabnews.com/node/1682306/saudi-arabia.
murray, jessica. "UK faces new legal challenge over arms sales to Saudi Arabia." The Guardian, 2020, <https://www.theguardian.com/politics/2020/oct/27/uk-faces-new-legal-challenge-over-arms-sales-to-saudi-arabia>.
Naar, Ismaeel. "Houthis launch missile targeting Yemeni city of Marib, lands among civilian area." Al Aribaya, July 2020, <https://english.alarabiya.net/en/News/gulf/2020/07/09/Houthis-launch-missile-targeting-Yemeni-city-of-Marib-lands-among-civilian-area>.
Reporters Without Borders. Saudi Arabia - RSF, 2020, <https://rsf.org/en/saudi-arabia>.
reporters without borders. "world Press freedom Index." 2020, <https://rsf.org/en/ranking>.
United Nations. The United Nations in Yemen, 2021, <https://yemen.un.org/en/about/about-the-un#:~:text=UN%20in%20Yemen-,The%20United%20Nations%20in%20Yemen,political%2C%20humanitarian%20and%20developmental%20crisis.&text=The%20United%20Nations%20is%20represented,the%20Secretary%2DGeneral%20for%20Yemen>.

Tutor comment:

"E. joined the course particularly late, and yet achieved an exceptional mark (almost 80). I also work teaching undergraduates at Durham University, as well as marking their essays. It is without doubt that E.'s essay skills were of a higher level than many of my first years. She should take huge confidence from this moving forward and I have every belief she will be very successful in the future."

STEM

The influenza virus: design a strategy to help prevent the outbreak

Year 7, Key Stage 3

Pupil: A. Taylor

School: Humphrey Perkins School, Leicestershire

Supervised by: N. Lamb

Tutor University: University of Sheffield

Course Title: Disease Detectives

Introduction - what is the flu?

Influenza (the flu) is caused by the influenza virus and is an infectious disease. Its symptoms can be severe or very mild. For example, the symptoms are (Wikipedia, 2020):

- Fever
- Chills
- Headaches
- Aching muscles
- Cough
- Sore throat
- Difficulty sleeping
- Loss of appetite
- Diarrhoea/tummy pain
- Feeling sick/being sick
- Feeling tired or exhausted

The virus can be spread by coughing and sneezing (NHS 2020).

For most healthy people, the flu is an uncomfortable but short-term illness that resolves itself as the immune system fights it off. Symptoms usually appear from one to four days after exposure to the virus, and they last five to seven days (Harvard Health Publishing, 2016).

If you have any of the symptoms above, you could have the flu (NHS 2020). People who work in open offices, use public transport or are young or over the age of 65 are more susceptible to getting the virus.

To treat the flu, you can (BBC, 2020): stay in bed and get some rest, or you can take paracetamol or ibuprofen as both will relieve your symptoms. In most years, a strain of influenza spreads across the globe, resulting in about 250,000 to 500,000 deaths worldwide (BBC Bitesize, 2020). This disease may be difficult to stop if you can have secondary infections. The influenza virus (flu) can be spread quickly for example, if you caught the virus on Saturday morning, you could be spreading it by Sunday evening (Healthline, 2020).

Prevention

There are a few methods that could be used to help stop the spread of the influenza virus. Below I will discuss three methods that could be used and will also discuss the advantages and disadvantages of each.

Method 1: Quarantine/Isolation

Overview

Quarantine is where you deliberately keep yourself away from other people. The exact definition of quarantine is: a state, period, or place of isolation in which people or animals that have arrived from elsewhere or been exposed to infectious or contagious disease are placed (Oxford Dictionary, 2020). In terms of the flu this could mean if you come from an infectious place you would be put straight into quarantine in hospital being cared for by nurses. Isolation means: without relation to other people or things; separately (Oxford Dictionary, 2020). For anybody with the flu this would mean that you would need to stay at home and not let visitors in. In terms of treatment, you would have to treat yourself at home.

Quarantine is an effective prevention for the spread of flu as it cannot spread to a new host. Quarantine can stop the spread of airborne diseases such as the flu and colds. To self-quarantine you need to separate yourself from other people even if you are not showing the symptoms but have been in contact with someone who has the infection. Isolation is a good method to stop the spread of the flu because it keeps the virus away from other people so it cannot spread.

Advantages

The advantages of quarantine are that people would get professional treatment and it is effective for a shorter period of time.

The advantages of isolation are that as many people as necessary could be isolated at one time and it would not cost anything. Also, people who work at offices would possibly be able to work from home.

Disadvantages

The disadvantages of quarantine are that it would cost a lot of money and can only support a small number of people at a time. It is expensive because you have to use specific rooms and would need to take staff away from different parts of the hospital and in doing so affect

other patients. Also, the staff who work to help with the outbreak would then have to self-quarantine/isolate and would not earn any money.

A disadvantage of isolation is that people could venture off even if they are supposed to be in isolation and would spread the virus which could then spread it further as more people would be contagious. Also, it could be a problem as people could run out of food and not know anybody who can help them get it.

Method 2: Vaccination

A vaccine can either be given via an injection or by a nasal spray. The injection contains the non-active influenza virus whereas the nasal spray contains a weakened form of the live virus (Wikipedia, 2020). In the UK only the following people are given the vaccine (NHS, 2020):

- school age children (age 4-11 years old)
- people over the age of 65 years old
- people with certain health conditions
- pregnant women
- children aged 2 & 3 years-old
- nurses and doctors

Children get vaccinated at school and adults/adolescents at GPs surgeries and pharmacies.

Advantages

The advantages of vaccines are that they: stop people becoming ill and if enough people are immunised it can stop whole populations from becoming ill (this is called herd immunity) (BBC Bitesize, 2020). It is cheaper over time to prevent a disease (vaccine) than it is to treat all the at-risk people or people who have it.

Disadvantages

As flu is a viral disease, this means that it can mutate. Therefore, a flu vaccine is only effective for a few years at the most (BBC Bitesize, 2020). Because of this, the vaccine has to be re-given every year or two. Some people refuse to take the vaccine because they believe that they do not work, and they make you ill (they do not). This means more people could carry the illness and spread it further resulting in an outbreak. They are not completely safe as a very small percentage of people have side effects such as (NHS,2020):

- a mild fever
- a slight muscle aches
- a sore arm

Method 3: Hygiene

Good hygiene helps to stop the spread of the virus. You should wash your hands for 20 seconds (happy birthday sang twice) with soap and warm water (NHS Inform 2020). Also, to stop the spread, when you sneeze, you can sneeze/cough into a tissue and then bin it. Also, to prevent the spread of flu you can regularly clean surfaces in your house, for example: your computer keyboard (NHS Inform 2020). To avoid getting flu in you can avoid large crowds; however, it may be difficult to avoid large crowds.

Advantages

The advantages of hygiene are that anybody and everybody can have good hand hygiene. Hand hygiene does not cost a lot of money.

Disadvantages

The disadvantages are that you cannot control hand hygiene and not everyone will comply. People may not always use soap and warm water, and this will not destroy/get rid of as many viruses. Also, they may not wash their hands for 20 seconds.

Conclusion

Fleming City has a population of 1.1 million people and is located in the centre of England. It has a lot of parks, is sparsely populated (per 1km²) and most of the population use public transport. Most of the public transport systems are tram lines. Fleming City has four hospitals. Each year there is a flu outbreak in the city.

As an intervention, I would get teachers to teach children in schools how to wash their hands properly. I would start this right at the beginning of schools (including nurseries) so it becomes a habit. Also, I would get the vaccine to be given to:

- school age children (age 4-11 years old)
- people over the age of 65 years old
- people with certain health conditions
- pregnant women
- children aged 2 & 3 years old
- Nurses and Doctors

The benefits of giving it to these people are that there would not be as many cases of the flu which means fewer visits to GPs and hospitals. Also, by vaccinating doctors/nurses they can carry on working as usual because they will have a reduced risk of becoming ill with influenza. I would start giving the vaccine at the beginning of winter (October and November). I would use quarantine/isolation if the virus started to quickly spread through the city.

Quarantine vs hand hygiene vs vaccine

The costs of all the methods are different but hand hygiene is the cheapest and probably the most effective, but it cannot be controlled. The vaccination is also very effective but not everybody will take the vaccine. Also, it is not too expensive and needs to be given before the outbreak. Quarantine is expensive and works but it takes a long time and has a limited amount of space but, it is controllable. However, if the outbreak is rapid, I would ask people to stay at home (self-isolate) but it is not controllable unless people did as they were told.

Recommendations

Overall hand hygiene and self-isolation are the best methods to use against the influenza virus in Fleming City.

References

BBC Bitesize (2020) Treating, Curing and Preventing disease. Available at: <https://www.bbc.co.uk/bitesize/guides/zyxg7p3/revision/5>, [Date accessed 16/03/2020]
BBC Bitesize (2020) Tuberculosis and Influenza. Available at: <https://www.bbc.co.uk/bitesize/guides/z2d68mn/revision/7>, [Date accessed, 10/03/2020]
Harvard Health Publishing (2016) How Long Does the Flu Last? Available at: <https://www.health.harvard.edu/staying-healthy/how-long-does-the-flu-last>, Last updated 29/01/2020, [Date Accessed 10/03/2020]

Healthline (2020) Flu Facts: Incubation Period and When it's Contagious. Available at: <https://www.healthline.com/health/flu-incubation-period>, [Date Accessed 04/03/2020]
NHS (2020) Flu vaccine overview. Available at: <https://www.nhs.uk/conditions/vaccinations/flu-influenza-vaccine/>, [Date accessed 16/03/2020]
NHS (2020) Flu vaccine side effects. Available at: <https://www.bbc.co.uk/bitesize/guides/zyxg7p3/revision/5>, [Date accessed 17/03/2020]
NHS (2020) Flu. Available at: <https://www.nhs.uk/conditions/flu/>, [Date accessed 04/03/2020]
NHS Inform (2020) Flu. Available at <https://www.nhsinform.scot/illnesses-and-conditions/infections-and-poisoning/flu>, [Date accessed 10/03/2020]
Oxford Dictionary (2020) The Oxford English Dictionary, Available at: <https://www.lexico.com/en/definition/quarantine>, [Date accessed 10/3/2020]
Troy Day, Andrew Park, Neal Madras, Abba Gumel & Jianhong Wu (2006) When Is Quarantine a Useful Control Strategy for Emerging Infectious Diseases? American Journal of Epidemiology, 163 (5), 479–485, Available at: <https://doi.org/10.1093/aje/kwj056>
Wikipedia (2020) Influenza vaccine. Available at: https://en.m.wikipedia.org/wiki/Influenza_vaccine, [Date accessed 16/03/2020]
Wikipedia (2020) Influenza. Available at: <https://en.m.wikipedia.org/wiki/Influenza>, [Date accessed 10/03/2020]

Tutor comment:
"I was blown away by the high quality of work from pupils at Humphrey Perkins school but the great work a. Did impressed me so much, I just had to get it in print! Although not even at GCSE level at the time this essay was completed, A.'S referencing was of a better quality than undergraduate students i have taught!"

What are keloid scars and the symptoms patients experience?

Year 9, Key Stage 4

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School: The Stockwood Park Academy, Luton
Supervised by: R. Ross
Tutor University: Queen Mary, University of London
Course Title: Can time really heal all scars? The science behind skin and scarring

Introduction

The skin is the largest organ of the human body. The average adult has around twenty-one square feet of skin containing eleven miles of blood vessels [1]. The skin is a continuous organ, and any damage can change its appearance.

Skin structure

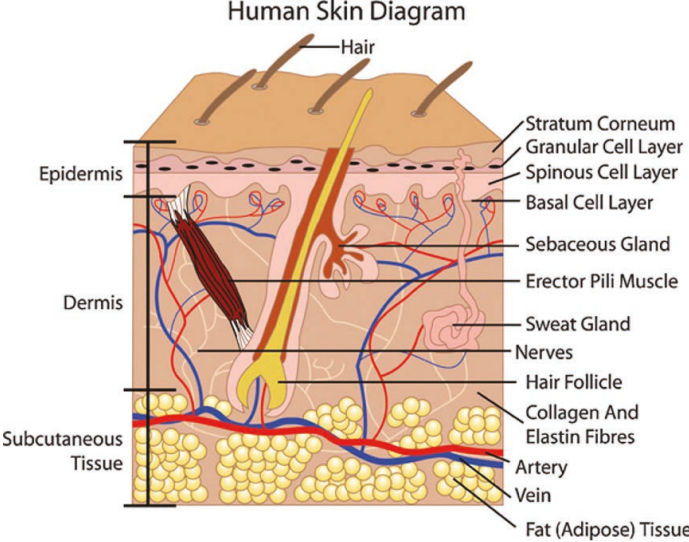


Figure 1: Layers of the skin. The skin has three layers; the epidermis, the dermis and subcutaneous tissue (also known as hypodermis). The diagram also shows a number of the components which make up the skin such as the basal cell layer, the sweat gland, nerves and the sebaceous gland [2].

Skin cells

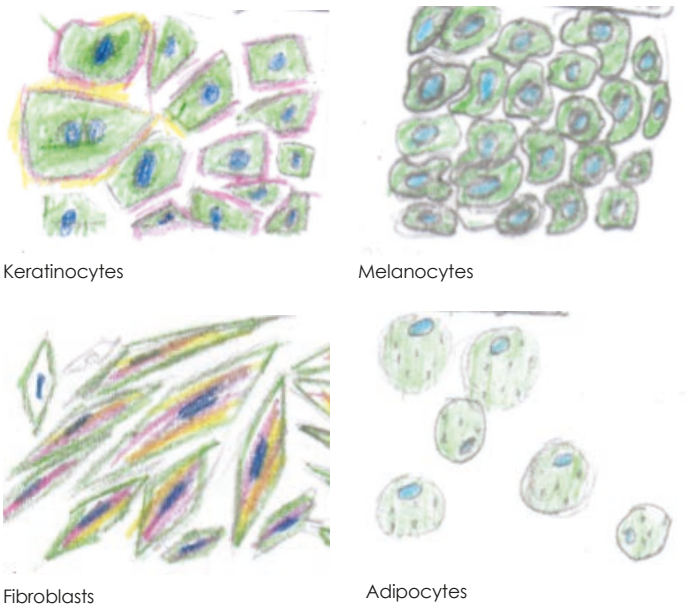


Figure 2: Four main types of skin cell (drawn)

Each layer of the skin contains specific cells. The epidermis has two main types of cells; keratinocytes and melanocytes. Keratinocytes make up around 95% of the cells and form a self-renewing layer. These are regularly shed from the surface of the skin because they die through dehydration and would therefore no longer be able to protect the body. They are then replaced by new skin cells which can continue the protection. They also produce a tough protein called keratin which helps the skin remain waterproof [3].

Melanocytes are cells which are located in the bottom layer of the skin's epidermis and are responsible for the production of melanin which is a pigment that gives the skin its colour. Melanin is packaged into small parcels which are then transferred to keratinocytes [3]. Dark skinned people have more melanin than light skinned people. Melanin provides protection against damage from the sun and melanocytes increase their production of melanin in response to sun exposure [4].

The primary cell type found in the dermis is fibroblasts. Fibroblasts can function as accessory cells in immune and inflammatory responses. Fibroblasts can use cytokines to co-operate with leukocytes during the process of wound healing [5].

In terms of the subcutaneous layer, the main cell types are adipocytes which are fat cells. These cells make up the connective tissue within the skin and are involved in insulating the body but can also be used to provide energy when nutrient intake is insufficient [3].

The skin has three main functions; protection, regulation and sensation. In terms of protection its primary function is to act as a barrier against dangers such as mechanical impacts, fluids, and radiation. When the skin is damaged it will undergo a process of healing [6].

Wound healing

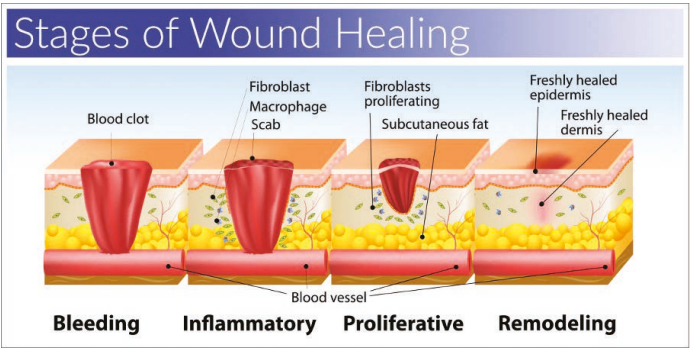


Figure 3: Stages of wound healing [7] A wound goes through four main stages. From the initial bleeding stage, the wound forms a scab before fibroblasts proliferate the underlying layers before eventually healing the skin.

The first is the process of the wound being closed by blood clotting. Blood clotting occurs when platelets immediately stick to the edges of the wound and then chemicals are released to attract more platelets. A platelet plug is formed, and the bleeding then stops. Then small molecules called clotting factors cause blood borne materials called fibrin to seal the wound. Once the blood vessel is healed the blood clot then dissolves over a period of a few days. [8]. This is referred to as haemostasis.

The inflammation phase comes next and begins straight after the injury when the injury leaks transudate (which is made of salt, water, and protein) causing localised swelling. This process controls bleeding and prevents infection [9]. The process of vasodilation results in increased capillary permeability which in turn enables phagocytic white blood cells such as neutrophils, monocytes, and eosinophils, along with other leukocytes, to enter the tissue around the injury. The inflammation phase allows phagocytes to enter the tissue and go to the site of the infection. Neutrophils appear first and are later replaced by macrophages [10].

The proliferation phase is where the wound is rebuilt with new tissue which is made up of collagen and extra cellular matrix. [5]. Fibroblasts are important as they lay the foundation for the new extra cellular matrix for collagen and granulation tissue. During the proliferation phase the body goes through growing new tissue, angiogenesis, collagen deposition, granular tissue formation, wound contracture, and epithelial cell migration [11]. To generate more cells to cover the wound, keratinocytes at the basal layer of the wound edge and epithelial stem cells from nearby hair follicles or sweat glands start multiplying and proliferating 2 – 3 days after the injury [12].

Finally, the remodelling phase is when collagen is remodelled from type 3 to type 1 and the wound fully closes. The cells used to repair the wound but are no longer needed are removed by programmed cell death. When collagen is laid down in this phase it is disorganised and the wound is thick. During the maturation phase, collagen is aligned along tension lines and water is reabsorbed so the collagen fibres can lay closer together and cross-link. Remodelling starts 21 days after an injury and can continue for up to a year. Even

taking into account the cross linking, healed wound areas continue to be weaker than uninjured skin as they have 80% of the tensile strength of unwounded skin [5].

Scarring

A scar is a mark left on the skin after a wound has healed but how it looks and is treated depends on a number of factors such as the depth of the wound, the location and the age, ethnicity and gender of the patient [13].

There are different types of scar. For example, a hypertrophic scar is a raised red scar that does not go beyond the boundary of the injury. Keloid scars are similar to hypertrophic scars but they extend beyond the original injury [13].

Keloid scars have a number of distinguishing features such as a localised area that is flesh coloured, pink or red. A keloid scar is a lumpy or ridged area of skin that's usually raised. A keloid scar is an area that continues to grow larger with scar tissue over time and can also be an itchy patch of skin [3].

Keloid Formation

Keloid scars occur due to the derangement of the wound healing process in susceptible individuals. There has been an increasing amount of evidence pointing towards TGF-β (Transforming Growth Factor Beta) as being a key factor in keloid development. TGF-β has also been associated with fibrotic diseases affecting the kidneys, lungs, and the skin [14]

A study by Nangole and Agak hypothesizes that keloids are formed due to an abnormal response to tissue injury. This results in an exaggerated inflammatory state with inflammatory cells entering the wound such as macrophages, lymphocytes, and mast cells. These in turn release cytokines, including Transforming Growth Factor β1 that stimulates fibroblasts to synthesize excess collagen which is one of the main signs of keloid disease. [15]

Keloid Risk Factors

Scientists have been able to identify that certain individuals have a higher risk of having a keloid scar. Some of these are shown by this diagram:

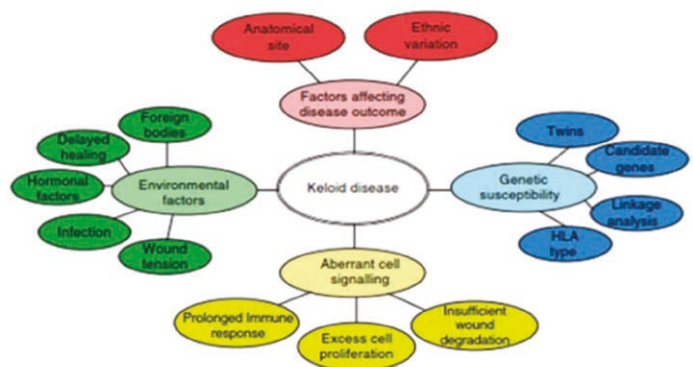


Figure 3: Risk factors of keloids. The genetic disposition of the patient is the most important, while other key factors include blood groups, melanin, the anatomical site, the type of skin injury, the age of onset and the gender [16].

Firstly, is the genetic susceptibility of the patient. It has been found that there is a higher occurrence in patients with darker skin. One study found that 50% of

the total of Afro Caribbean patients with keloid scars had a family history of them [16]. It has also been found that there is higher occurrence of keloid scars in identical twins [16]. Both of these facts would indicate that keloid scars can run in families.

Environmental factors such as infection, delayed healing and foreign bodies can trigger keloid scars in genetically prone individuals. Several genes have been identified to possibly cause keloid scars, but no single gene mutation has yet been found to be responsible. [17]

Keloids mainly occur on highly mobile sites with high tension such as the shoulders and neck. The chest, shoulders, earlobes, and upper arms have a higher bias for keloid scarring while areas such as the eyelids, palms and mucous membranes are less affected. Shaheen found that the upper limb (20%) followed by the sternum (19%) were the most common sites on Syrian patients while Abas Mouhari Toure saw the sternum (29%), head (17%) and upper limb (16%) were the most common sites in darker skinned patients. [18]

In addition, people with blood group A have a higher probability to develop keloids. A study by Shaheen revealed association between spontaneous keloids and blood group A. [16]

The British Association of Dermatologists also identify that keloids most commonly arise between puberty and the age of 30, and that they may appear or enlarge during pregnancy. They quote that among the European population around 5% - 10% who have keloids have a family history of them [19]. This is compared with the statistic that 50% of the total of Afro Caribbean patients with keloid scars had a family history of them [16] so it provides further evidence that keloids occur more frequently in patients with darker skin.

Prevention is preferable to treatment therefore people with risk factors are best to avoid skin trauma such as tattooing and body piercing. [19]

Main Treatments

Consultant Plastic Surgeon, Ioannis Goutos, identifies four treatment options for keloid scars [20].

Surgery and postoperative radiotherapy are viewed by Dr Goutos as the gold standard treatment. This treatment removes the keloid lesion and replaces it with a flat symptom free scar. To achieve this surgery needs to be performed by a plastic surgeon in such a way that tension is minimised during wound closure. [20]

However, the main disadvantage of surgery is that if the patient is susceptible to keloid scarring then operating on them could cause another keloid to appear, and this could be larger in size. To counteract this problem a surgical procedure is often performed alongside other techniques. [3]

A study by Sun Young Lee and Jin Park in 2015 looked at the recurrence rates for 30 patients with who underwent postoperative electron beam radiotherapy. The study

noted an 81.1% recurrence-free rate amongst the patients studied. The median time to recurrence for the seven patients was 7.9 months. [21].

Other options aim to decrease unpleasant symptoms and bulk. The first example is steroid injections which is the most common mode of treatment, but results do not always last. Side effects can include skin thinning, white translucent plaques, and visible blood vessels [20]. There is also 5 fluorouracil (5FU) which is a type of chemotherapy. Combining this drug and steroid has been found to be more effective than use of the steroid on its own [20]. A study by Srivastava et al [22] looked at 60 patients and compared their response when given triamcinolone acetonide (TAC), (5FU) or both together. The study concluded that a combination of TAC and 5FU offered the balanced benefit of faster and more successful response with lesser adverse effects compared to the individual drugs [22].

Alternative Treatments

There are other treatment options but evidence for these is limited at present. Pressure garments have been used on some patients, but the benefits can be short lived, and the keloid can grow back. Steroid ointments exist, but clinical studies do not back the use of these as a single treatment for keloids [20].

Cryosurgery, where keloids are frozen with a metallic probe, can be a good option particularly if the scar has a narrow base. Finally, lasers are growing in popularity but there is not enough evidence on the success of this treatment and there may be a risk of making the keloid worse [20].

Botulinum toxin is a new treatment. It is a wrinkle reducing injectable which has shown to be effective in reducing pain and itching. It has also been found to reduce the keloidal bulk [20].

Recurrence Rates

Dr K Sruthi et all [23] undertook a study of thirty patients to evaluate recurrence after radiotherapy. Keloids are prone to recurrence in 50% - 80% of cases with a singular form of treatment. In this study 73.4% of patients remained recurrence free at 5 years [23].

Excision alone has been associated with recurrence rates as high as 100% but there have been other treatments alongside such as injections of steroids, radiotherapy and silicone sheets which increase the chances of success. Some studies have shown that post surgery TA (triamcinolone acetonide) injection improves the likelihood of staying recurrence free with the majority of studies reporting less than 50% recurrence [24].

Conclusion

The exact treatment that is the "best" will depend on the size and location of the scar. For example, cryotherapy works best on scars with a narrow base while steroid tape is more suited to scars of a small to medium size. Many of the studies identify that having two treatments reduces the risk of the keloid recurring. Dr Ioannis Goutos believes that surgery and postoperative radiotherapy is the best way to treat keloids, and this theory is backed

up by Dr K Sruthi who studied the effects of radiotherapy alongside other treatments.

Although there are many options already available, further research is still required to develop new and more effective treatments.

Bibliography

[1] <https://forefrontdermatology.com/skin-fun-facts/> Article: "Skin Fun Facts" Published 23rd October 2017. Accessed 19th February 2020

[2] http://www.thecosmeticchemist.com/education/skin_science/introduction_to_skin_structure.html

[3] Can Time Really Heal All Scars? The Science behind Skin and Scarring: Key Stage 4 Programme. Coursebook designed by Rosie Ross

[4] <https://www.medicinenet.com/script/main/art.asp?articlekey=4340> : Medical Definition of Melanin by William C.Shiel Jr MD, FACP, FACR Accessed 20th Feb 2020

[5] <https://www.sciencedirect.com/topics/neuroscience/fibroblast> Ifor R. Williams in Encyclopedia of Immunology (Second Edition) 1998 Accessed 20th Feb 2020

[6] <https://www.woundcarecenters.org/article/wound-basics/functions-of-the-skin> Accessed 19th February 2020

[7] <https://www.bioderms.com/what-are-the-stages-of-wound-healing-s/221.htm> Accessed 20th February 2020

[8] <https://medlineplus.gov/ency/imagepages/19462.htm> Accessed 2nd March 2020

[9] <https://www.woundsourc.com/blog/four-stages-wound-healing> Accessed 21st February 2020

[10] [https://bio.libretexts.org/Bookshelves/Microbiology/Book%3A_Microbiology_\(Kaiser\)/Unit_5%3A_Innate_Immunity/11.4%3A_Early_Induced_Innate_Immunity/11.3E%3A_Phagocytosis](https://bio.libretexts.org/Bookshelves/Microbiology/Book%3A_Microbiology_(Kaiser)/Unit_5%3A_Innate_Immunity/11.4%3A_Early_Induced_Innate_Immunity/11.3E%3A_Phagocytosis) Author: Gary Kaiser, Professor (Microbiology) at Community College of Baltimore County (Cantonsville) 24th June 2019. Accessed 2nd March 2020.

[11] <https://www.woundsourc.com/blog/phases-wound-healing-breakdown> Author: Martin Vera, 1st December 2016. Accessed 2nd March 2020.

[12] <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5021733/> Authors: Ning Xu Landen, Dongqing Li and Mona Stahle 14th May 2016. Accessed 2nd March 2020.

[13] <https://www.webmd.com/beauty/cosmetic-procedures-scars#1-2> Accessed 20th February 2020

[14] <https://www.ncbi.nlm.nih.gov/pubmed/17660136> Accessed 20th February 2020

[15] <https://www.sciencedirect.com/science/article/pii/S2352587819300439> Authors: Ferdinand W. Nangole and George W. Agak Published December 2019. Accessed: 19th February 2020

[16] <https://symbiosisonlinepublishing.com/dermatology/dermatology68.php> Author: Abeer Shaheen, Doctor at department of dermatology, Tishreen Hospital, Syria. Accessed 5th March 2020

[17] <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3385329/> Keloid Scarring: Understanding the Genetic Basis, Advances and Prospects. Authors: Ahmad Sukari Halim, Azadeh Emami, Iman Salahshourifar and Thirumulu Ponnuraj Kannan. Published May 2012 Accessed 19th February 2020

[18] <https://www.ncbi.nlm.nih.gov/pubmed/?term=Is+There+an+Association+between+Keloids+and+Blood+Groups%3F> Author: A. Mouhari-Toure, B Saka, K Kombate, S Akakpo, P Egboghoh and K Tchanga-Walla Accessed 5th March 2020

[19] <http://www.bad.org.uk/for-the-public/patient-information-leaflets/keloids> Published October 2017. Accessed 5th March 2020.

[20] <https://www.britishskinfoundation.org.uk/blog/dealing-with-keloid-scars> Author: Ioannis Goutos Published: January 2019 Accessed: 6th March 2020

[21] <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4323603/> Postoperative Electron Beam Radiotherapy for Keloids: Treatment Outcome and Factors Associated with Occurrence and Recurrence. Authors: Sun Young Lee and Jin Park February 2015. Accessed 24th February 2020

[22] <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5665091/> Comparison of Intraleisional Triamcinolone Acetonide, 5-Fluorouracil and Their Combination for the Treatment of Keloids. Authors: Sunil Srivastava, Aditya Nanasaheb Patil, Chaitra Prakash and Hiranmayi Kumair. November 2017. Accessed 25th February 2020

[23] <http://www.cancerjournal.net/article.asp?issn=0973-1482;year=2018;volume=14;issue=6;spage=1251;epage=1255;aulast=Sruthi> Authors K Sruthi, Prameela G Chelakkot, Ram Madhavan, Rajest R Nair and Makuny Dinesh Accessed 3rd March 2020

[24] <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2861230/> Authors: Jim Young Jung M.D., Mi Ryung Roh M.D., Yeon Sook Kwon M.D. and Kee Yang Chung M.D. Ph.D. Published 31st August 2009 Accessed 5th March 2020

Tutor comment:

"This is a fantastic essay written by J. and I am super pleased it is being published in The Scholar and getting the recognition it truly deserves. From the beginning of my placement at The Stockward Park Academy it was clear that J. was understanding the course content to a very high standard, all his homework assignments were done to a very high level. J. has demonstrated in this essay an excellent ability to understand complex concepts but also to critically evaluate evidence and ideas based on what he has learnt within the tutorials but also read independently. Critical evaluation is an essential skill for university learning and for life in a world of 'fake news' and J. has already displayed a very good ability for it which will only get better as he progresses through his education."

Management of Sickle Cell Disease in Victoria City

Year 9, Key Stage 4

Pupil: N. Edwards
School: St Julie's Catholic High School, Liverpool
Supervised by: Dr M. Agwae
Tutor University: University of Liverpool
Course Title: Blood and hematological diseases

Sickle Cell Disease

Sickle Cell Disease(SCD) is not pleasant and is most definitely more serious than some of us might think. It is one of the most commonly inherited blood diseases, though mostly common with African/Caribbean ethnicities^{1}. SCD occurs about 1 out of every 365 African/Caribbean births^{7}. The disease consists of red blood cells being mutated to change shape into an almost 'half-moon' shape^{11}, resulting from mutated haemoglobin 'haemoglobin S'^{1}.

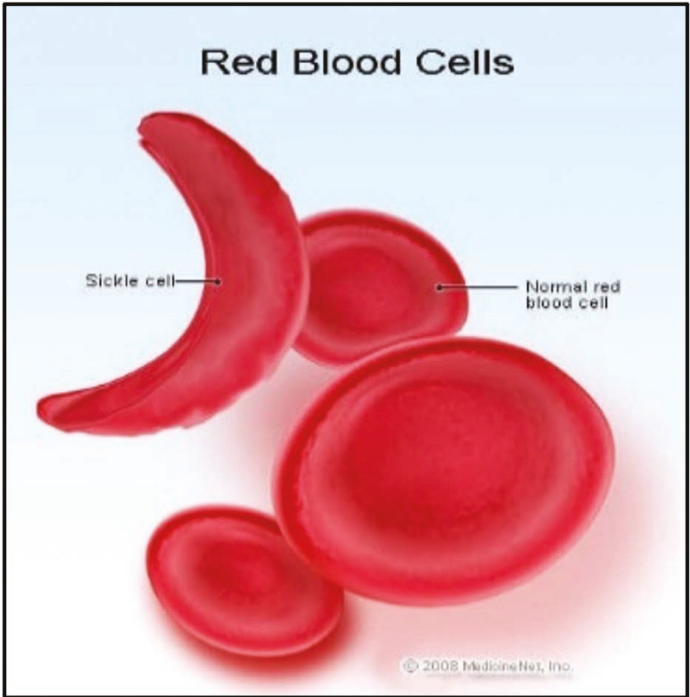


Figure 1: This shows the morphological difference between sickled cells and normal red blood cells.

Sickle Cell Anaemia can cause many different problems such as certain organ failure in some of the severe cases^{11}, this is due to the shape of the red blood cells as they are no longer flexible and able to bend when passing through certain blood vessels, and therefore can get stuck and build up causing blockages^{2}. This also means that it is much easier for people with this disease to develop complications as their immune systems have been weakened^{1}. In addition, due to the presence of the abnormal haemoglobin in the red blood cells, there is a slight complication with oxygenation occurring throughout the body^{1} which could be the reason so many SCD patients experience shortness of breath^{11}. The most common organs that are affected by SCD would be Lungs, Kidneys, Brain and Spleen^{2}, this can be very serious as they are all very valuable organs and if they are damaged it can cause many long-lasting problems either physically and emotionally or socially and financially. Which is also a reason as to why this is a topic that needs to be discussed a lot more especially in

African/Caribbean areas. The most severe complications from this disease would leave many parts of the body damaged and the biggest system that would be affected would be the cardiovascular system^{3}, as that is what the body relies upon in order to stay functional as the most important aspects to keep humans alive, resides within this system e.g. the major organs and the functions they carry out.

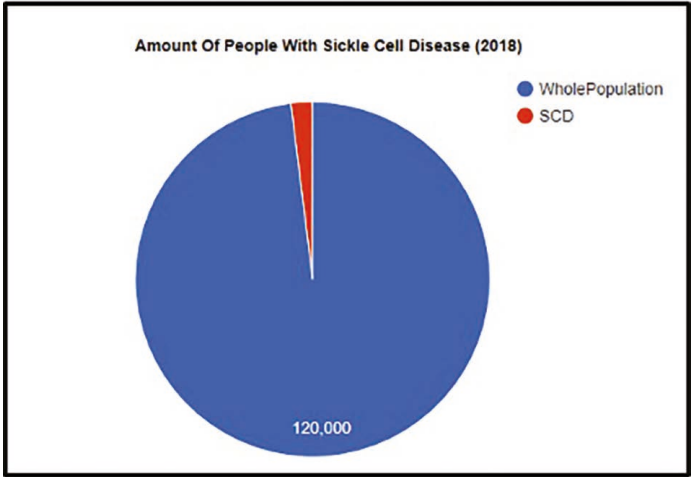


Figure 2: This pie chart shows how many people had SCD in 2018 in Victoria City.

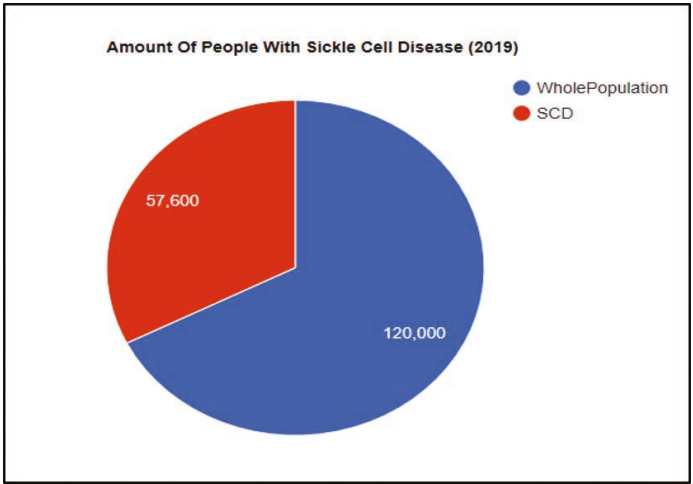


Figure 3: This pie chart shows how many people had SCD in 2019 in Victoria City.

Victoria City

Sadly, it has come to the point, for the sub-Saharan city Victoria City, that many people have been diagnosed with the awful disease of SCD and there seems to be no helpline for them. Victoria City is a beautiful quaint city located in the country of Kenya, which is in the continent Africa, and a population of 120,000 mostly of African and Caribbean ethnicity. This disease has caused the city to now have an unwanted stigma towards them which is definitely not what this 'hidden gem' of a city deserves. Throughout this city, after 2018 there had been 2% of the population that had to deal with SCD yet in 2019 it had been recorded as an astonishing 48% of the population with at least one case of Sickle Cell Disease within their immediate family. Due to the location of this city many organisations have not been notified about this major epidemic within the city therefore leaving most of the people to try and survive all on their own, with minimal access to healthcare and knowledge about the disease itself. Below we can see two diagrams which are able to

present this information much more clearly. This shocking increase in the amount of cases recorded tells many different organisations that people should be more educated about diseases that may run in their families, or possibly could affect them in their lifetime and how they are to treat them in an efficient way which will help them. As this rise in the incidence of the disease could be due to lack of medical information or even general lack of education about what diseases may be passed to children.

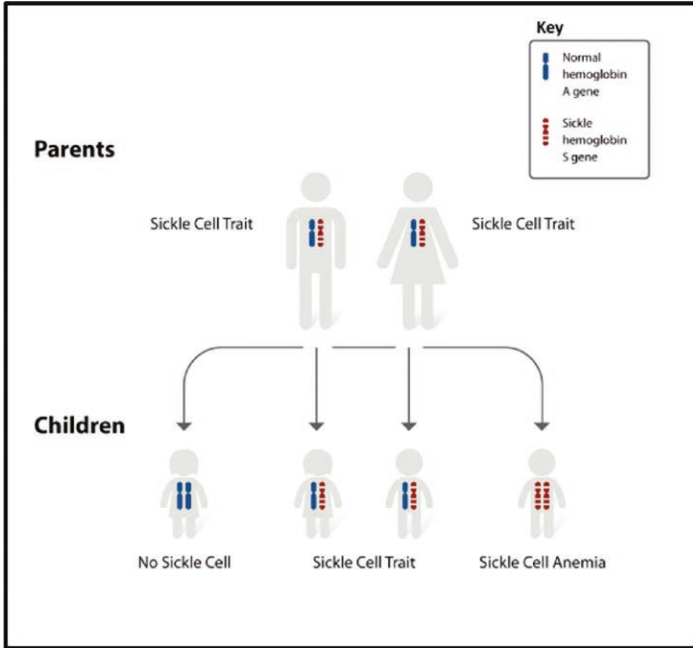


Figure 4: this shows the chance of a child getting SCD if both their parents are carriers of the disease.

Genetics

Sickle Cell Anaemia is caused by a mutation in the haemoglobin gene and carrier parents are able to pass the disease to their children. It is very common for people with African/Caribbean heritage to be carriers of the Sickie Cell Disease trait^{4}, therefore meaning that if two people who are carriers of the disease decide to have children there will be a 25% chance that their children may have the disease^{4}.

So, it can be recommended to people who are thinking of getting married or start a family to go through with genetic counselling, in order to avoid having babies with the SCD. If children are to have the disease some of the symptoms that may occur could be; anaemia which is a lack of red blood cells^{3}, episodes of pain that may last a long time^{3}; swelling of hands and feet^{3}; frequent infections^{3}; delayed puberty or growth^{3} or possibly vision problems^{3}. Further complications that can occur with SCD, include; organ damage^{3}; strokes^{3} or possibly even gallstones^{3} and these are very serious conditions. It is a sad thing to be told that one has this disease and especially as a child, which is why the next few sections are so important as they discuss about how victims of this disease can be treated and supported through the process.

The fact that the disease is mostly inherited means that doctors have been able to come up with ways of detecting whether people are carriers of the disease

as well as also detecting if an embryo has the disease by testing some of the embryonic fluid^{4}. If embryos are positive for this disease this allows the parents to prepare themselves and as to whether or not that they still want to go through with the pregnancy as it would be a lot more responsibility looking after a child who is permanently ill. Yet some people would disagree with that action as they do not agree with getting rid of a child due to a sickness, but it is solely up to the parents of the child as to what they decide to do.



Figure 5: this shows a picture of type of treatment that can be taken for SCD and the most common is hydroxyurea.

There are multiple different ways that people can treat sickle cell anaemia, and prevent catching other diseases too as having sickle cell anaemia weakens your immune system^{11}. An example of this prevention would be taking penicillin as this is a very effective antibiotic which can help people fight off other diseases such as bacterial infections^{11}. This method however is mostly recommended for children who are victims of this disease as they are advised to take penicillin from the age of 2 months to 5 years old^{3}. In low-grade sickle cell disease, one recommendation will be to drink a lot of fluid and take painkillers if necessary, especially if the patient wants to stay at home^{11}. Also, SCD patient will benefit from a good knowledge of the disease to know when they would need to seek medical care^{11}. In more severe scenarios of sickle cell disease, some patients may need to go through blood transfusion^{11} in order to make their red blood count rise again to the efficient amount. In addition, an alternative method some may have to take could be being prescribed certain drugs such as, hydroxyurea as this is very efficient for reducing painful crisis and reduce the need for blood transfusion^{3}. A further step some people may have to take in some of the most painful cases or for young children would be a stem cell transplant^{3}. This is because of the extensive amount of recovery time it takes after the procedure and that it is very important to try and find a perfect donor who is preferably a family member without the disease^{3}. For some people, they may not want to go through with a stem cell transplant, as there are many complications that could occur and would therefore cause many long-term problems^{3}. This is because, stem cell transplant is a delicate procedure.

Patient Support

There is a limited amount of support that is available

for people who are suffering from Sickel Cell Disease, which is not what these people deserve as this is a disease that can in some cases take control of your whole life. The main way that people with this disease can be supported would be by talking to people, e.g. a support group where patients can talk about their experiences with the diseases and how they cope with it ^{3}. They could also be encouraged to find out more the disease, so that decisions that are made are very informed to have the greatest outcome possible. In addition to that, it may also be best to ask doctors about what they recommend doing as they will also have a lot of information about the specific case as well as the disease in general ^{3}. SCD affects less than 1% of the entire world population (250 million people) ^{6}, as a result, not many people will know about it. This also means it does not have a severe burden on the public health services. So, the best approach for patients would be to educate themselves and make sure that they know all the available procedures and resources that may be useful to themselves or other who may have been diagnosed with this disease, and that could help save lives.

Conclusion

It is very useful for people to become more educated about certain diseases that can affect them, just like the Sickel Cell Disease and for all the people in Victoria City I believe that it would drastically help to begin to raise money for help with research about the disease. Or alternatively, be able to give certain people a chance at living a life that would be much easier to deal with the disease by possibly funding certain procedures e.g. certain drugs that can be taken to reduce pain or prevent further infections. As for most people with the disease, it is very likely that they could come down with other complications such as pneumonia which has the ability to kill people if they are already vulnerable to many diseases ^{4}. This is a disease just like any other, and any help that can be given in preventing this disease would be the key to helping the population of Victoria City reduce the amount of cases of Sickel Cell Disease in the city and allow everyone to resume back to their normal lives. The methods that can be taken are highlighted previously in many different areas, and the most successful method that is recommended would be a 'stem cell transplant' and that is sometimes seen as the only 'cure' for this disease ^{3}.

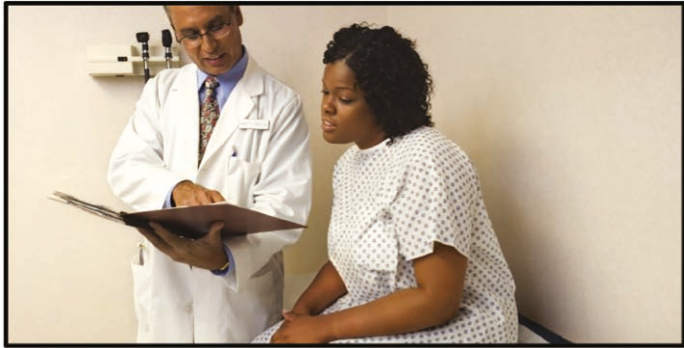


Figure 6: this shows a patient discussing support with their doctors about which treatment plans are available.

References

{1} https://www.emedicinehealth.com/sickle_cell_crisis/article_em.htm
E Medicine Health [4th March 2020]
{2} <https://ghr.nlm.nih.gov/condition/sickle-cell-disease>
National Institutes of Health – Genetics Home Reference [4th March 2020]
{3} <https://www.mayoclinic.org/diseases-conditions/sickle-cell-anemia/diagnosis-treatment/drc-20355882>
Mayo Clinic [4th March 2020]
{4} <https://www.genome.gov/Genetic-Disorders/Sickle-Cell-Disease>
National Institutes of Health – Genome Research [4th March 2020]
{5} <https://onlinelibrary.wiley.com/doi/full/10.1111/jgh.13023>
Wiley Online Library [7th March 2020]
{6} <http://www.scdcf.org/who-is-affected.html>
Sickle Cell Disease Foundation [7th March 2020]
{7} <https://www.cdc.gov/ncbddd/sicklecell/data.html>
Centres for Disease Control and Prevention [10th March 2020]

Tutor comment:

"Sickle cell disease is still very much prevalent in some parts of Africa and this may be said to be largely due to non-compliance with genotype counselling. The students studied blood cells and associated diseases and narrowed into specialist work on Leukaemia and sickle cell disease. They were required to write a review on sickle cell disease, with a focus on how to reduce the incidence in Victoria City (a city in Africa). In addition to being part of an excellent cohort of students from a very well organised school, N. has been able to demonstrate very good understanding of the topic and the ability to present thoughts in an organised form. Her review presents a beautiful read, and I am proud of her, the lead teacher, and all of St Julie's Catholic High School."



How would you go about in ensuring that prosthetics you design, fabricate and manufacture in this region are effective to its users?

Year 9, Key Stage 4

Pupil: S. Mardari
School: Weston Favell Academy, Northamptonshire
Supervised by: S. Tetteh
Tutor University: Loughborough University
Course Title: Industrial design – Application of medical devices

Introduction

This paper discusses prosthetics around the world with some key points on manufacturing and design considering designing for different cultures, backgrounds and context. Furthermore, it delves into country information about Sierra Leone, general knowledge about prosthetics, materials, prices, functionality, importance and significance of prosthetics and its impact on daily life. Also, is critique of some ideas, own opinions and research/discoveries.

Sierra Leone

Sierra Leone is a country in West Africa, which is located off the Atlantic Ocean. The country has a population off about 7.6mil (as of 2017) ^{1}. In 1991, a civil war started due to an ex-army corporal Foday Sankoh and RUF (Revolutionary united Front) during an attempted overthrowing of the Joseph Momoh government. The rebellion/civil war lasted for approximately 11 years

(1991-2002) and was funded by diamonds mined in Sierra Leone. ^{2,3}

During the 11-year period, many people/soldiers lost numerous limbs due to many factors such as bombings and shootings. This led to several of the soldiers and civilians requiring prosthetics for their daily lives after the war.

Engineering Design Process

A) The problem

The unique problem - is the loss of multiple limbs, context of the country, anthropometry (such as the sizes of their hands, arms, legs, feet) would be different from the 50th percentile which we usually use for measurements/date about sizes of limbs etc, in the UK.

B) The ideation process

Some of the ideas that could be applied would be:

- Finding or creating a database for anthropometric data of the population in Sierra Leone. This will aid in determining the percentile data (for measurements at the hands, arms, elbows, legs, feet, knees, neck, face) taking into account people aged between 30-35, 40-45, 50+, gender, would give us a selection of measurements as well as database to start designing from.

- With the aid of physicians, volunteers and researchers in and outside of Sierra Leone can develop a research hub to delve deeper into prosthetic research unique to the country. Research could then focus on how people live daily in Sierra Leone and the effect and impact on how prosthetics would eventually improve their lifestyle.
- Inquire from Sierra Leoneans what they would want in terms of design of their prosthetic in relation to functionality and affordability.
- Research into materials that could possibly be used for prosthetics with a focus of local materials to reduce the costs required for prosthetics.

C) The plans

With loads of ideas, there also has to be a consideration there is a budget limit to work within - designing, manufacturing, distributing and improvement. Some ideas that could be built for the future are:

Data collection from soldiers and possibly civilians. This can be achieved through advertising via word of mouth, newspapers, radio, television, and any advertising media with possible rewards for participation. The rewards could and encourage more participation. This will help researchers collecting data on anthropometric data of Sierra Leoneans. (Anthropometry refers to the measurement of the human individual. Anthropometric measurements are used to assess the size, shape, and composition of the human body. Today, anthropometry plays an important role in industrial design, clothing design, ergonomics, and architecture where statistical data about the distribution of body dimensions in the population are used to optimize products.).

- Finding out from civilians, about their everyday routines to understand fully the lifestyle to be able to design a

prosthetic that will be efficient for use. Another way to gain all this information would be going door to door, neighbourhood to neighbourhood, cities to cites and asking them directly if they are willing to help for a good cause as it would help the veterans of the country. This would take longer than the advertising and reward method, but at least you are sure you will collect some data, and actually are doing something about it rather than waiting for the people to find you for sharing data, personally, I believe this is a better way of collecting data if there's none available (There is a lot of repetition of the method of collecting data and reward system).

- Also, working with sociologist on a project like this would be beneficial as they would be able to collect and distribute data correctly, so it is easier to actually design and manufacture the prosthetic from informed data.

Basic prosthetic

When producing a prosthetic, you have to take in consideration such serious aspects like, mass, size, height, length, aesthetic, and even the patient's feedback to improve the prosthetic to make it to their desire and likeness.

A prosthetic is a type of artificial device which allows different body parts to be replaced. A prosthetic is more than a life saver to people that have lost limbs during their lifetime, or even born without any.

When making a prosthetic you should always take in account: weight, size, fit, suspension, rotation, energy used, allergies, material used and most important patient feedback. These are important because as they will aid in designing a better prosthetic that benefits fully to its user.

There are about 3 different types of artificial limbs: 1) Prosthetics 2) Implants 3) Orthotics. For example, a prosthetic would be like a replaced limb, a leg, an arm, etc. An implant would be something such as valves to make sure the blood does not clot. An orthotic would be braces for teeth.

These elements are essential as its crucial in aiding and improving the everyday quality of its users as well as the aesthetics of the prosthetics. Some people could live their life without a prosthetic. However, some prosthetic users can start to feel insecure due to worrying, stares from people therefore the use of a prosthetic will help these users with to regain their confidence.

Effective prosthetic design for Sierra Leone users
The design and fabrication procedure consist of numerous steps. It begins with a precise measurement procedure where a prosthetist takes measurements before the patient's limb is amputated, so that the fabrication process can get started and be ready for amputation. The measurements are based on the anthropometry of the patient.

For example, detailed measurements of the patient's body are taken to help correctly size the prosthetic limb, which is when the patient's own personalised prosthetic

fails in place, as it is modified to fit the patient's own body. ⁽⁴⁾

The mould for the prosthetic then is developed, it's usually made out of a resin. Resin is a solid or highly viscous substance of plant or synthetic origin that is usually convertible into polymers, which is what makes the mould of the prosthetic. ⁽⁵⁾

Careful attention is also paid to the structure of the patient's residual limb, including the location of any muscles, tendons and bones, this is important because it will help the prosthetic fit and be comfortable for the patient. The health of the user and condition of the skin are other factors taken into account when designing the prosthesis, because of the patient's allergies, meaning that if they are allergic to a type of material, it cannot be used as it will cause harm and discomfort to the patient. ⁽⁴⁾ When designing for a person in Sierra Leone you have to take in consideration the material used, due to the weather and living style there. Because temperature usually gets around 23° to about 30° ⁽⁶⁾, this implies that the material has to be heat proof and it doesn't make it less stable and unpleasant.

Heat control in prosthetics is important due to the complications it can bring to the patient. Any lower limb amputation leads to extra energy consumption when walking which means additional heat production from the muscles. Scientific research has found that this energy consumption is higher for those individuals with higher levels of amputation. This means that a person with a short above knee amputation will use much more energy than someone with a partial foot. ⁽⁷⁾ To fix this, the body and outside temperature has to be constant and not likely to change very, which is what makes Sierra Leone a set place for prosthetic assistance.

Another key focus point should be the mass of the prosthetic. This means that the prosthetic has to have the same mass as the other present limbs, this is because for a human to be able to move around and be able to do human activities the body has to be able to ambulate. With this the body needs to be balanced and identical in mass to the anatomic limb, meaning any extra added weight to the prosthetic to make the whole body be unstable and not perform well.

The use of maths is also essential, in the manufacture of the prosthetic namely measurements such as the diameter and the radius of the limb, how dense it is, and to apply all of those to find out the stress and strain of a material as well as the prosthetic.

Also, skin colour of the patient needs to be considered as it needs to blend in with the rest of the body. For example, undertones need to mixed and matched to match the skin colour.

Conclusion

In different parts of the world means different needs are needed for the prosthetic design. For example, in Sierra Leone different key points needs to be addressed. Prosthetics are very interesting and the way they can

vary specifically from one person to the other is amazing. When designing one has to take into account different information and data to ensure an effective prosthetic is safe. It can seem daunting and stressful but at the end of the day you are helping a person in need, or just a person trying to live their life at the best. When producing a prosthetic, you have to take in consideration such serious aspects like, mass, size, height, length, aesthetic, and even the patient's feedback to improve the prosthetic to make it to their desire and likeness.

References

https://en.wikipedia.org/wiki/Sierra_Leone (1)
<https://uk.reuters.com/article/uk-leone-warcrimes-war/factbox-sierra-leones-civil-war-idUKL0286217420070802> (2)
https://en.wikipedia.org/wiki/Sierra_Leone_Civil_War (3)
<https://science.howstuffworks.com/prosthetic-limb3.htm> (4)
<https://en.wikipedia.org/wiki/Resin> (5)
<https://www.climatestotravel.com/climate/sierra-leone> (6)
<https://www.limbs4life.org.au/news-events/news/temperature-control-with-a-prosthetic-limb> (7)

Tutor comment:
"Working with S. was a pleasure during the Uni Pathways programme. Her ability to think outside of the box, being critically creative whilst relating information taught during the tutorials with the assigned task was exemplary. If S. keeps on this trajectory, she will no doubt excel in whatever she puts her mind to, that is either in A-level or an undergraduate programme as she nailed this assignment."

How are bacterial diseases diagnosed now and how could advancements in science change this?

Year 10, Key Stage 4

Pupil: T. O'Rourke
School: Hope Academy, St Helens
Supervised by: E. Trinh
Tutor University: The University of Manchester
Course Title: The unseen enemy – Diagnosing bacterial infections

Introduction:

Inducing approximately 35,000 US deaths each year, (1) bacteria are unicellular, prokaryotic microorganisms containing plasmid DNA. (2) Enclosed by a plasma membrane for cell protection, bacteria can conform to characteristic shapes – such as spirals and rods – which assist in the diagnosis of bacterial diseases. (3) Despite the negative stigma suggesting that all bacteria are harmful, only 5% are considered pathogenic, equating in only a small selection of them causing bacterial diseases. (4) As bacteria invades and multiplies within a patient's body, (5) it is likely that their infection will be a urinary tract infection – such as cystitis – or a sexually transmitted infection (STI) – such as chlamydia – due to them being the most common within the UK. These infections can be detected via cloudy urine, pain during sexual intercourse or pain whilst urinating.

Salmonella enteritidis gastroenteritis:

Causation of gastroenteritis:

Usually lasting between 4-7 days, *Salmonella enteritidis* – also referred to as *S. enteritidis* – is a pathogenic bacterium which induces abdominal cramps,

severe diarrhea and a harsh fever. (7) As a result of *S. enteritidis*, infections such as gastroenteritis can occur, which – in most cases – does not demand serious medical treatment. (8) Gastroenteritis is an infection which can be contracted bacterially via *S. enteritidis*, not only alluding to digestive trouble, but also resulting in intestinal inflammation. (9) *S. enteritidis* evokes this digestive and abdominal trouble through the infection, gastroenteritis. Once these bacterial particles, emerged from *S. enteritidis*, have been consumed, they progress through a patient's digestive system and invade both the small and large intestine. *S. enteritidis* then therefore colonizes the lymphoid tissue (10) – an embedded structure which results in an immune response (11) – of the gastrointestinal tract, immersing bacteria to spread throughout the patient's bloodstream. (10)

Treatment:

With there being no distinctive treatment for common gastroenteritis, (12) it is evident that in 2007-2016, the British public gradually became more aware of the severity of *S. enteritidis*. This analysis was depicted through a decrease of 4133 reported cases within the space of 10 years. This immense drop in values ensures that the British public are becoming more socially aware of *S. enteritidis*, and that they are therefore enforcing measures to decrease their risk of contraction. (13) Children below the age of five, adults over 65 and patients consuming certain medication are more at risk of *S. enteritidis* due to their weakened immune systems. (7) Because of this, bacteria – such as *S. enteritidis* – cannot be fought off as easily opposed to a healthy adult with a fully functioning immune system. Henceforth, it situates patients under 5-years-old and adults with immunity hindrances in the extremely vulnerable category. (14) As the number of laboratory reports for *S. enteritidis* have distinctly decreased over a 10-year period, it therefore entails to less patients being diagnosed with gastroenteritis through *S. enteritidis*, all due to the bacteria becoming less prominent. (13)

Contraction of S. enteritidis:

Through the bacteria present in vomit and fecal matter, gastroenteritis can be contracted via multiple possibilities: the environment a patient is subjected to, the food a patient consumes or the general face-to-face contact a patient undergoes. (15) The general cruciality of environmental factors - such as sanitation facilities - impacting the overall spread of gastroenteritis is a matter which is still awaiting concrete evidence; however, it is presumed to be a significant attribute which assists in transmission, hence its inclusion in the investigation. (16,15) Concluded from a Brazilian study which occurred in February 1994 to June 1997, an investigation regarding 7802 patients suffering with *S. enteritidis* was initiated. From the 79 of 92 outbreaks examined, diarrhea and abdominal pain were on the pedestal for most prevalent and frequent symptoms, closely followed by vomiting and nausea. This study enlightened the importance of food storage cleanliness and conditions of industrial kitchens; each factor being equally as essential in reducing diagnosis for this gastrointestinal illness. (17)

S. enteritidis morphology:

Regarding structure, *S. enteritidis* is a Gram-negative

bacterium: (18) a bacterium consisting of a thin peptidoglycan cell wall. (19) The core objective of peptidoglycan is to maintain cell integrity, (20) and as *S. enteritidis* is a Gram-negative, (18) it enables the purple stain applied in bacteria staining to be washed away. This therefore allows a pink stain to be added due to acetone washing out the purple stain, subsequently making *S. enteritidis* recognizable as a Gram-negative bacterium due to its thin peptidoglycan cell wall. (19)

Pathogenicity:

Numerous attributes - such as lipopolysaccharide structures – have been explored when it comes to their correlation with pathogenicity in *S. enteritidis*. (21) Bacterial lipopolysaccharides are often referred to as endotoxins and are said to be affiliated with chronic gut inflammation. (22) With pathogenicity being an organism that results in a disease, (19) the placement of lipopolysaccharides in poultry assisting the transmission of *S. enteritidis* adds an aura of virulence through the bacterial disease due to the combination being pathogenic. (21) Causing over two million yearly deaths for children under the age of 5, diarrhoea – induced through gastroenteritis – poses as a serious threat in underdeveloped countries. (23) Despite the harshness of gastroenteritis, rehydration within children is the most effective way of combatting the infection – especially in third world countries – due to effective diagnosis tests being unavailable. (24)

Year	Number of laboratory reports	Laboratory reports per 100,000 population
2007	6489	11.93
2008	4387	8.00
2009	4010	7.26
2010	2462	4.42
2011	2582	4.60
2012	2186	3.86
2013	2090	3.67
2014	2331	4.06
2015	2495	4.31
2016	2356	4.04

Table 1: Presenting a drop in English and Welsh *S. enteritidis* cases over a ten-year period. The cases have dropped from 6489 laboratory reports to 2356 in 10 years, representing a steady decline.

Microbiological diagnosis of S. enteritidis:

Sampling:

Regarding the diagnosis of *S. enteritidis*, a sample from a patient is required to be sent to the lab and await further investigation and development. Bacteria from *S. enteritidis* can be found present in excrement or bodily tissue, consequently resulting in the sample therefore having to come from either the patients' bloodstream or faecal matter – a stool sample. (25) Once a sample has been produced and contained – which is a process that takes approximately 1 hour – it takes a further 24 hours to transport the sample from the GP medical centre to the hospital laboratory for identification. (19) *S. enteritidis* is a Gram-negative, anaerobic bacilli, signifying that it consists of rod-shaped bacteria where oxygen is not present. (18, 26) If a gram stain test were to be taken, this would then consecutively entail to the bacteria being stained pink due to its thin peptidoglycan cell wall. This

thin peptidoglycan cell wall enables the purple stain from the gram test to be washed away with acetone and to be replaced with an opposing pink stain, (19) meaning that the peptidoglycan did not maintain cell integrity, (20) consequently symbolising that *S. enteritidis* is Gram-negative. (18)

Agar plates:

With the aid of agar plates and culturing, microbiologists can diagnose *S. enteritidis* in the laboratory through bacteria which has grown within a 3-to-24-hour time period. Containing agar and nutrients, a sterile petri dish would be scientifically referred to as an agar plate. An agar plate is used to grow bacteria which is a process that has been named culturing, therefore almost always entailing to a bacterial diagnosis. Microbiologists distribute an array of bacteria to a selection of varying agar plates which gives them a strong indication to what the bacteria growing on the plates could potentially be. (19) When diagnosing *S. enteritidis* via an agar plate, Xylose lysine deoxycholate (XLD) agar is one of the most promising options due to its affiliating role in the January 1968 Misericordia Hospital study. This precise study was to enforce a comparison between the effectiveness of XLD agar and MacConkey agar when it came to the isolation of *Salmonella* variations and serotypes, and both the MacConkey agar and XLD agar proved to be effective. (27) Despite agar plates being convenient regarding the assessment of colonies and permitting growth of microaerophiles – microorganisms that can survive and grow more efficiently surrounded by low areas of oxygen – they also inevitably also carry faults. (28,29) For a process which relies so heavily on the bacteria grown, the potential for colonies to overlap on the agar not only puts the experiment at risk but reduces the certainty and dependability of agar plates. (30) Furthermore, culturing bacteria on agar plates is also a procedure which has proven to be time consuming; a process which can take up to 24-48 hours. (28) Great importance is situated within the presence of early diagnosis by virtue of the cruciality and effect it can have on a patient. (31) With traces of *S. enteritidis* occasionally being found in blood, (32) a study on the significance of the early diagnosis of blood stream infections displays that the timing of a patient being diagnosed is the key to their survival. This therefore proves that a slow diagnosis is not efficient in a world where the timing of diagnosis is detrimental to a patient's health. (31) With a direct link to *S. enteritidis*, agar plates are not always entirely accurate. This was concluded from a 1968 study which discovered that *Salmonella-Shigella* agar plates displayed a high incident rate of false-positive tests. (27) This study is a prime example of the inaccuracy of some agar plate tests, however, with it being published in 1968, advancements in science have now altered the effectiveness of agar plates, consequently making the discovery not as applicable to modern day microbiology. These new advancements in science consist of altering agar volume, proven in a 2013 study which identifies the impact of this. (33)

Biochemical tests:

With biochemical tests often being used after bacteria has grown on agar for the identification of a species, (19) lysine decarboxylase tests are often used in association with diagnosing *S. enteritidis*. (34) From a 2003 study where it was

recognised that *S. enteritidis* was one of the leading causes of food borne diseases in Japan, lysine decarboxylase tests were consequently utilized more frequently as a biochemical route for diagnosis. (35) Despite this, a lysine decarboxylase test can often take up to 24 hours for results, (36) proving it be inefficient opposed to an oxidase tests which show results in less than 1 hour. (19) Another sector which requires testing is antibiotic resistance. 100,000 people out of the annual US *Salmonella* infections are as of a direct result of antibiotic resistance, proving it to be a prominent issue. (37) This test can be done easily through antibiotic susceptibility testing via antibiotic disks. This is a process which displays resistance through clear circles surrounding the antibiotic, however, MALDI-TOF – an opposing method – only takes 2 hours opposed to 24-48. (19) Despite MALDI-TOF being more expensive and needing specialist equipment, early diagnosis is crucial due to its proven impact of saving lives. (31)

Future Diagnostic Methods:

Polymerase Chain Reaction:

Utilised to amplify minute segments of DNA for molecular examination, Polymerase Chain Reaction (PCR) is a quick and affordable method of diagnosing bacteria. (38) With it being especially successful when finding *S. enteritidis* and *Salmonella* serotypes, PCR is said to be able to discover the presence of bacteria in a short period of time, allowing serotypes – such as *S. enteritidis* – to be detected without difficulty. (39) PCR searches bacterial DNA for specific genes to understand what disease is present, whilst also being the cheapest and quickest method available. However, PCR tests have significant room for error, not only due to a 10% inaccuracy rate, (40) but due to easy contamination from human DNA, often leading to altered results. (19) PCR tests are readily available in laboratories due to the surge of COVID-19 testing, situating them as more prominent than ever before with 54,302,701 conducted COVID-19 tests within the UK. (41)

Conclusion:

S. enteritidis is a pathogenic serotype of *Salmonella* which henceforth provokes the disease Gastroenteritis; an infection which not only attacks the small and large intestines, but also enforces severe abdominal cramps and diarrhoea. Commonly found in patients with weakened immune systems, *S. enteritidis* is a gram-negative bacterium – commonly found in poultry – which can be tested via agar plates, biochemical tests or PCR tests. As of 2016 where 4.04 British people per 100,000 had tested positive for *S. enteritidis*, it became evident that studies for this bacterium within third world countries were less common, as a result of financial situations. Advancements in science could alter this by making medical outlets more accessible within third world countries and allowing them more appropriate medical equipment. MALDI-TOF testing would be very effective in these countries due to its aid in reducing antibiotic resistant strains of bacteria and because of its efficient speed. By reducing deaths due to early diagnosis – a concept which is crucial regarding mortality – MALDI-TOF is a strong contender of bacterial diagnosis in poorer countries. However, MALDI-TOF testing is not a cost-efficient method of diagnosis, meaning it not easily accessible in third world countries due to its price. For me, if advancements in science produced an inexpensive,

quick, accurate and sensitive method of diagnosis, it would enable equality for countries with less financial stability. This would result in more patients getting tested for *S. enteritidis*, reducing the spread of gastroenteritis, allowing an earlier diagnosis and preventing further fatalities.

Bibliography:

- ¹ CDC. Antibiotic Resistance Threats in the United States 2019. Atlanta, GA: U.S. Department of Health and Human Services; 2019. Available from: <https://www.cdc.gov/drugresistance/pdf/threats-report/2019-ar-threats-report-508.pdf>
- ² Bacterial cells - Cell structure - Edexcel - GCSE Combined Science Revision - Edexcel - BBC Bitesize [Internet]. BBC Bitesize. 2021 [cited 6 January 2021]. Available from: <https://www.bbc.co.uk/bitesize/guides/zg9mk2p/revision/3>
- ³ Salton M, Kim K. Medical Microbiology. 4th edition. [Place of publication not identified]: University of Texas Medical Branch at Galveston; 1996.
- ⁴ LaMorte, W. Bacteria as Pathogens - Boston University School of Public Health [Internet]. Sphweb.bumc.bu.edu. 2016 [cited 6 January 2021]. Available from: https://sphweb.bumc.bu.edu/otlt/mph-modules/ph/ph709_infectiousagents/PH709_infectiousAgents4.html
- ⁵ What You Need to Know About Infectious Disease. Washington, DC: National Academies Press (US); 2010.
- ⁶ Common Bacterial Infections | Antibiotic Research UK [Internet]. Antibiotic Research UK. 2021 [cited 6 January 2021]. Available from: <https://www.antibioticresearch.org.uk/about-antibiotic-resistance/bacterial-infections/common-bacterial-infections/>
- ⁷ CDC - Signs & Symptoms - Salmonella Enteritidis Infections Linked to Ground Beef - Salmonella [Internet]. Cdc.gov. 2020 [cited 9 December 2020]. Available from: <https://www.cdc.gov/salmonella/enteritidis-07-12/signs-symptoms.html>
- ⁸ Salmonella (non-typhoidal) [Internet]. Who.int. 2020 [cited 9 December 2020]. Available from: [https://www.who.int/news-room/fact-sheets/detail/salmonella-\(non-typhoidal\)](https://www.who.int/news-room/fact-sheets/detail/salmonella-(non-typhoidal))
- ⁹ Publishing H. Gastroenteritis In Adults - Harvard Health [Internet]. Harvard Health. 2020 [cited 9 December 2020]. Available from: <https://www.health.harvard.edu/staying-healthy/gastroenteritis-in-adults-a-to-z>
- ¹⁰ [Internet]. Cdc.gov. 2020 [cited 9 December 2020]. Available from: https://www.cdc.gov/training/SIC_CaseStudy/Infection_Salmonella_ptversion.pdf
- ¹¹ Paxton S, Knibbs A, Peckham M. The Leeds Histology Guide [Internet]. Histology. leeds.ac.uk. 2020 [cited 9 December 2020]. Available from: <https://www.histology.leeds.ac.uk/lymphoid/index.php>
- ¹² Viral gastroenteritis (stomach flu) - Symptoms and causes [Internet]. Mayo Clinic. 2020 [cited 9 December 2020]. Available from: <https://www.mayoclinic.org/diseases-conditions/viral-gastroenteritis/symptoms-causes/syc-20378847>
- ¹³ Public Health England. Salmonella data 2007-2016. Table 1. Page 6. [cited 9 December 2020]. Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/711972/salmonella_data_2007_to_2016_may_2018.pdf
- ¹⁴ People With a Higher Risk of Food Poisoning | Food Safety | CDC [Internet]. Cdc.gov. 2020 [cited 9 December 2020]. Available from: <https://www.cdc.gov/foodsafety/people-at-risk-food-poisoning.html>
- ¹⁵ Lopman B, Gastañaduy P, Park G, Hall A, Parashar U, Vinjé J. Environmental transmission of norovirus gastroenteritis. Current Opinion in Virology. 2012;2(1):96-102.
- ¹⁶ Disease outbreaks [Internet]. Who.int. 2021 [cited 2 January 2021]. Available from: <https://www.who.int/teams/environment-climate-change-and-health/emergencies/disease-outbreaks/>
- ¹⁷ dos Santos SM, Kupek E. Serial outbreaks of food-borne disease in Blumenau, Brazil, caused by Salmonella enteritidis. The Brazilian Journal of Infectious Diseases: an Official Publication of the Brazilian Society of Infectious Diseases. 2000 Dec;4(6):275-278.
- ¹⁸ Giannella R. Medical Microbiology. 4th edition. [Place of publication not identified]: University of Texas Medical Branch at Galveston;
- ¹⁹ Trinh E. The Unseen Enemy: Diagnosing bacterial infections.
- ²⁰ Vollmer W, Blanot D, De Pedro M. Peptidoglycan structure and architecture. FEMS Microbiology Reviews. 2008;32(2):149-167.
- ²¹ Cox J. Salmonella enteritidis: Virulence factors and invasive infection in poultry. Trends in Food Science & Technology. 1995;6(12):407-410.
- ²² Wassenaar T, Zimmermann K. Lipopolysaccharides in food, food supplements, and probiotics: should we be worried? European Journal of Microbiology and Immunology. 2018;8(3):63-69.
- ²³ Nic Fhogartaigh C, Edgeworth J. Bacterial gastroenteritis. Medicine. 2009;37(11):586-593.
- ²⁴ Bruzese E, Giannattasio A, Guarino A. Antibiotic treatment of acute gastroenteritis in children. F1000Research. 2018; 7:193.
- ²⁵ Diagnosis and Treatment | General Information | Salmonella | CDC [Internet]. Cdc.gov. 2021 [cited 3 January 2021]. Available from: <https://www.cdc.gov/salmonella/general/diagnosis-treatment.html>
- ²⁶ 12. Bacillus. [Internet]. 2020 [cited 3 January 2021];. Available from: <https://www.britannica.com/science/bacillus-bacteria>
- ²⁷ Rollender W, Beckford O, Belsky R, Kostroff B. Comparison of Xylose Lysine Deoxycholate Agar and MacConkey Agar for the Isolation of Salmonella and Shigella from Clinical Specimens. American Journal of Clinical Pathology [Internet]. 1968;51(2-ts):284-286. Available from: <https://academic.oup.com/ajcp/article-abstract/51/2-ts/284/4817203>
- ²⁸ University of chester. THE Advantages AND Disadvantages OF THE Different techniques. [Online]. Available from: <https://www.studocu.com/en-gb/document/university-of-chester/introductory-microbiology-and-immunology/lecture-notes/the-advantages-and-disadvantages-of-the-different-techniques/1643941/view> [Accessed 4 January 2021].
- ²⁹ Facultative anaerobe | microorganism [Internet]. Encyclopedia Britannica. 2020 [cited 4 January 2021]. Available from: <https://www.britannica.com/science/facultative-anaerobe>
- ³⁰ Talaro K, Talaro A. Foundation in Microbiology. Wm. C. Brown Publishers, Kerper Boulevard; 1993.
- ³¹ Seifert H. The Clinical Importance of Microbiological Findings in the Diagnosis and Management of Bloodstream Infections. Clinical Infectious Diseases. 2009;48(s4):S238-S245.

- ³² Salmonella infection - Diagnosis and treatment - Mayo Clinic [Internet]. Mayoclinic.org. 2020 [cited 5 January 2021]. Available from: <https://www.mayoclinic.org/diseases-conditions/salmonella/diagnosis-treatment/drc-20355335>
- ³³ ITherkom J, Mainelis G. Effect of Agar Plate Volume on Accuracy of Cultureable Bioaerosol Impactors. Aerosol Science and Technology. 2013;47(12):1353-1362.
- ³⁴ Food Microbiology Testing: Traditional and Alternative Methods. 2nd ed. 2019.
- ³⁵ Masatomo Morita, Kadumi Mori, Kiyoshi Tominaga, Jun Terajima, Kenji Hirose, Haruo Watanabe, Hidemasa Izumiya. Characterization of lysine decarboxylase-negative strains of Salmonella enterica serovar Enteritidis disseminated in Japan, FEMS Immunology & Medical Microbiology, Volume 46, Issue 3, April 2006. Pages 381–385
- ³⁶ Lysine Decarboxylase Test [Internet]. Static.livengine.net. 2006 [cited 5 January 2021]. Available from: <http://static.livengine.net/filabo/lmgs/outros/88014.TechnicalDataSheet.pdf>
- ³⁷ V. T. Nair D, Venkitanarayanan K, Kollanoor Johny A. Antibiotic-Resistant Salmonella in the Food Supply and the Potential Role of Antibiotic Alternatives for Control. Foods. 2018;7(10):167.
- ³⁸ Polymerase Chain Reaction (PCR) Fact Sheet [Internet]. Genome.gov. 2020 [cited 5 January 2021]. Available from: <https://www.genome.gov/about-genomics/fact-sheets/Polymerase-Chain-Reaction-Fact-Sheet>
- ³⁹ de Freitas C, Santana A, da Silva P, Gonçalves V, Barros M, Torres F et al. PCR multiplex for detection of Salmonella Enteritidis, Typhi and Typhimurium and occurrence in poultry meat. International Journal of Food Microbiology. 2010;139(1-2):15-22.
- ⁴⁰ Souzaé F, Ntoudou-Thomé A, Tran C, Rostène W, Forgez P. Quantitative RT-PCR: Limits and Accuracy. BioTechniques. 1996;21(2):280-285.
- ⁴¹ Official UK Coronavirus Dashboard [Internet]. Coronavirus.data.gov.uk. 2021 [cited 6 January 2021]. Available from: <https://coronavirus.data.gov.uk/details/testing>

Tutor comment:

"I really enjoyed working with Hope Academy. D. was a very enthusiastic teacher to work with, and the students were very keen to learn. I am very proud of my student T. for his exceptional essay. He is an inquisitive and diligent individual who showed a very high level of research in his essay. I believe he would excel at any university course, and I would definitely encourage him to keep working hard!"

Business plan for your new biomedical venture

Year 12, Key Stage 5

Pupil: **T. Boukhanouf**

School: **George Spencer Academy, Nottinghamshire**

Supervised by: **M. Malenica**

Tutor University: **University of Nottingham**

Course Title: **Let's start a biomedical 3D printing business**

A gap in the market

The increase of flu infections in winter months is a common occurrence globally. Considering the current coronavirus pandemic, the rate of respiratory infections has increased by over 37.0% in comparison to previous years [1,2]. The pathogens causing flu infections are known to be suppressed by the body's innate immune defence through the release of cathelicidins found in the lysosomes of macrophages.

In turn, it is well established that the production of cathelicidins is stimulated by 1,25-dihydroxyvitamin D3, an active form of vitamin D3, synthesized by exposure to sunlight [3]. Recent studies have shown abundance of evidence correlating low levels of serum 25-hydroxyvitamin D, which identifies vitamin D levels in the blood, and increased risk of developing common cold (respiratory syncytial virus), influenza and SARS-CoV-2. This usually peaks around the winter months due to a lack of sunlight exposure. [4, 5]. The cutaneous synthesis of vitamin D is further attributed to the percentage of melanin pigmentation present in the skin therefore requiring dosages ranging from 75nmol/L-150nmol/L to achieve the optimum health benefits [6].

Proposed solution

Vitamin D is commonly sold over the counter as daily

supplements tablets. This proposal seeks to address the issue of vitamin D deficiency and the complexity in personalized dosage. Auxilien Pharmaceuticals has achieved this through the formulation of D-Hex - a vitamin D capsule with a bespoke geometry, synthesised to reside and be released in the duodenum for up to 3 months. The proposed design of the capsule will reduce the daily tablet intake, therefore decreasing intake omissions, and inconsistent release of the vitamin in the body which may lead to vitamin D toxicity [7]. The physical geometry of D-Hex is made from the careful synthesis of a hydroxypropyl-methylcellulose (HPMC) and 10µg active ingredient 1,25-dihydrovitamin D, commonly known as Calcitriol, to form a filament. A hexagonal matrix is extruded via a fused-filament fabrication (FFF) 3D printing method [8]. To control capsule dissolution, the matrix is embedded in an hydroxypropyl-methylcellulose acetate succinate O-capsule formed through a modification of the conventional fused-deposition modelling (FDM) process [9]. It is estimated that by lodging the D-Hex matrix in the duodenal bulb (i.e., high absorption surface area) absorption can be ca. 77%, hence increasing the levels of serum 25-hydroxyvitamin D synthesized in the kidneys and reinforcing a healthy immune system [10,11].

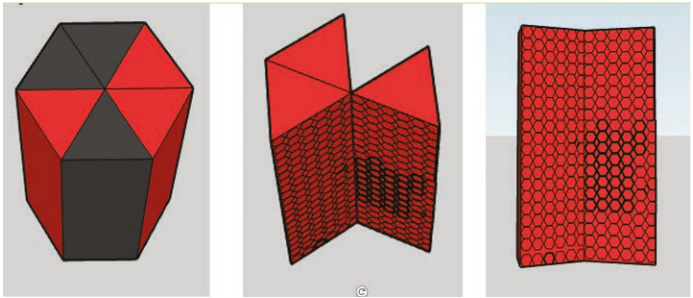
The complexity of producing an extended-release capsule to last the duration of the winter months requires a unique method and material process to be embedded into the design. In this proposal, the design strategy was adopted from an intricate multi-layer blueprint previously used in the formation of a one-month oral contraceptive [12].

The D-Hex matrix is held in a 0-capsule printed via a tailored fused-filament fabrication (FFF) 3D printing method with a 0.1 mm nozzle. The new technique incorporates hydroxypropyl- methylcellulose acetate succinate (HPMCAS) with a lactose filler to produce a unique gastro-resistant filament for capsule extrusion. Targeted dosage release is achieved through the enteric properties of HPMCAS allowing dissolution to occur between the pH range of the duodenal bulb (pH 5.5-6). [13,14]

The D-Hex matrix was formulated by the preparation of a 1,25-dihydrovitamin D saturated hydroxypropyl-methylcellulose (HPMC) filament suitable for fused-filament fabrication (FFF) [8]. As one of the cheapest and reliable pharmaceutical 3D- printing methods, FFF served as the ideal method to use in maximising profit for a larger matrix in comparison to previous 3D printed drugs [15]. 1,25-dihydrovitamin D is known to have both a longer half-life than 1,25 hydroxyvitamin D3 and hydrophilic properties hence ensuring a slower absorption rate of the active pharmaceutical ingredient (API). This increases the dissolution time of the matrix, allowing for an extended-release dosage.[16]

After careful synthesis of the filament a CAD design was formatted via a 3D drawing package (Sketch Up) which was converted into an STL file to be sliced [table 1]. A 0.4mm nozzle was used to extrude the filament onto a print bed with temperature 70°C to ensure an even deposition of the filament and eliminate drug

frailability [17]. The matrix consists of a 2-part 100% hexagonal filament infill separating at capsule synthesis into duodenal walls. The custom triangle matrices are locked around villi through mucus secreted by goblet cells eliminating dislodgement and dosage excretion [18]. Using a 100% infill allows for a prolonged delay in vitamin D dissolution, eliminating toxicity risks, while the hexagonal patterns counter the large diffusion pathways created by viscous mucus during lodgment. D-hex holds a formulation density of 408mg with dimensions of 38mm² x 21mm. Each individual triangle matrix consists of 204mg of infill filament with 0.22% vitamin D - the exact dosage for dissolution to extend over the winter period.



D-hex CAD design, single triangle matrix and close up of 100% hexagonal infill

Market overview

The Covid-19 pandemic caused a world economic downturn. However, for sectors including food supplements there has been an upsurge in demand with UK projections indicating an 13% growth rate in the next 5 years reaching over £550 million. [19]. Heightened popularity of vitamin D amongst UK consumers led to an 8% increase in sales over the last 12 months deeming it to be the highest supplement in demand [20].

As the UK's geographical location renders it sunlight deficient for most of the year, the National Diet and Nutritional Survey found over 50% of the population to be vitamin D deficient with Black, Asian, and Minority Ethnic (BAME) groups to be at higher risk as the higher percent of melanin pigmentation in the epidermal layer decreased the cutaneous synthesis vitamin D [21,22].

In the UK there are approximately 2.2 million clinically vulnerable people and in light of the Covid-19 pandemic, they are at a higher risk of developing SARS-CoV-2 [23]. The correlation between vitamin D deficiency and Covid-19 has been shown to increase the likelihood of catching the virus, exacerbating patients' symptoms, knowing that 89% of deaths from covid-19 are those aged over 65 years [24]. Due to the rapid increase of cases over the past few months, the death proportions may have altered slightly.

The initial distribution of D-hex will focus on a national level, distributing 7 million capsules to around 1000 hospital pharmacies in the UK where the supplement will be given on a prescription basis. The primary consumers will include patients suffering from osteomalacia, a bone softening condition affecting 1 in 1000 people. The condition is often caused by a lack of vitamin D and leads to muscle weakness and the fracture of bones in elderly people [25,26]. Further distribution will be to patients suffering from

chronic conditions including diabetes, Alzheimer disease, depression, and chronic cardiovascular diseases [27].

Unique selling point

The unique properties embedded within the design of D-hex provide transformative mechanisms that benefit customers for an extended period. Both personalised dosage filaments and the long-release profile of the matrix allows D-hex to stand out from a crowded vitamin D market.

Auxilien's development of a 3-month extended-release mechanism is a first in the VMS industry. It is known that current single circadian use capsules are the common cause of inconsistent vitamin intake and missed doses as patients are more likely to conform to monthly over weekly / daily supplements [28]. To counter this D-hex was formulated, as patient adherence to a consistent vitamin intake can be increased by reducing dosage frequency [29].

The use of a FFF filament enhances the ability for personalized matrices to be formulated, catering to the higher vitamin D dosages needed for more pigmented skin hence reducing the risk of over/underdoses. The precision of FFF 3DP allows dosages to be tailored to the pharmacogenetics and pharmacokinetic profiles of each patient, taking into consideration: age, weight, metabolism patterns etc. [30,31].

Swot analysis



Personalisation: As the first VMS company to utilise 3DP, we can incorporate dosage and formulation personalisation into capsules synthesised.

Extended-Release: The 3month extended-release capsule is a first in the field of pharmaceuticals and with a fast-growing market, a new innovative appeal to customers.

Management Team: We have assembled a strong management team of seasoned experts committed to producing the best quality matrices.



Materials: Possible limitations of synthesising FFF filaments due to lack of biodegradable materials. Would have to transfer to other 3DP methods which may increase overall cost due to investment in more machinery.

Capital: Having a lack of capital brings about the need

to for all start-up funds to come from loans and investors. **Reputation:** A lack of reputation may result in investors wary to invest in new ventures.



Worldwide: Opportunities to expand worldwide in one of the fastest growing markets. [20]

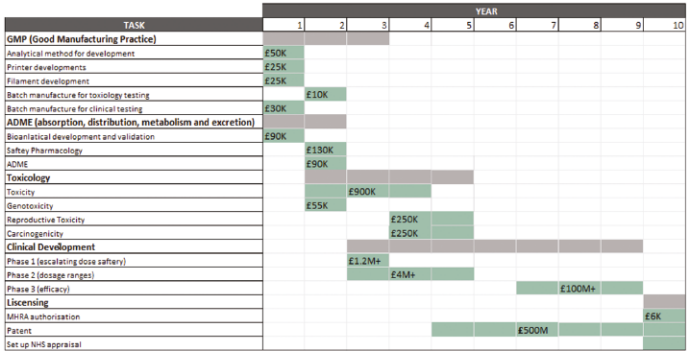
Holistic Therapy: As part of holistic therapy, capsules prescriptions would extend to patients suffering from chronic diseases including diabetes, Alzheimer disease, depression, and chronic cardiovascular diseases. [27]



Free Vitamin D: UK will distribute a free vitamin D winter supply to over 3.5million, could possibly render profit losses in the UK.[32]

Competitive Market: The need of expensive marketing campaigns may arise to push D-Hex sales and stand out in a crowded market.

Timeline



Finances

After primary business setup, Auxilien Pharmaceuticals aims to launch D-Hex in the UK from 2032-2036, to increase revenue and build brand credibility. The following table summaries profits over the first three years of sales.

PROFIT AND LOSS STATEMENT	2032	2033	2034
Income			
Sales	£1B	£2B	£4B
Expenses			
Production Expenses	£50K	£25K	£1M
Cost of Sales	£50K	£100K	£300K
Testing Operations	£105M	£0	£105M
Product Liability Insurance	£119.37	£110	£59
Payroll Development	£500M	£59	£59
PROFIT	£390M	£1.9B	£3.8B

Final thoughts

In the past year, the VMS industry has seen significant growth, rendering it to be a prime sector for a new start-up venture. With vitamin D sales surging, the unique design properties and formulation of D-Hex will be attractive both on effectiveness and cost in a competitive market. Being the first VMS company to utilize 3DP, our personalized dosage formulations and extended-release matrices will appeal to customers wishing to carry holistic therapies and alternative medicine routes.

Our team of carefully chosen experts in the fields of business, pharmaceuticals, and engineering, will allow rapid expansion of Auxilien, with future plans to increase the use of biodegradable filaments in FFF 3DP. Through the synthesis of D-Hex we aim to impact lives throughout the globe by relaying the message of when it comes to dosage frequency: 'Less is more'.

Finally, D-Hex holds the potential to become a worldwide pharmaceutical staple, pioneering the way for 3DP in the VMS market.

References

- [1] Why COVID-19 Might Get Worse in Winter, Just Like Flu. 2020; Available at: <https://www.medpagetoday.com/infectiousdisease/covid19/89495>. Accessed Dec 13, 2020.
- [2]. Available at: <https://www.statista.com/topics/5908/respiratory-disease-in-the-uk/>. Accessed Dec 13, 2020.
- [3] Borella E, Neshet G, Israeli E, Shoenfeld Y. Vitamin D: a new anti-infective agent? Ann N Y Acad Sci 2014 May;1317:76-83.
- [4] Radujkovic A, Hippchen T, Tiwari-Heckler S, Dreher S, Boxberger M, Merle U. Vitamin D Deficiency and Outcome of COVID-19 Patients. Nutrients 2020 Sep 10;12(9).
- [5] Cereda E, Bogliolo L, Lobascio F, Barichella M, Zecchinelli AL, Pezzoli G, et al. Vitamin D supplementation and outcomes in coronavirus disease 2019 (COVID-19) patients from the outbreak area of Lombardy, Italy. Nutrition 2020 November 11;111:1055.
- [6] Webb AR, Kozantidis A, Kift RC, Farrar MD, Wilkinson J, Rhodes LE. Colour Counts: Sunlight and Skin Type as Drivers of Vitamin D Deficiency at UK Latitudes. Nutrients 2018 -4-07;10(4).
- [7] Marciniowska-Suchowierska E, Kupisz-Urbańska M, Łukaszkiewicz J, Płodowski P, Jones G. Vitamin D Toxicity—A Clinical Perspective. Frontiers in endocrinology (Lausanne) 2018 Sep 20;9:550.
- [8] Kadry H, Al-Hilal TA, Keshavarz A, Alam F, Xu C, Joy A, et al. Multi-purposable filaments of HPMC for 3D printing of medications with tailored drug release and timed-absorption. Int J Pharm 2018 -06-10;544(1):285-296.
- [9] Smith D, Kapoor Y, Klinzing G, Procopio A. Pharmaceutical 3D Printing: Design and Qualification of a Single Step Print and Fill Capsule. International Journal of Pharmaceutics 2018 March 1;544.
- [10] Hollander, D., Rosenstreich, S.J., & Volwiler, W. Role of the duodenum in vitamin D3 absorption in man. Digest Dis Sci 16, 145–149 (1971).
- [11] Sakem, B., Nock, C., Stanga, Z. et al. Serum concentrations of 25-hydroxyvitamin D and immunoglobulins in an older Swiss cohort: results of the Senior Labor Study. BMC Med 11, 176 (2013).
- [12] A Once-a-month Oral Contraceptive By Ameya R. Kirtane, Tiffany Hua, Alison Hayward, Ambika Bajpayee, Aniket Wahane, Aaron Lopes, Taylor Bensel, Lihong Ma, Frank Z. Stanczyk, Sierra Brooks, Declan Gwynne, Jacob Wainer, Joy Collins, Siddhartha M. Tamang, Robert Langer, Giovanni Traverso Science Translational Medicine 04 Dec 2019
- [13] Enteric Coating: An Overview. 2019 -04-18T07:00:59+00:00.
- [14] Fällingborg J. Intraluminal pH of the human gastrointestinal tract. Dan Med Bull 1999 -06;46(3):183-196
- [15] Kadry H, Al-Hilal TA, Keshavarz A, Alam F, Xu C, Joy A, et al. Multi-purposable filaments of HPMC for 3D printing of medications with tailored drug release and timed-absorption. International Journal of Pharmaceutics 2018 June 10;544(1):285-296.
- [16] Cianferotti L, Cricelli C, Kanis JA, Nuti R, Reginster J, Ringe JD, et al. The clinical use of vitamin D metabolites and their potential developments: a position statement from the European Society for Clinical and Economic Aspects of Osteoporosis and Osteoarthritis (ESCEO) and the International Osteoporosis Foundation (IOF). Endocrine 2015 -09;50(1):12-26.
- [17] Khaled SA, Burley JC, Alexander MR, Yang J, Roberts CJ. 3D printing of five-in-one dose combination polypill with defined immediate and sustained release profiles. J Control Release 2015 -11-10;217:308-314.
- [18] Lock JY, Carlson T, Carrier RL. Mucus models to evaluate the diffusion of drugs and particles. Adv Drug Deliv Rev 2018 -1-15;124:34-49.
- [19] Vitamin market set to hit £500m but where are the new users? Available at: <https://www.nutraingredients.com/Article/2020/10/23/Vitamin-market-set-to-hit-500m-but-where-are-the-new-users>. Accessed Dec 30, 2020.
- [20] The single supplement driving growth in a £500 million VMS market. Available at: <https://www.naturalbuyers.com/blog/editors-comment/the-single-supplement-driving-growth-in-a-500-million-vms-market>. Accessed Dec 30, 2020.
- [21] Dr Wolfgang Hogler, Dr Soma Uday. Vitamin D supplementation in the

United Kingdom: time for change. Available at: <https://www.birmingham.ac.uk/research/perspective/vitamin-d-supplementation.aspx>. Accessed Dec 31, 2020.

[22] Nair R, Maseeh A. Vitamin D: The "sunshine" vitamin. J Pharmacol Pharmacother 2012;3(2):118-126.

[23] Coronavirus and shielding of clinically extremely vulnerable people in England - Office for National Statistics [Internet]. Ons.gov.uk. 2021 [cited 5 January 2021]. Available from: <https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/conditionsanddiseases/bulletins/>

Tutor comment:

"It was an absolute pleasure working with T. Throughout our tutorials, she demonstrated extraordinary work ethic, communication skills, knowledge and intellect. For her final assignment, T. came up with an original business proposal for a biomedical 3D printing venture. In order to do this, she had performed a comprehensive literature search, and read several complex research papers. In addition, she presented her ideas in a manner which exceeds not only the A-level requirements, but also the undergraduate ones. I wish T. all the best for the rest of her education - I am sure that she will be very successful."

A research proposal attempting to secure a grant to fund the search for a new antibiotic from a leafcutter ant colony

Year 12, Key Stage 5

Pupil: **A. Fallows**

School: **University Technical College Norfolk, Norfolk**

Supervised by: **J. Hamilton**

Tutor University: **University of East Anglia**

Course Title: **Biochemical warfare in the environment – How ants help cure disease**

Grant proposal

Leaf cutter ants: the forefront of antibiotic discovery.

Antibiotic resistance is one of the 'biggest threats to global health, food security and development'.¹ Preventative measures are effective to a certain point – streamlining the approach of discovery is essential in managing resistance. Could be the *Streptomyces* hosted by leaf cutter ants provide us with the treatments we need?

1. Antibiotic resistance

Antibiotics are composed of substances designed to prevent the growth of bacteria or destroy it. However, when put under pressure, bacteria adapt to survive despite the use of an antibiotic that normally kills it. This is known as antibiotic resistance.²

1.1 Causes of antibiotic resistance

Mutation of bacterial DNA occasionally produces characteristics that provide resistance. This resistance spreads through horizontal gene transfer, which is where genes are obtained from another organism. Examples of developed characteristics include efflux pumps, which remove internal antibiotics before they take effect.³

Mutations will happen regardless of human activity; improper use of antibiotics speeds up the rate of resistance spread. Incomplete courses of antibiotics result in the strongest bacteria surviving to reproduce and horizontally transfer characteristics, creating a new strain of resistant bacteria that is more difficult to treat. On the other hand, taking antibiotics unnecessarily, for

viruses like colds, results in the antibiotic killing healthy gut bacteria instead. When bad bacteria enter the body later, they can gain resistance by horizontally transferring DNA from the dead bacteria. Additionally, the use of prophylactic antibiotics in agriculture induces multi-resistance, which is passed through direct contact with animals as well as when the meat is eaten.

1.2 Limiting the spread of resistance

Schemes like WHO's 'World Antibiotic Awareness Week'¹ aim to reduce improper use by informing the public about the consequences. They also utilise engaging activities for children, implementing knowledge from younger ages so misuse decreases in the next generation. Despite these efforts, resistance remains a growing problem.

Selective breeding programs can be utilised to ensure all livestock are of suitable size and strength for farming, removing the need for prophylactic antibiotics. Pairing this with regulations and fines ensures that animals are only treated when ill, therefore limiting water and produce contamination.

These tactics can only reduce resistance spread, not stop it. Therefore, funding research of new antibiotic is crucial, as the existing ones will become ineffective.

2. A source of new antibiotics

Antibiotics can be produced as a secondary metabolite, an organic compound that doesn't contribute to the development or cell function of the organism. They are synthesised by groups of genes known as biosynthetic gene clusters. 80% of modern antibiotics are produced by *Streptomyces*⁴, most of which are found in soil. However, *Streptomyces* can thrive in other environments such as sea sponges, plant roots and leaf cutter ant colonies. *Streptomyces* hosted by the ants will be the focus of this research.

Leaf cutter ants have been farming *Leucoagaricus gongylophorus* fungi for approximately 50 million years⁵ in specialised chambers for optimal temperatures. Chopped leaves are provided for nutrients. The fungi use enzymes to break down polymers in leaves that ants cannot, producing structures called gongylidia, containing lipids and sugars - these are the sole food source of the ants. When ingested, they transmit fungal decomposition enzymes through ant faecal matter that is transferred to the leaves, killing unwanted fungi spores.⁶

These fungal gardens are rigorously cleaned, ants use mandibles to cut out pest-infested areas, discarding them in a separate pile far from the nest. The ants secrete chitinases and lignocellulases to act as pest-repellents, alongside phenylacetic acid that acts as an anti-microbial. However, these defences are inadequate on their own. A pathogenic fungus called *Escovopsis* targets the fungal cultivar, aiming to take it over to gain the protection and nutrient source from the ants. This changes the colour of the garden from cream to a darker brown. *Escovopsis* do not produce the gongylidia that ants eat, therefore the nest can collapse completely if the spread is not contained.

To limit this, there is mutualism between the ants and defensive bacteria, *Streptomyces*. Mature ants enable bacterial growth on their chest plates, feeding it through glands. The chemicals provided by the ants are unconfirmed, however it is speculated to be sugar compounds, as bacteria use glucose in anaerobic respiration. In return, the bacteria produce antibiotics to prevent the ants from becoming ill and antifungals to inhibit the growth of *Escovopsis*. These secondary metabolites require a large amount of DNA code, so the growth of the *Streptomyces* is far slower than that of the fungi. *Streptomyces* is transferred horizontally; ants rub larvae on their chest plates to ensure all members of the colony have a form of *streptomyces*. They also do this to disinfect cut material in the waste pile, killing the pathogens so they cannot enter the nest again. Resistance spread is low in the colony, due to the variety of *Streptomyces* used. However, *Escovopsis* have co-evolved to increase its survival. *Escovopsis* use secondary metabolites to produce melinacidin IV and shearinine D - both of which kill bacteria. Shearinine D also affects the behaviour of the ants, using neurotransmitters to induce abnormal actions, such as preventing the removal of the *Escovopsis*.⁶

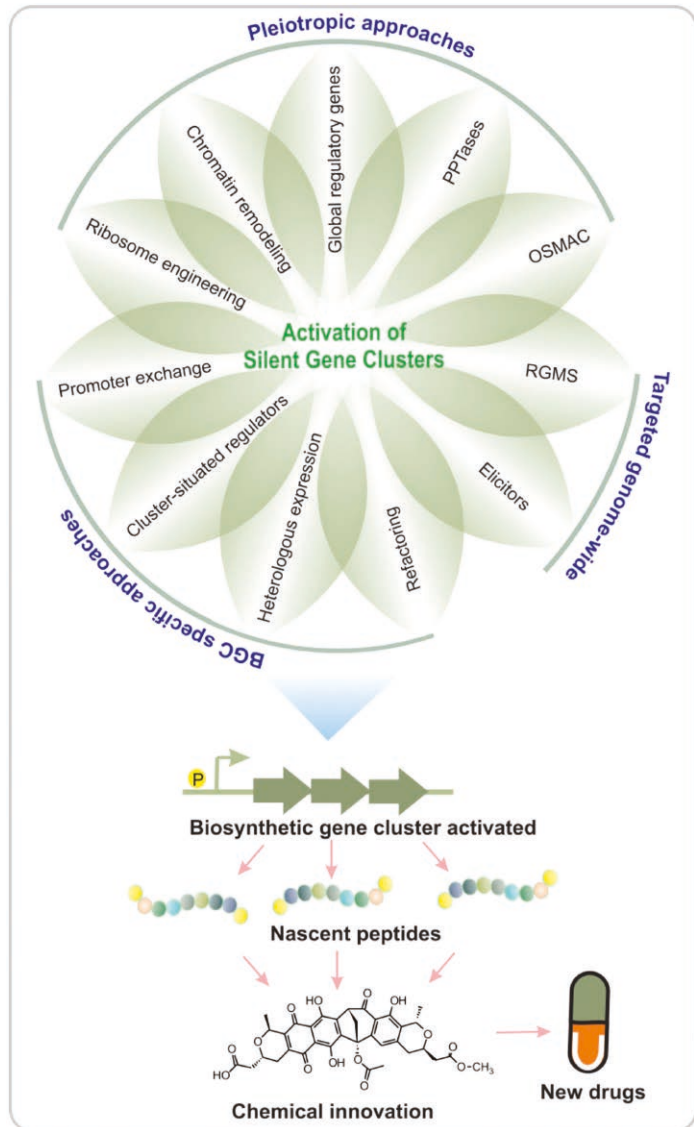


Figure One: A diagram demonstrating methods of unlocking cryptic gene clusters
https://www.ncbi.nlm.nih.gov/core/lw/2.0/html/tileshop_pmc/tileshop_pmc_inline.html?title=Click%20on%20image%20to%20zoom&p=PMC3&id=6190515_gr2.jpg

3. Approaches of antibiotic discovery

In secondary metabolite producing bacteria, the genes can produce more diverse compounds than what has currently been isolated. This means that some gene clusters are switched off under laboratory conditions⁷ – these are known as cryptic gene clusters and must be unlocked.

3.1 Pleiotropic approach

As shown in figure one, there are several pleiotropic approaches to unlocking cryptic gene clusters. One strain many compounds (OSMAC) is the most versatile and simple approach to perform.⁸

Procedure

Experiment is to be done under a flow hood. Pipette tips are sterilized using an autoclave, then sealed using tape that changes colour from yellow to black when opened. This ensures that there is no risk of contamination or the growth of unwanted microbes.

Three types of agar, SFM, MYM and FML, is prepared for culturing the *Streptomyces* and pathogens. Agar is to be evenly distributed between five labelled plates for each type, then left to set. The *Streptomyces* alone acts as a positive control, proving that the bacteria can grow in the environment. The pathogens alone act as a negative control for the same purpose. These controls ensure all results are valid.

Two pipettes are to be used for distribution; *Streptomyces* spores are placed using a ten-microliter pipette, while pathogens are placed using a one hundred microliter pipette. When operating the pipette, the first small click is used to pick up the substance and the second larger click is used to fully expel. Tips are to be replaced after each use to prevent uneven spread and contamination. The three plates out of each set that have *Streptomyces* written on the label should be distributed with two-microliters of *Streptomyces*. These plates are incubated at thirty degrees Celsius for five to twenty days to allow growth before the introduction of pathogens. After incubation, ten-microliters of the corresponding pathogen are added to the plates according to their labels. Distribution is now complete, plates are left to grow, being observed regularly.

Results analysis

Signs of growth should be documented. The presence of an antibiotic is shown by a clear ring around the fluffy *Streptomyces* spores. This ring can be extracted, then analysed using mass spectrometry, where the substance is ionised, accelerated to a certain kinetic energy, then deflected by a magnetic field. Heavier ions are deflected less, so the mass of the component can be determined by the shape of the arc produced.⁹ Alternatively High-performance liquid chromatography (HPLC) can be used, where a solvent is forced through a column at pressures of up to four hundred atmospheres. The substance analysed is put inside the column with a packing material, such as silica, and is separated as the solvent is pumped past.¹⁰

3.2 Drawbacks

Pleiotropic methods are non-specific to a gene cluster, hence the environments are not always guaranteed to produce an antibiotic. Additionally, rediscovery of known antibiotics is common. This means that discovery processes are time-consuming. A streamlined process could be derived from the bacterial defence system.

4. The bacterial defence system

Viruses attack bacteria to use them as hosts for DNA replication. If a bacterium survives this, it uses a system known as CRISPR/Cas9 to protect itself from future attacks.

4.1 CRISPR/Cas9

Clustered regularly interspaced short palindromic repeats (CRISPR) is an array of bacterial DNA that foreign genetic material is placed in, and CRISPR associated protein 9 (Cas9) is a protein which cleaves complimentary DNA stored in the CRISPR array, disabling invasive DNA.

The bacterium requires three components to recognize a cleavage target: CRISPR RNA (crRNA), trans-activating crRNA (tracrRNA) and the Cas9 nuclease. These components form a complex, which travels down the bacterial DNA, checking what is present. When a section of DNA complements the viral DNA stored in the array, the tracrRNA and crRNA bind to the site. If the protospacer adjacent motif (PAM) sequence, which follows the code: any base, guanine, guanine (NGG), is registered before the section, Cas9 cleaves it into a double strand break (DSBs). The PAM sequence ensures no vital DNA is cleaved.

4.2 Strand repair

Following the cleavage of the bacterial DNA carried out by Cas9, DNA is repaired through two methods: non-homologous end joining (NHEJ) and RecBCD dependent homologous recombination.

NHEJ

NHEJ is predominantly used to repair DSBs, limited DNA synthesis and the absence of repair templates, such as sister chromatids, enable this method to be performed faster compared to RecBCD dependent homologous recombination. However, the lack of precision causes NHEJ to occasionally create null alleles or place a stop codon unintentionally, which can be fatal. There are two classifications of NHEJ. Alternative NHEJ (α-NHEJ) depends on micro-homologies, which are identical short base sequences in DNA, that are exposed through end resection before ligation. Alternatively, classical NHEJ (c-NHEJ) minimises the use of end resection, so it offers more versatility.¹¹ The latter of the classifications, c-NHEJ, will be explained further, as it is dominant in most cells. Broken DNA ends are recognised by the Ku70/80 heterodimer, then the Ku scaffolds the addition of a protein kinase (DNA-PKcs), a two subunit DNA ligase (XRCC4-ligase IV) and other factors such as PAXX and XLF. This forms a complex to pair the DNA ends, which then ligates compatible DNA bases to repair the break.¹²

RecBCD

RecBCD is an enzyme present in *Escherichia coli* which repairs double strand breaks and degrades linear double-stranded DNA as a defence mechanism against invasive DNA, it is commonly accepted to behave similarly in *Streptomyces*. The current studies in this field are limited, further demonstrating the importance of research in this field, as fully understanding and replicating this process could be crucial in the discovery of new antibiotics.

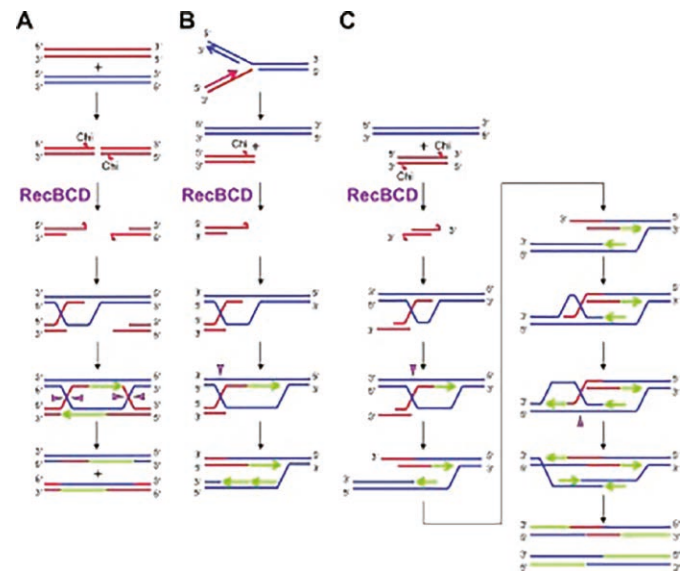


Figure two: A diagram demonstrating three pathways of RecBCD. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2593567/figure/f2/?report=objectonly>

Figure two demonstrates the variants of RecBCD dependent strand repair; A shows recombination dependent DSB repair, B shows recombination dependent replication and C shows integration of linear dsDNA. The two latter variants will not survive selective markers, so will not be elaborated on. As shown by the A pathway in figure one above, recombination dependent DSB repair requires a template to be combined with the bacterial DNA. The use of a template allows for specific alterations to be made, with a lower risk of fatal mutations. Bacteria use a sister chromatid as a template. The Rec enzymes form a complex with the broken DNA strand, allowing RecB and RecD to degrade the DNA until the cis-acting DNA sequence, known as the crossover hotspot instigator (Chi) sequence is detected. The Chi sequence is section of DNA which identifies the DNA as necessary, ensuring healthy DNA is not cleaved. Once the Chi sequence is reached, RecA coats the single strand DNA containing the Chi sequence, acting as a marker of where to cleave. Then, RecC cleaves the strand, allowing the template to be inserted via reciprocal break join. This creates a holliday junction of four DNA strands which is cleaved again. This results in a new bacterial genome and a discarded template, both of which are a combination of the original DNA used and the template.¹³

5. Using CRISPR/Cas9 to discover new antibiotics

CRISPR/Cas9 will be used to cleave known antibiotic producing genes, allowing cryptic gene clusters to be expressed. As this approach targets specific biosynthetic gene clusters, antibiotic rediscovery is less common, so success rate is higher. This has the potential to discover a

large variety of new antibiotics, alleviating the stress on existing ones and widening the market.

Procedure

The plasmids used in the gene editing of *streptomyces* are pCRISPomyces-1 and pCRISPomyces-2. Both types have codon-optimised SpCas9, a BbsI-flanked lacZ cassette for Golden Gate assembly of spacer sequences, an XbaI site for the addition of editing templates and a temperature-sensitive pSG5 origin. However, pCRISPomyces-2 is more efficient, as crRNA and tracrRNA are fused into a single synthetic guide RNA (sgRNA).¹⁴ This simplifies the insertion process, as the scaffold contains less substances.

sgRNA will be edited to target a certain sequence of known antibiotics, enabling a cryptic cluster to be expressed instead. The sgRNA, Cas9 protein and a genetic marker are to be constructed on a pCRISPomyces-2 scaffolding plasmid, then inserted into the cell via nucleofection. An electric shock is used to open the cell wall, allowing the scaffold into the cell, then a secondary shock will close the wall. This process is optimal compared to zinc-finger nucleases and transcription activator-like effector (TALE), as it can target material rapidly. The only requirement is the presence of an adjacent NGG PAM sequence.

When the plasmid reaches the targeted site following the process explained in section 4.1, Cas9 cleaves the DNA into a double strand break if the required PAM sequence is registered. The break is healed via RecBCD dependent strand repair, explained in section 4.2, however grRNA will be used a template.

Analysing results

Streptomyces spores will be cultivated similarly to the method outlined in OSMAC (section 3.1), however only SFM agar will be used, as it provides optimal conditions for *Streptomyces* growth. Following complete incubation, a ring of clearance around the *Streptomyces* indicates the presence of an antibiotic. Mass spectrometry or HPLC will be used to identify the compound for stability testing.

6. Conclusion

Cryptic biosynthetic gene clusters within *Streptomyces* dwelling in leaf cutter ant colonies may synthesise an abundance of new antibiotics. Pleiotropic approaches are not capable unlocking these clusters quickly, we will use CRISPR/Cas9 to target known clusters, allowing cryptic clusters to be expressed. If analysis shows the presence of antibiotics, the compound can be trialled. As this approach is biosynthetic gene cluster specific, the issue of rediscovering antibiotics is reduced. This research is vital to combat the rapid spread of antibiotic resistant bacteria, which will cause devastating illnesses that are expensive to treat.

Endnotes

- 1 WHO, 'Antibiotic resistance', WHO website, 5th February 2018. <https://www.who.int/news-room/fact-sheets/detail/antibiotic-resistance>
- 2 Dr Marian Bos (VMD), Dr Berit Muller-Pebody (PHE), Dr Ana Vidal (VMD) and Rebecca Guy (PHE), 31st January 2019, UK One Health Report: Joint report on antibiotic use and antibiotic resistance 2013-2017, page 77. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/775075/One_Health_Report_2019_v45.pdf
- 3 Laura Christine McCaughey, 'How Does Bacteria Become Resistant To Antibiotics?', The Conversation, 10th June 2016. [<https://sciencebeta.com/bacteria-become-resistant-antibiotics/>]
- 4 Rudi Emersonde Lima Procópio, Ingrid Reisda Silva, Mayra KassawaraMartins, 'Antibiotics produced by *Streptomyces*', science direct website, 14th August 2012 <https://www.sciencedirect.com/science/article/pii/S1413867012001341>

5 Dr Jennifer Tsang, 'The Leaf-cutter Ant's 50 Million Years of Farming', American Society For Microbiology, 26th September 2017 <https://asm.org/Articles/2017/September/the-leaf-cutter-ant-s-50-million-years-of-farming>

6 Daniel Heine, Neil Holmes, Sarah Worsley, 'Chemical warfare between leafcutter ant symbionts and a co-evolved pathogen', Nature Communications, 7th June 2018 <https://www.nature.com/articles/s41467-018-04520-1>

7 Fang Yun Lim, James F Sanchez, Clay C C Wang, Nancy P. Keller, 'Toward Awakening Cryptic Secondary Metabolite Gene Clusters in Filamentous Fungi', PMC website, available 7th July 2013 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3703436/>

8 Bikash Baral, Amir Akhgari, Mikko Metsä-Ketelä, 'Activation of microbial secondary metabolic pathways: Avenues and challenges', PMC website, 12th September 2018 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6190515/>

9 Jim Clark, THE MASS SPECTROMETER, <https://www.chemguide.co.uk/analysis/masspec/howitworks.html> [updated March 2019, accessed February 2020]

10 Im Clark, HIGH PERFORMANCE LIQUID CHROMATOGRAPHY – HPLC, <https://www.chemguide.co.uk/analysis/chromatography/hplc.html> [updated June 2016, accessed February 2020]

11 Satish K Tadi, Carine Tellier-Lebègue, Clément Nemoz, Stéphane Audebert 'PAXX Is an Accessory c-NHEJ Factor that Associates with Ku70 and Has Overlapping Functions with XLF' cell reports webpage, 26th September 2016 <https://www.cell.com/cell-reports/pdf/S2211-1247%2816%2931248-7.pdf>

12 David Wyatt and Dale Ramsden, 'CRISPR 101: Non-Homologous End Joining' addgene blog webpage, 16th April 2015 <https://blog.addgene.org/crispr-101-non-homologous-end-joining>

13 Mark S Dillingham and Stephen C Kowalczykowski, 'RecBCS Enzyme and the Repair of Double Stranded DNA Breaks', PMC website, December 2008. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2593567/>

14 Ryan E. Cobb, Yajie Wang and Huimi Zhao, 'High-Efficiency Multiplex Genome Editing of Streptomyces Species Using an Engineered CRISPR/Cas System' online ACS publication, 19th June 2015 <https://pubs.acs.org/doi/pdf/10.1021/sb500351f>

Tutor comment:

"A. was an absolute pleasure to work with, she was always engaged with the programme and asked interesting, challenging questions. The grant proposal A. produced was of superb quality, using appropriate language and written with excellent English skills. Throughout, A. was able to grasp complex scientific topics with ease, going above and beyond the requirements of the course to bring in new concepts and ideas with ease – working at a level worthy of an undergraduate."

How a new immunotherapy could be beneficial as a treatment option over existing treatment?

Year 12, Key Stage 5

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School: Oasis Academy South Bank, Lambeth
Supervised by: H. Roddy
Tutor University: University College London
Course Title: Immunotherapy: From catching a cold to curing cancer

Discuss how a new immunotherapy could be beneficial as a treatment option over existing treatment

Chimeric antigen receptor T-cell therapy is a type of cellular immunotherapy, in which T cells are genetically engineered to express artificial chimeric antigen receptors (CARs) – thus able to recognise specific antigens on cancer cells. This relatively new cancer treatment delivers superior efficacy as a targeted therapy; as such, it is more precise in the way it attacks cancer cells as opposed to other treatments such as chemotherapy which are not able to distinguish between a cancer and a somatic cell: hence kill both. Once CAR-T cells proliferate in patients they initiate immune memory and treat stagnant and metastatic lesions - identified through continual monitoring. Through this, they directly suppress the population of cancer cells (Lorente, 2016). Cancer is a non-communicable disease where cells in a specific area of the body proliferate; it initially develops when mutations occur in the DNA of cells (which impedes the body's normal growth

function). Herein, this essay aims to discuss the novelty of CAR T-cell immunotherapy; evaluate its advantages and disadvantages; examine its implementation in the treatment of leukaemia by reviewing clinical results reflecting the investigational use of CD19-targeted CAR T-cell therapeutics in patients with B-cell hematologic malignancies (Park, Geyer, & Brentjens, 2016, p. 3312). Justifying, ultimately, why its adoption in the use of treating leukaemia (a haematological malignancy) would be particularly beneficial.

Immunotherapy utilises the body's own immune system to hinder, modulate, and eradicate malignancies present in the body. Hence, immunotherapies are sometimes called biological therapies. The different types of immunotherapy include monoclonal antibodies (MABs), vaccines, cytokines and CAR T-cell therapy. Where each one has its own, specific aim: MABs trigger and help the immune system attack cancer by recognising and attaching themselves onto specific antigens present on the cancer cells; vaccines stimulate the immune system by helping it recognise foreign antigens present on cancer cells; cytokines are proteins in the body which help boost the immune system, and lastly, CAR T-cell therapy uses genetically engineered T-cells to recognise and kill cancer cells. Immunotherapy is an advantageous treatment; it can be an effective treatment option when others prove to be inefficacious; its usage in addition to other therapies such as chemotherapy, can improve the other treatment's effectiveness; it often produces fewer side effects than other treatments as it does not attack the healthy cells in the body; it reduces the likelihood of cancers, such as leukaemia, returning by encouraging immunological memory.

Henceforth, leukaemia is a type of blood cancer that impairs the body's ability to fight of infection (via the immune system). It emerges in the bone marrow (the spongy, cancellous tissue) where haematopoiesis occurs – the production of blood cells. The three types of blood cells made are: white blood cells, red blood cells and platelets (cell fragments) (Harvard Health Publishing, 2014). Whilst polycythaemia vera is the blood cancer affecting red blood cells and thrombocytopenia refers to a dangerously low platelet count, leukaemia refers to the cancer affecting white blood cells. This type of cancer has the tendency to affect lymphocytes and granulocytes (the two major types of white blood cells). Leukaemia commencing via cancerous lymphocytes is known as lymphocytic leukaemia, whereas leukaemia via cancerous granulocytes is myelogenous (or myeloid) leukaemia. Thus, the four main types of leukaemia are: acute lymphocytic leukaemia (ALL), chronic lymphocytic leukaemia (CLL), acute myelogenous leukaemia (AML) and chronic myelogenous leukaemia (CML). The first categorisation (acute or chronic) indicates the speed of development of the leukaemia. Acute leukaemia tells us the leukaemia has progressed rapidly and aggressively, hence this type usually requires immediate treatment. Chronic leukaemia progresses more slowly, over a period of time. For this reason, it occurs more frequently in the age range 60-65. The second categorisation tells us which white blood cell (lymphocytes or granulocytes) it affects.

There are around 10,100 new cases of leukaemia in the UK, every year (Cancer Research UK, n.d.). Leukaemia occurs in both adults and children, where the most common childhood leukaemia is acute lymphocytic leukaemia (ALL) - acute myelogenous leukaemia (AML) being the second most. The most common adult leukaemia's are acute lymphocytic leukaemia (AML) and chronic lymphocytic leukaemia (CLL). Although leukaemia is unpreventable, limiting exposure to certain risk factors can help reduce the likelihood of its development. These risk factors include previous use of chemotherapy or radiotherapy, a family history of leukaemia, exposure to extreme levels of radiation (this includes previous radiotherapy treatment), smoking and other forms of exposure to benzene and having a blood disorder or certain genetic conditions (e.g. Down's syndrome).

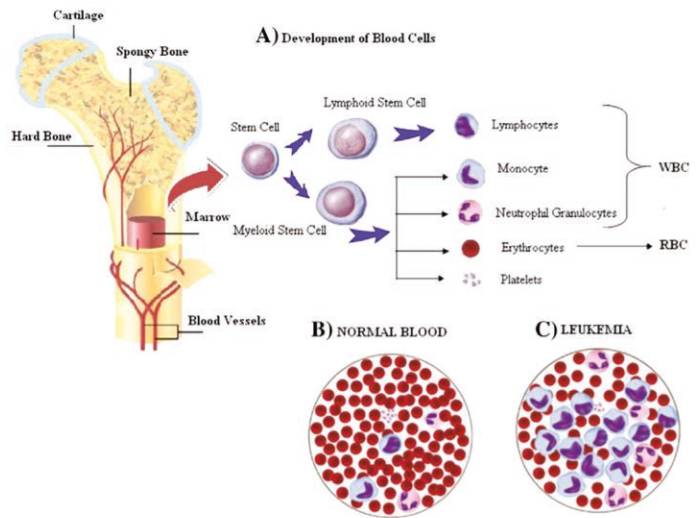


Fig. 1. A. Development of blood cells from bone marrow, B. normal blood, C. blood during leukemia.

Source: (Soni & Yadav, 2015, p. 157)

The development of leukaemia is summarised in the image above.

The pathophysiology differs slightly between all four types of leukaemia. Both acute lymphoblastic and acute myeloid leukaemia originate due to a series of acquired genetic aberrations. Malignant transformation usually occurs at the pluripotent stem cell level - these are self-renewing cells that do such by indefinitely dividing. Abnormal proliferation, clonal expansion, aberrant differentiation, and diminished apoptosis lead to the replacement of normal blood elements with malignant cells (Emadi & Law, 2020). During chronic lymphocytic leukaemia, CD5+ B cells undergo malignant transformation. These cells are continually activated by the acquisition of mutations that lead to monoclonal B-cell lymphocytosis (MBL). Further accumulation of genetic abnormalities and subsequent oncogenic transformation of monoclonal B cells leads to CLL (Emadi & Law, 2020). Finally, chronic myeloid leukaemia ensues when an abnormal pluripotent hematopoietic progenitor cell initiates excessive production of all myeloid lineage cells, primarily in the bone marrow but also in extramedullary sites (e.g., spleen, liver) (Emadi & Law, 2020).

Cancer treatment aims to cure the cancer, allowing patients to receive a good quality of life. If the cancer

is incurable, treatments are used to shrink its growth or slow its rate of progression. Cancer treatment is the use of therapies to cure, shrink or prevent the rate of progression of the cancer. Due to the multitude of available treatments, the one used is dependent on the type of cancer present and its severity. The three types of treatment are: primary, adjuvant and palliative. Primary treatment removes the cancer in its entirety or eradicates all its cells. Adjuvant treatment eliminates any cancer cells that remain after primary treatment, thus reducing the likelihood of it relapsing. Palliative treatment helps relieve side effects of (primary and adjuvant) treatment but also symptoms caused by the cancer. Any cancer treatment can be used as a primary or adjuvant treatment, whereas surgery, radiation, chemotherapy and hormone therapy are examples of treatment used to relieve symptoms during palliative treatment (Mayo Clinic, n.d.).

When initially diagnosing leukaemia, a complete blood count (CBC) will be conducted by a doctor to determine its presence. An indication of it could also be abnormally low levels of white blood cells, red blood cells or platelets. A biopsy is then conducted on the bone marrow to determine the type of leukaemia present. The patient is checked for any symptoms of the condition and is arranged to have a blood test. If an abnormally high number of white blood cells is present or if the patient has a low blood count, they are referred to a haematologist. To confirm the presence of leukaemia a bone marrow transplant is then conducted: a sample of bone marrow is taken and examined under a microscope. Further testing can be conducted to determine which of the four types of leukaemia is present, some of this testing can include: genetic testing, scans, a lumbar puncture, cytogenetic testing and immunophenotyping (NHS, n.d.).

After diagnosis, the type of treatment available depends on the type of leukaemia present; acute lymphoblastic leukaemia is treated after a few days of its diagnosis due to its rapid development. Furthermore, a chemotherapy medicine called methotrexate is given to eliminate the leukaemia cells in the bone marrow. After treatment common side effects include sickness, diarrhoea, loss of appetite, ulcers (mouth), tiredness, skin rashes, infertility and hair loss. There are many different types of treatment for cancer; whichever treatment used is dependent on the type of cancer and how advanced it is. Additionally, many people have a combination of treatments as such from the following: surgery, radiation therapy, chemotherapy, immunotherapy, targeted therapy, hormone therapy, stem cell transplant and precision medicine (National Cancer Institute, n.d.). Consequently, cancer treatment is often multidisciplinary because patients usually undergo several, different types of treatments - all of which are complex and require professionals in subject-specific areas.

Furthermore, some cancer treatments do not always fit easily into a certain type of treatment because some drugs or treatments work in multiple ways, thus belong to more than one category, for example, some immunotherapies are known as targeted therapies such

as monoclonal antibodies. Leukaemia is commonly treated with targeted therapy, but the most frequently used treatment is chemotherapy. It is mainly used for people with acute leukaemia as it targets rapidly dividing cells. Chemotherapy uses cytotoxic drugs to treat cancer; a single drug or a combination of different drugs are administered into the patient. A combination of chemotherapy drugs is favourable as it can decrease the resistance of the leukaemia. In addition, early administration of two or more drugs at a given time allows for all the medication to be administered into the patient as soon as possible. At a molecular level, multiple drugs can simultaneously target several processes in the growth stages of leukaemia; this can increase the likelihood of its elimination (Eldridge, 2019). For instance, patients with acute myeloid leukaemia experience a mutation in the FLT3 gene which is responsible for helping cells grow. Midostaurin (Rydapt) and Gilteritinib (Xospata) are drugs which block FLT3 and other proteins on cancer cells, which aid them in growth. However, chemotherapy can cause side effects to accumulate if several drugs are used. Drug interaction can also occur and cause further side effects, consequently, difficulty arises in trying to identify which of the medications is responsible for such. However, the severity of the medication may lead to its discontinuation (Eldridge, 2019). After undergoing chemotherapy, approximately 40-45% of adults younger than 60 years survive longer than 5 years, however, in older patients, fewer than 10% survive (Seiter, n.d.).

Chimeric antigen receptor T-cell therapy involves reprogramming the patient's T-cell which are then used to target their cancer. During CAR T-cell therapy, T-cells are collected from patients through apheresis; this is a medical procedure in which blood is withdrawn, separated into individual components before the appropriate one is removed. The remaining blood is returned to the body. These cells are then reconfigured in a laboratory or a drug manufacturing facility during which they are modified to express chimeric antigen receptors (CARs) on their surface. This is done by the introduction of DNA into the T cells. The cells produced are known as CAR T-cells and are then multiplied in their numbers, frozen and transported for usage. Prior to receiving the CAR T-cells, lymphodepletion is performed, normally by irradiation, in which the number of lymphocytes in the blood is reduced. The CAR T-cells that return proliferate, identify and destroy cells that present the targeted antigen on their cell membranes, for example, the CD19 antigen is the most common biomarker used in CAR T cell therapy as it is expressed frequently on the surface of malignant B cells, on all B cells (excluding plasma cells) and follicular dendritic cells (Leukemia & Lymphoma Society, n.d.).

CAR T-cell therapy is emerging as a promising, beneficial and highly effective treatment for leukaemia. Moreover, unlike other cancer treatments, it has a relative short treatment time – its completion involves an administered infusion that requires (at most) two weeks of inpatient care (Rutgers, n.d.). CAR T-cell therapy can also have long-term benefits. As these modified cells can remain in the body for an extended period, they continue identifying and destroying leukaemia cells, if a relapse

occurs. For example, two-thirds of childhood acute lymphoblastic leukaemia patients who received CD19 CAR T-cell therapy were still in remission after six months. These are patients whose cancers were deemed very aggressive and for whom other standards of care had failed (The University of Texas MD Anderson Cancer Center, 2018).

Instead of the “1-dose-for-all” approach, scientists are now looking for safe doses of CAR T-cells with optimal effectiveness (Park, et al., 2016). Additionally, scientists have recognised barriers which limit the widespread use of CAR T-cell therapy; these barriers are the side effects, namely, cytokine release syndrome (CRS) and neurologic toxicity. Therefore, a profound understanding of the pathophysiology of CRS and neurotoxicity can dramatically increase the quality of CAR T-cell therapy (Brudno & Kochenderfer, 2019, p. 45). From reviews of CD19 targeting CAR T cells it is also apparent that a uniform and standardised definition of CRS and neurological side effects specific and relevant to CAR T-cell therapy needs to be created so that the toxicities of different treatments can be compared with each other (Park, et al., 2016).

CAR T-cell therapy is avowed for its complexity and potential risks but still showcases itself as the new potential treatment for leukaemia and other haematological malignancies. Moreover, with the success of CD19, the last decade has shown an explosion of new targetable biomarkers on a range of other human malignancies. These surface targets have made it possible to provide directed, specific therapy that reduces healthy tissue destruction and preserves the patient's immune system during treatment, reducing the severity of side effects (Townsend, et al., 2018). The higher precision of CAR T-cells mean they can attack cancer cells that express the targeted antigen, however, problem arises when these cells mutate. This means that the re-engineered T-cells can no longer unleash an attack on these cancerous cells whom of which have mutated and express a different antigen, thus, hiding themselves from the mechanisms of the immune system. Unlike other cancer treatments, CAR-T cells initiate immune memory and can treat stagnant and metastatic lesions; these are identified through continual monitoring when they remain long-term in the body. Therefore, they directly suppress the population of cancer cells without affecting normal somatic cells, especially in the occurrence of a relapse.

CAR T-cell therapy also has a relatively short treatment time when compared to other cancer treatments. This means that patients can often recover quicker and easier through this procedure. In numerous clinical trials it has been shown that 70–90% complete remission can be achieved in paediatric and adult patients treated with CD19-directed CAR T-cells. However, 30–60% of patients relapse after CAR treatment, and among those, 10–20% are CD19-negative relapse (Xu, et al., 2019). Car T-cell therapy can also produce serious, life-threatening effects, two of which is Cytokine-Release Syndrome (CRS) and neurotoxicity. The symptoms of CRS include mild flu-like symptoms to more serious ones such as hemophagocytic lymphohistiocytosis and renal

insufficiency. Common symptoms of neurotoxicity can include aphasia, hallucinations, and unresponsiveness. Side effects, like these, can decrease patients' quality of life which is what cancer therapy aims to do the opposite of.

To conclude, CAR T-cell therapy could become the most beneficial treatment option over existing ones for leukaemia such as chemotherapy (currently the most popular), stem-cell transplantation and radiation therapy as it can be effective when other options are not. CAR T-cell therapy has provided a miraculous solution to patients whose leukaemia had either relapsed several times or failed to respond to standard therapies. Some of these patients achieved remission after receiving CAR T-cell therapy. This immunotherapy also produces fewer side effects than other treatments by not attacking healthy, somatic cells. However, the severity of its side effects can deplete its likeness.

References

Brudno, J. N. & Kochenderfer, J. N., 2019. "Recent Advances in CAR T-Cell Toxicity: Mechanisms, Manifestations and Management". Blood reviews, Volume 34, pp. 45-55.
Cancer Research UK, n.d. Leukaemia (all subtypes combined) statistics. [Online]
Available at: <https://www.cancerresearchuk.org/health-professional/cancer-statistics/statistics-by-cancer-type/leukaemia#heading-Zero> [Accessed 2 January 2021].
Eldridge, L., 2019. What Is Combination Chemotherapy?. [Online]
Available at: <https://www.verywellhealth.com/what-is-combination-chemotherapy-2248995> [Accessed 2 January 2021].
Emadi, A. & Law, J. Y., 2020. Acute Lymphoblastic Leukemia (ALL). [Online]
Available at: <https://www.msmanuals.com/professional/hematology-and-oncology/leukemias/acute-lymphoblastic-leukemia-all> [Accessed 30 December 2020].
Emadi, A. & Law, J. Y., 2020. Chronic Lymphocytic Leukemia (CLL). [Online]
Available at: <https://www.msmanuals.com/professional/hematology-and-oncology/leukemias/chronic-lymphocytic-leukemia-cll> [Accessed 30 December 2020].
Emadi, A. & Law, J. Y., 2020. Chronic Myeloid Leukemia (CML). [Online]
Available at: <https://www.msmanuals.com/professional/hematology-and-oncology/leukemias/chronic-myeloid-leukemia-cml> [Accessed 30 December 2020].
Harvard Health Publishing, 2014. "Leukemia". [Online]
Available at: <https://www.health.harvard.edu/cancer/leukemia> [Accessed 23 December 2020].
Leukemia & Lymphoma Society, n.d. Chimeric Antigen Receptor (CAR) T-Cell Therapy. [Online]
Available at: <https://www.lls.org/treatment/types-of-treatment/palliative-care> [Accessed 31 December 2020].
Lorente, A., 2016. The Promise of Chimeric Antigen Receptor (CAR) T-Cell Therapies for Cancer Treatment. [Online]
Available at: <https://www.prescouter.com/2016/09/car-t-cell-therapies-cancer-treatment/> [Accessed 23 December 2020].
Mayo Clinic, n.d. Cancer treatment. [Online]
Available at: <https://www.mayoclinic.org/tests-procedures/cancer-treatment/about/pac-20393344> [Accessed 31 December 2020].
National Cancer Institute, n.d. Types of Cancer Treatment. [Online]
Available at: <https://www.cancer.gov/about-cancer/treatment/types> [Accessed 29 December 2020].
NHS, n.d. Diagnosis - Acute myeloid leukaemia. [Online]
Available at: <https://www.nhs.uk/conditions/acute-myeloid-leukaemia/diagnosis/> [Accessed 31 December 2020].
Park, J. H., Geyer, M. B. & Brentjens, R. J., 2016. "CD19-Targeted CAR T-Cell Therapeutics for Hematologic Malignancies: Interpreting Clinical Outcomes to Date". Blood, pp. 3312-3320.
Rutgers, n.d. Advantages of CAR-T Cell Therapy. [Online]
Available at: <https://www.cinj.org/patient-care/advantages-car-t-cell-therapy> [Accessed 31 December 2020].
Seiter, K., n.d. How do survival rates for acute myeloid leukemia (AML) vary by age?. [Online]
Available at: <https://www.medscape.com/answers/197802-63224/how-do-survival-rates-for-acute-myeloid-leukemia-aml-vary-by-age> [Accessed 2 January 2021].
Soni, G. & Yadav, K. S., 2015. Applications of nanoparticles in treatment and diagnosis of leukemia. Materials Science and Engineering C, Volume 47, pp. 156-164.
The University of Texas MD Anderson Cancer Center, 2018. 9 things to know about CAR T-cell therapy. [Online]
Available at: <https://www.mdanderson.org/cancerwise/car-t-cell-therapy--9-things-to-know.h00-159221778.html> [Accessed 3 January 2021].
Townsend, M. H., Shrestha, G., Robison, R. A. & O'Neill, K. L., 2018. The Expansion of Targetable Biomarkers for CAR T Cell Therapy. Journal of Experimental & Clinical Cancer Research.
Xu, X. et al., 2019. "Mechanisms of Relapse After CD19 CAR T-Cell Therapy for Acute Lymphoblastic Leukemia and Its Prevention and Treatment Strategies". Frontiers in Immunology.

Tutor comment:

"I feel very fortunate that Oasis Academy South Bank was one of my first tutor placements. I felt very supported and welcomed by the lead teacher and the pupils showed great enthusiasm and engagement after what has been a very challenging couple of terms. All the pupil's essays were of a great standard however, E.'s was simply outstanding, and I believe that it would be well placed amongst a first-year university cohort. She showed excellent knowledge of the subject taught and demonstrated much higher-level thinking, alongside a mature writing style. Her additional research was carefully chosen and incorporated well. I am aware that my course outlines a scientific topic which would be a challenge for most scientists to understand but the pupils I taught at Oasis really gave it a lot of effort, and this is particularly exemplary in this essay."

Can fossils predict the future?

Year 12, Key Stage 5

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Supervised by: E. Dunne
Tutor University: University of Birmingham
Course Title: Can fossils predict the future?

Fossils have a pivotal role in the explanation of what past biodiversity on Earth was like, providing scientists with information such as a species' diet, locomotion, and lifestyle. For a new reader, fossils are explored particularly in the field of palaeontology which is the scientific study of prehistoric species, and allows scientists to investigate fossils as a way to view past life on Earth. These fossils can be recovered in various ways after the occurrence of fossilisation, for example as body, trace, or terrestrial fossils. However, fossilisation is rare, and the report aims to consider this whilst the fossil record is explored as a method to investigate how fossils can be used to predict the future. Alongside this, I will explore how sampling biases can affect data within the fossil record as well as present my findings of what methods we need to focus our efforts on in order to conserve modern species in what may be the sixth mass extinction. Since it has been noted that current climate change is similar to that of past events leading to mass extinctions, such as the first mass extinction which had derived from the absorption of carbon dioxide from the atmosphere, cooling the planet down drastically [1], large datasets can also be used to explore the changing patterns of biodiversity over changing geological time periods up to the modern-day. Thus, I will investigate in this report how we can compare and contrast past biodiversity through the use of fossils in order to reach a conclusion on whether or not fossils can be used to better help predict and prepare for future biodiversity crises.

In this report, I will focus primarily on the use of amphibians as an example of how a species' evolutionary history can provide insights into the future circumstances of its species. Amphibians first appeared in the fossil record 368 million years ago, dated approximately as the earliest known amphibian fossil (Elginerpeton) was discovered in Late Devonian rocks in Scotland [2]. However, it has been noted that the first true amphibians we refer to appear in the late Carboniferous period, approximately 300 to 310 million years ago [3].

The first species of the group appeared to look like large animals with large, wide heads and short legs. They had an aquatic (or, semi-aquatic) lifestyle and moved around using mainly their muscular tail with rays similar to that of fish. Having evolved from lobe-finned fish named sarcopterygians, amphibians were the first tetrapods to traverse the land, leading the way for later vertebrates to follow, but the first recorded amphibians were labyrinthodonts, which meant that their teeth had had layers of dentin and enamel in a structure similar to a maze. Early amphibians first began to resemble modern species in body functions rather than appearance as these ancestors presented a lateral line, which was a sensory organ that enabled fish to detect vibrations and movements underwater, as well as being able to breathe through their skin (however, modern species lost their ancestral cosmoid scales). Early amphibians also laid eggs in water, of which tadpoles emerged, before undergoing a metamorphosis process into adulthood [4].

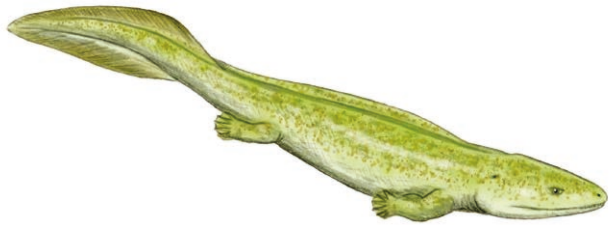


Figure 1. Elginerpeton pancheni, an early tetrapod from the Late Devonian of Scotland, pencil drawing, by Nobu Tamura, https://upload.wikimedia.org/wikipedia/commons/b/bf/Elginerpeton_BW.jpg

These ancestors began to resemble modern species appearance-wise 350 million years ago after their evolution from fish as they have not changed much in morphology since, having four limbs and sharing a similar gait to modern salamanders as they move by bending their bodies side to side (lateral undulation) [5]. However, they especially gave rise to the three main modern species we know of today after a global mass extinction at the end of the Permian period, which my research has found could be due to a series of volcano eruptions and its debris which blocked out the sun, or, as scientists have debated, it was the result of global climate change [6] [7]. Amphibians managed to survive, however, due to living in freshwater ecosystems which shielded them and the accumulation of run-off nutrients from the land proved to be advantageous [8]. Another mass extinction occurred 65 million years ago, where only five amphibian species survived, leading to the majority of frog and salamander species alive today [9], with more than 7650 amphibian species estimated to exist today [10], and this was due to a massive asteroid colliding with the Earth, devastating the global environment, but also giving rise to a collection of new ecological niches such as new vegetation which, in turn, as my research has discovered, allowed more amphibians to survive as new species began to form at the end of the Mesozoic during the Cretaceous period [11].

Modern amphibians (lissamphibians) share several traits unique from any other species: they typically have moist skin, rely mostly on skin-surface respiration, possess a

double-channelled hearing system, green rods in their retinas to differentiate hues, and, finally, have two-part teeth. However, the three existing groups differ in their appearances, as frogs are tailless and slightly squat with hind limbs built for jumping whereas caecilians are limbless and adapted for burrowing. Salamanders and newts also have tails and four legs of similar size but are less specialised in body form than the others. Amphibians also occur widely throughout the world, absent in only Antarctica, the most remote of oceanic islands, and extremely dry deserts [12]. This diversity in appearance may allow for a larger proportion of amphibian species to survive current biodiversity crises due to past evolutions of species requiring amphibians to adapt to the changing environments, and so this could prove essential to the future of these species. Some studies have shown that amphibians were able to survive as a result of new habitats and ecological niches being introduced at the end of biodiversity crises of which amphibians could expand into alongside flowering plants and huge changes in vegetation [11]. However, this may not mean current amphibian species will be able to survive current biodiversity crises the same way.

Figure 2 shows that amphibian diversity has been, overall, increasing over hundreds of millions of years, but there have been dips, or troughs, and peaks in the data coinciding with potentially huge losses and gains of amphibian populations, or these are the areas in which sampling biases have had most devastating an effect on the fossil record, influencing this trend. This is a key area of the investigation in which I shall explore further next in the report.

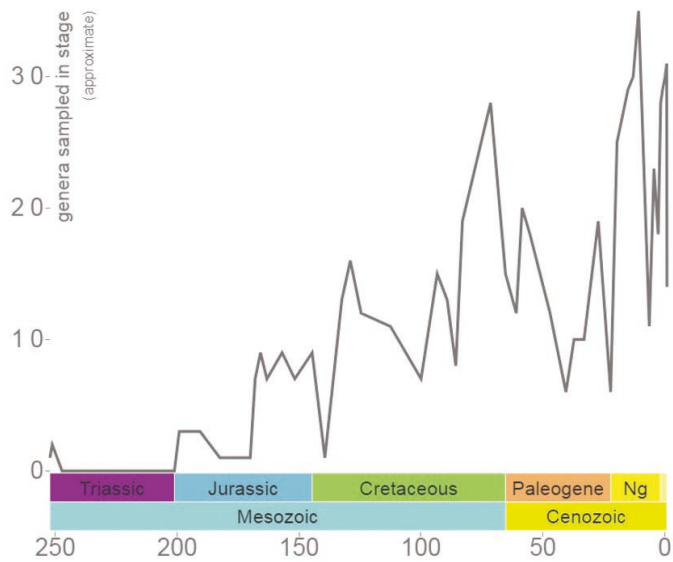


Figure 2. A diversity curve for lissamphibians, Palaeobiology Database

There are a plethora of sampling biases that may affect the data and the following discussed are the main ones affecting the diversity curve of Lissamphibia (Figure 2).

According to the fossil data present in the Palaeobiology Database, which can be found in Figure 3 below [13], amphibian fossils are primarily found in Europe and North America, although large collections can be found in Asia and South America. China has been known recently to

have uncovered thousands of fossils from the Cambrian Explosion, which is exciting but would not contain amphibian fossils, unfortunately [14]. Fossil data being primarily found in these areas is perhaps the result of the rock types amphibian fossils are found in, for example, they cannot be found in Devonian or Mississippian rocks in Ohio but can be found in Pennsylvanian and Permian rocks [15]. These geographical biases would affect the fossil record, and thus our interpretations, as more fossils would appear in these specific areas rather than anywhere else in the world which could construe the data as some fossils may have simply not been discovered yet or places where amphibian fossils could be found cannot be due to building regulations over these areas.

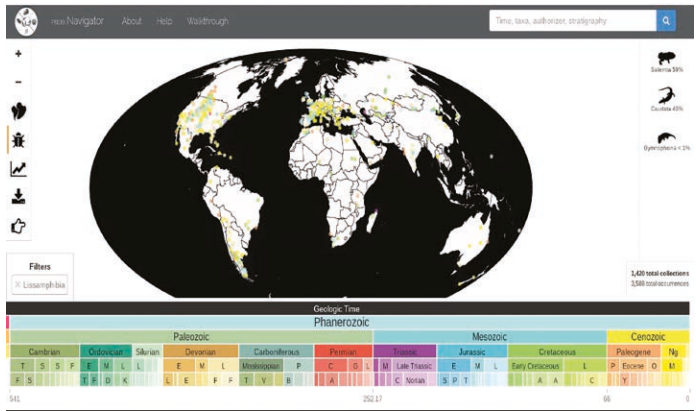


Figure 3. A world map of the amphibian fossil record, Palaeobiology Database [13]

Amphibians are not always particularly popular or famous, but they are well-studied as amphibians have been used as a way to collect information about all animals due to their use in a plethora of different studies, for example, taxonomic diversity which is suited for comparative studies as well as in physiological studies aimed at providing new insights into evolutionary biology [16]. Thus, amphibian fossils may also be of key preference to researchers. Examples of such studies recently include the comparison of two methods used to detect amphibians in terrestrial environments [17] and the exploration of Iberian amphibian species' response to recent climate change through amphibian distribution [18]. These preferences could affect the fossil record by perhaps finding more inconsistencies in the data as more researchers interpret their findings differently, however, peer reviews would reduce this chance of skewing the data.

It seems that the diversity of amphibians has increased towards the present, reinforced by the increase in fossil abundance towards the modern-day, despite being quite a late accumulation of extant lineage diversity [19]. However, this could be due to fossil scarcity as their current diversity cannot be tracked through the little data the fossil record contains of amphibians, and this could potentially affect the data underlying the diversity curve (Figure 2).

These sampling biases affect our interpretations of amphibian fossils as they affect the fossil record, thus it may not be ideal to use the fossil record. However, the

fossil record is still useful and important as it can allow researchers to view what occurred in the past and the information discovered is still significant to this past biodiversity as it can provide evidence for, or disprove, future and current theories.

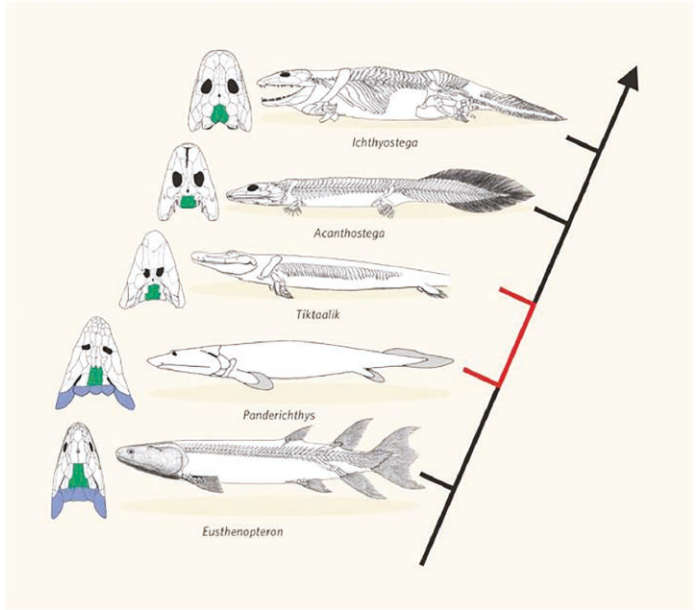


Figure 4. A diagram showing the documentation of the transition of terrestrial amphibians from fish in the fossil record, <http://eweb.furman.edu/~wworthen/bio111/evodevo.html>

The fossil record can also be useful by understanding how fossils can help researchers to investigate how ancestors of species managed to survive past extinction events as well as exactly what species didn't survive in order to recognise the traits or environments current species need to have to survive future extinction events. For example, amphibians survived the End-Cretaceous mass extinction whereas dinosaurs did not, and my research suggests this could have resulted from slow egg incubation periods dinosaurs' experiences, perhaps putting them at that risk of extinction [20].

The current climate change crisis has meant that not only amphibian species, but other living organisms are being affected as biomes are changing rapidly. It has been determined that the biggest emerging threats to biodiversity include, but are not limited to: ocean fish farming, which has been found to pollute the environment with nutrients and other chemicals but adverse impacts can be reduced through recirculating aquaculture systems; habitat loss and degradation, which force animals to relocate and results in biodiversity reduction; and, epidemic and infectious diseases which can affect wildlife [21][22]. There are approximately 8100 (an uploaded of 8104 species in an amphibian database) species of amphibians currently existing in the world [23][24] and amphibians can be found on almost every continent but the largest total of species of amphibians reside in Brazil, where approximately 1022 species can be found, with 771 amphibian species (the second-largest amount) being found in Colombia [25]. However, amphibian species have been increasingly declining, particularly in the last few decades, so the conservation status of various amphibian species is bad. Nearly 168 species are believed to have gone extinct and at least

2469 amphibian species contain populations that are starting to decline [26]. In 2016 in the UK alone, there had been a decline of 68% of common toad populations over the previous 30 years, approximating a decline of 2.26% per year [27]. The threats to their biodiversity that have encouraged these declines include, but are not limited to, climate change, land-use change, domestic and international trade, and a fungal disease called chytridiomycosis which dries out skin and affects an amphibian's ability to regulate moisture. [28][29].



Figure 5. Boophis baetkei, <https://www.iucnredlist.org/species/164889/1076622>

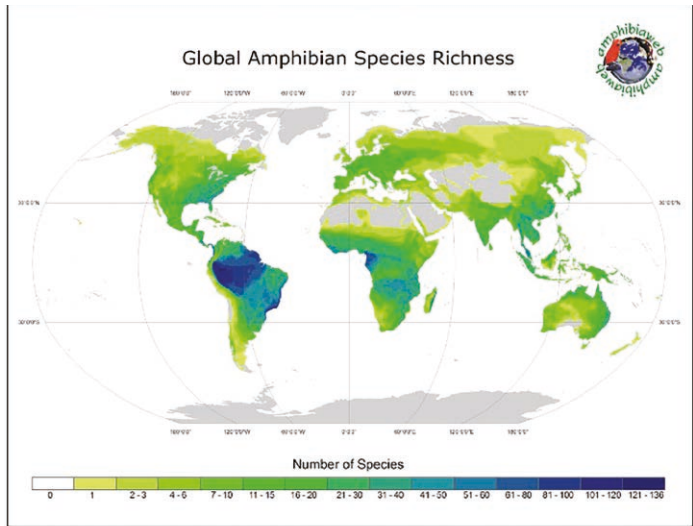


Figure 6. Cartography by Christina Lew, February 2017
A map to show the overlapping ranges of all known amphibians, Figure 5.
<https://amphibiaweb.org/declines/declines.html>

An example includes the *Boophis baetkei*, which is an amphibian species with a declining population and is listed as critically endangered on the IUCN Red List as a result of a severe ongoing decline in the extent and quality of its forest habitat (due to logging, clearance for agriculture, grazing of domestic livestock, and more). It requires conservation protection significantly due to this species seemingly being endemic to a region called the Fôret d'Ambre Special Reserve, with an extent of occurrence of only 49 km². There have been conservation actions suggested which include: development of small scale eco-tourism, local environmental awareness

programmes, an effective training programme to produce forest wardens, and more, with new schemes having been done via workshops in 2016, 2017, and 2018, leading to ecotourism development and ecosystem restoration in certain protected areas, but its conservation is still very weak.[30][31].

There is evidence of a sixth mass extinction underway in the world, as scientists have found that extinctions are occurring hundreds of times faster than they would generally, threatening up to a million species of animals and plants [2]. This is why it is of the utmost importance for species to be conserved, and my research has shown what would be needed to conserve amphibians as an example: to ensure amphibian species do not go extinct, intensive breeding programmes need to be created in order to create a chance of survival for species nearing extinction, and as amphibians are less favoured to conserve than other taxa, it is required that they are given immediate attention through identifying and assisting species already in or approaching decline alongside legislative funding mechanisms to rid the bias of conserving more favoured species. Furthermore, as the number of emerging diseases grows, amphibian species need to be monitored more regularly as well as have management prescriptions implemented to mitigate these disease threats [32].

In conclusion, the report has found that fossils can be used to prepare for future biodiversity crises despite sampling biases such as geographical biases potentially construing the data and affecting our interpretations of the fossil record. This is because fossils can be used to look at past biodiversity and compare against current biodiversity in terms of size, appearance, and their environment. These past events are significant in suggesting how species were able to survive their biodiversity crises which can be used to better prepare our own conservation efforts in order to ensure further extinction of species does not occur or is at the least reduced. Therefore, we can use the fossil record as it is still useful in providing information and its amount of evidence is necessary, therefore more likely to be accurate when extrapolating data for the future, thus even in predicting future diversity. The current situation for amphibians, however, is critical because large numbers of amphibian species are declining due to threats like fungal diseases. The report's findings have also suggested that we must focus our efforts in the future on creating intensive breeding programmes to ensure amphibians' survival and monitor the species regularly in order to mitigate any potential threats, which can also be performed for other species.

References

Greshko, M., 'What are mass extinctions, and what causes them?', <https://www.nationalgeographic.com/science/prehistoric-world/mass-extinction/>
Carroll, Robert L., 1988, Vertebrate Paleontology and Evolution, W.H. Freeman and Company, New York
Strauss, Bob, '300 Million Years of Amphibian Evolution.', ThoughtCo, Aug. 15, 2019, <https://www.thoughtco.com/300-million-years-of-amphibian-evolution-1093315>
Bosch, David, 2015, 'The evolution of amphibians: the conquest of the land', All you need is Biology, <https://allyouneedisbiology.wordpress.com/2015/05/07/evolution-amphibians/>
Amphibians- Biology 2e, <https://openstax.org/c/biology2eopenstax/chapter/amphibians/>
C., 'Permian Earth- The Age Of Amphibians', <https://earthlyuniverse.com/permian-earth-age-amphibians/>
Hoffman, H. J., 'The Permian Extinction- When Life Nearly Came to an End', <https://www.nationalgeographic.com/science/prehistoric-world/permian-extinction/>
Perkins, S., 2013, 'Why Some Species Thrived When Dinosaurs Died', <https://www.sciencemag.org/news/2013/07/why-some-species-thrived-when-dinos-died>

Brahic, Catherine, 2007, 'Amphibians- the comeback kings of evolution', NewsScientist.com, <https://www.news-scientist.com/article/dn10910-amphibians-the-comeback-kings-of-evolution/>
EDGE Amphibians, 'Edge of Existence', <https://www.edgeofexistence.org/amphibians/>
Gaworecki, M., 2017, 'How a mass extinction event caused a boom in most of the frog species alive today', <https://psmag.com/environment/how-a-mass-extinction-event-caused-a-boom-in-most-of-the-frog-species-alive-today>
Duellman, W. Zug, G., 2019, "Amphibian" Encyclopædia Britannica, Encyclopædia Britannica, inc., <https://www.britannica.com/animal/amphibian>
Czaplewski, J., PBDB Navigator, Paleobiodb.org, <https://paleobiodb.org/navigator/>
Sample, I., 2019, 'Mindblowing' haul of fossils over 500m years old unearthed in China, the Guardian, <https://www.theguardian.com/science/2019/mar/21/mindblowing-haul-of-fossils-over-500m-years-old-unearthed-in-china>
Hansen, M. C., 1996, "Phylum Chordata- Vertebrate Fossils," in Fossils of Ohio, edited by R. M. Feldmann and Merrienne Hackathorn. Ohio Division of Geological Survey Bulletin 70, p. 288-369.
Burggren, W., Warburton, S., 2007, 'Amphibians as Animal Models for Laboratory Research in Physiology', <https://academic.oup.com/ilarjournal/article/48/3/260/664101>
Michael, D., Blanchard, W., Scheele, B., Lindenmayer, D., 2018, 'Comparative use of active searches and artificial refuges to detect amphibians in terrestrial environments', <https://onlinelibrary.wiley.com/doi/abs/10.1111/aec.12677>
Enriquez- Urzelai, U., Bernardo, N., Moreno-Rueda, G., Montori, A., Llorente, G., Are amphibians tracking their climatic niches in response to climate warming? A test with Iberian amphibians, <https://link.springer.com/article/10.1007/s10584-019-02422-9>
Roelants, K., Gower, D., Wilkinson, M., Loader, S., Biju, S., Guillaume, K., Moriau, L., Bossuyt, F., Global patterns of diversification in the history of modern amphibians, <https://www.pnas.org/content/104/3/887>
Heathman, A., 2017, 'Why did dinosaurs die out when other creatures survived? The key is in the egg', <https://www.wired.co.uk/article/dinosaur-eggs-incubation>
Hoff, M., 2019, 'Biodiversity in 2020: the biggest threats and opportunities', <https://www.theguardian.com/environment/2019/dec/05/biodiversity-in-2020-the-biggest-threats-and-opportunities-aoe>
'Top 6 Major Threats to Biodiversity', Bio Explorer, <https://www.bioexplorer.net/threats-to-biodiversity.html/>
AmphibiaWeb, 2019, University of California, Berkeley, CA, USA, <https://amphibiaweb.org>
Zug, G., Duellman, W., Amphibian, Encyclopædia Britannica, Encyclopædia Britannica, inc., (2019), <https://www.britannica.com/animal/amphibian>
Butler, R., 2019, 'Total number of amphibian species, by country', <https://rainforests.mongabay.com/03amphibian.htm>
AmphibiaWeb, 2019, 'Worldwide Amphibian Declines: What is the scope of the problem, what are the causes, and what can be done?', AmphibiaWeb, <<https://amphibiaweb.org>> University of California, Berkeley, CA, USA.
'Amphibian and reptile declines- UK perspective', 2018, <https://www.froglife.org/2018/03/23/amphibian-and-reptile-declines-uk-perspective/>
Christian Hof, Miguel B. Araújo, Walter Jetz, Carsten Rahbek, 2011, Additive threats from pathogens, climate and land-use change for global amphibian diversity, Nature, DOI: 10.1038/nature10650
Welch, S., 'Amphibians', 2019, <https://defenders.org/wildlife/amphibians>
IUCN SSC Amphibian Specialist Group 2015. Boophis baetkei. The IUCN Red List of Threatened Species 2015: e.T164889A1076622. <http://dx.doi.org/10.2305/IUCN.UK.2015-4.RLTS.T164889A1076622.en>
ALLIANCE FOR ZERO EXTINCTION MADAGASCAR: Mainstreaming Strategy, http://zeroextinction.org/wp-content/uploads/2019/10/Madagascar_case_study-1.pdf
Brian Gratwicke, Thomas E. Lovejoy, David E. Wildt, Will Amphibians Croak under the Endangered Species Act?, BioScience, Volume 62, Issue 2, February 2012, Pages 197–202, <https://doi.org/10.1525/bio.2012.62.2.13>

Tutor comment:

"S. has the brightest future ahead of them. Their exceptional work throughout the course was completed with such dedication and enthusiasm, and I very much valued their insightful input during tutorials. S.'s expertly composed final assignment was truly the cherry on top of a wonderful experience at a fabulous school with an extraordinary group of students!"

Explaining the routes by which avoidance behaviour is replaced by parenting behaviour in rodents

Year 12, Key Stage 5

Pupil: F. Woodward
School: Coleg Sir Gar, Carmarthenshire
Supervised by: M. Higgs
Tutor University: Cardiff University
Course Title: 'Circuits for Care' - The neurobiology of parenting behaviour

'When rodents encounter pups, most will instinctively ignore, or even attack these pups. However, there are

circumstances in which rodents will display parenting behaviour instead. Explain the routes by which avoidance behaviour is replaced by parenting behaviour in rodents including a critical examination of the evidence supporting the existence of those routes. Within your discussion please reflect on the evolutionary reasons for the different routes of activation as well as the wider implications for having more than one route to produce parenting behaviour.'

Darwin's theory of natural selection explains how inherited traits which provide a competitive advantage proliferate. Both physical and behavioural characteristics are subject to this process and its consequence; genetically encoded traits which increase an individual's likelihood of survival and reproduction within their given environment are more likely to be passed on to the subsequent generation. Parenting behaviour in rodents can be considered an adaptive trait which serves to meet the demands of their vulnerable offspring - hence increasing such offspring's chances of survival and reproduction. This essay will examine different routes to parenting behaviour, considering how the innately avoidant or aggressive response to pup stimuli is overcome via different routes. The focus throughout will be outlining the different proximate causes of parenting behaviour, primarily hormonal factors, then changes due to experience, followed by the evolved changes in neural circuitry which have in certain cases enabled rodents to be parental independent of either of these. Evolutionary reasons for these routes will be postulated based on consideration of their adaptive benefits.

The neurological basis of avoidance and parenting behaviour

Extensive investigation of rodent behaviour in laboratory experiments has enabled the identification of key regions of the brain which are involved in coordinating avoidant or parental behaviour. Central to understanding the shift between avoidant and caring behaviour in terms of neural circuitry, is the mutually inhibitory nature of their behavioural pathways. Below, figure 1 [1] is a simple representation of the brain regions involved in processing and responding to such cues (which will in turn be expanded upon to include other relevant components [15]).

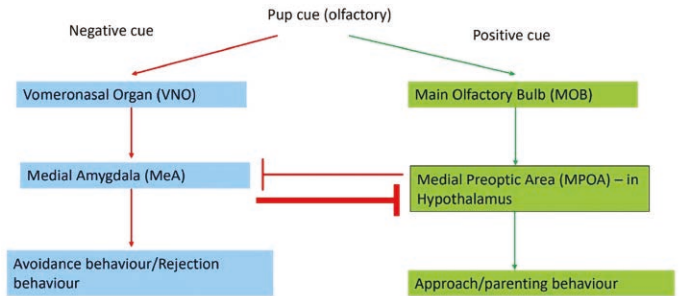


Figure 1.

When an adult rodent is exposed to a pup, various sensory cues are detected. The diagram shows the route from detection of a pup-related olfactory stimulus, as scent

and pheromones tend to be the most important stimuli for rodents. By default, the 'parenting circuit' (green) is inactive, as it is inhibited by the activity of neurons in the medial amygdala; involved in the avoidance circuit (blue). The medial preoptic area (MPOA) in particular is a key area of interest in producing parenting behaviour, as demonstrated by the data below in figures 2 and 3. Lee et al [2] deactivated the MPOA in multiparous (having previously given birth) rats, which resulted in a significant decrease in maternal behaviours such as licking and retrieving pups.

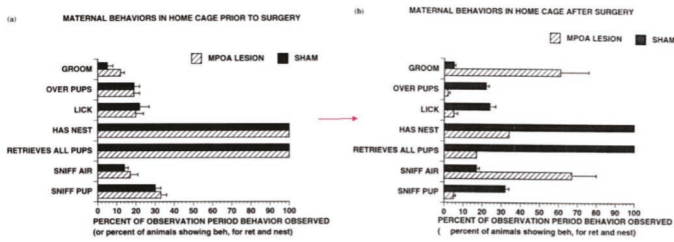


Figure 2.

Fig. 5. (a) Effects of lesions to the mpoa or sham lesions on maternal behaviors during the test period prior to surgery. Behaviors are expressed in terms of the average (across days) percent of the observation period during which behaviors were observed or, for retrieving and with nest, the percent of animals showing the behavior over test days in cycling multiparous animals. (b) Effects of lesions to the mpoa or sham lesions on maternal behaviors during the test period after surgery. Behaviors are expressed in terms of the average (across days) percent of the observation period during which behaviors were observed or, for retrieving and with nest, the percent of animals showing the behaviors over test days in cycling, multiparous animals.

Lee et al [2] used electrical brain lesioning to specifically deactivate the MPOA only. Multiparous rats were given lesions or sham lesions, then observed for the behaviours shown in figure 2 (before lesioning) and figure 3 (after lesioning). This technique enables a specific region to be targeted so that any behavioural changes observed can be deemed to have been caused by the inactivation of the region of interest.

As part of the procedures these rats were tested prior to treatment to establish the natural level of maternal responsiveness for both groups. Use of a control group, which underwent sham procedure, strengthens the results as this demonstrates the reduction is not due to confounding variables arising from the procedures of treatment. Thus, the experiment can be considered to demonstrate a causal relationship between inactivation of the MPOA and a reduction in parenting behaviours; especially motivated or costly behaviour such as pup retrieval and covering, demonstrating the crucial role of the MPOA in coordinating these behaviours.

While inactivation of this brain region reduces parental behaviours, eliminating activity in the medial amygdala will enable parenting to occur in otherwise avoidant animals. This was demonstrated by Numan & Numan [7] by injecting excitotoxic amino acid directly into the medial amygdala, which was observed to facilitate maternal behaviour in virgin female rats. Direct injection allowed specific targeting of the region of interest to demonstrate its role in the circuit. When the avoidance circuit is active, the parenting circuit is not, and vice versa. Subsequently, in order for parenting behaviour to occur, the pup stimuli must be able to gain access to the parenting circuitry. The inhibitory action of the avoidance circuit must therefore be overcome. One such route is by increasing the activity of the MPOA such that it can

overwhelm the avoidance circuit; as once the MPOA is activated it is able to suppress avoidant behaviour. This can be achieved by increases in the levels of key hormones.

Hormonal activation of parenting: endocrine events of pregnancy and parturition

The most reliable and motivated demonstration of parental behaviour across all rodents is maternal behaviour due to the hormonal events of pregnancy [8]. During the course of pregnancy, the mother undergoes a series of hormonal events which lead to her carrying out maternal care. Such changes include increases in estrogen, prolactin [3] and oxytocin [4], and a sharp drop in progesterone [3]. As demonstrated in figure 4 [5], the most drastic hormonal changes occur just preceding parturition (birth), corresponding with a dramatic increase in maternal behaviour.

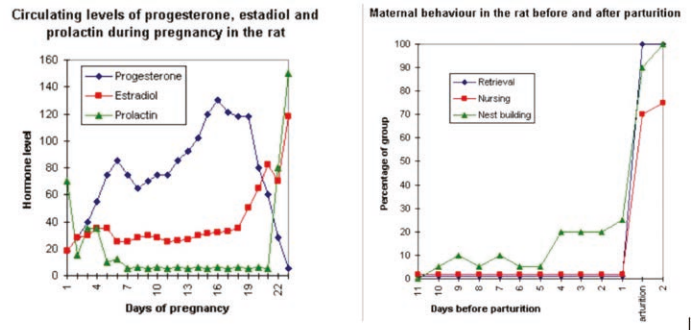


Figure 4.

Aside from initiating the physical events including uterine contraction and milk production involved in parturition and nursing [6] these hormones have been demonstrated to act to stimulate key areas of the brain, priming the mother to carry out maternal behaviour.

In terms of the avoidance/parenting responses, in the case of pregnant or newly mothering mice, the inhibition of the caring response is overcome by stimulation of the MPOA, enabling it to overcome the inhibitory effect of the medial amygdala. The MPOA is then able to inhibit regions normally activated by pup cues further down the line in the avoidance circuit, known as the anterior hypothalamus and periaqueductal grey, which are involved in instigating an avoidant pup response - as shown in figure 5 below [15]

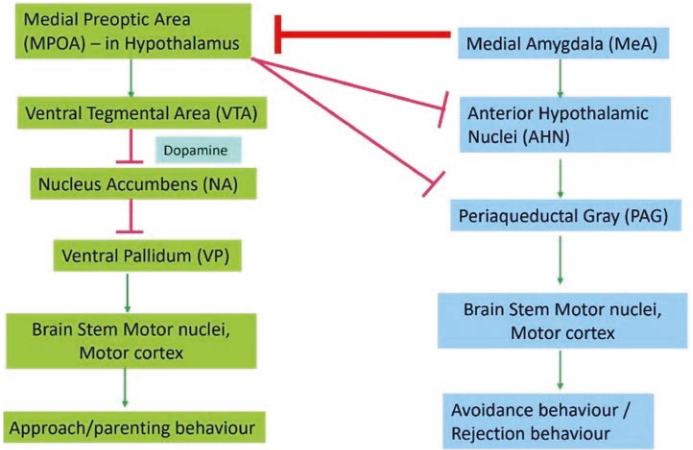


Figure 5.

As well as inhibiting activity in these areas, the MPOA now excites neurons in the ventral tegmental area, enabling the rest of the circuit which produces parenting behaviour to be completed. The action of pregnancy hormones has been reliably demonstrated to instigate this, as in the two following studies. Bridges [8] investigated the effect of estradiol and progesterone on maternal responsiveness, finding that treating the rats with a hormone combination mimicking that of pregnancy significantly reduced their latency to become fully maternally responsive (see figure 6). Rosenblatt and Poole conducted a similar experiment on castrated male rats, also finding that those treated with progesterone and estradiol were significantly quicker to display parental behaviour, as shown in figure 7.

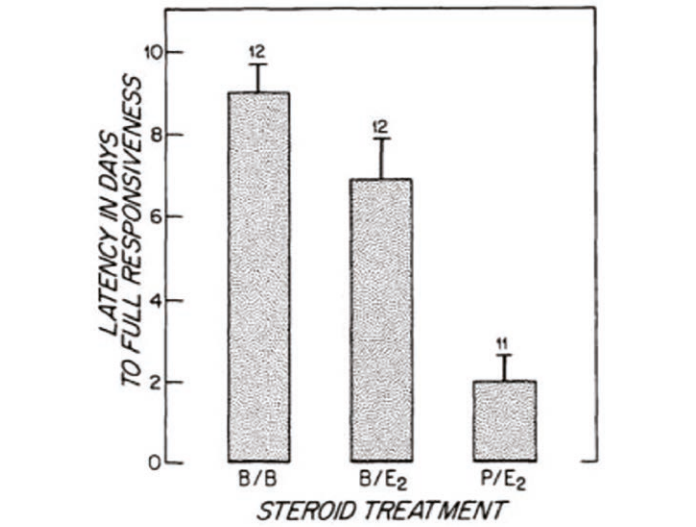


FIG. 6. Effects of sequential treatment with P followed by E₂ on maternal responsiveness. Ovx nulliparous rats were outfitted with P (3 × 30-mm) Silastic implants or blank (B) capsules on day 3 of treatment. On day 13, P and B capsules were removed and E₂ (2-mm) or B capsules were implanted. Behavioral testing was initiated on day 14. Rats treated with P and E₂ (P/E) responded significantly faster ($P < 0.001$) than the B/E₂ and B/B groups.

Figure 6.

Bridges [8]. Female rats were either given no hormones, treated with no hormones and then given estradiol, or treated with prolactin followed by estradiol. The use of nulliparous ovariectomised rats reliably demonstrates that the results are not due to the rats' natural hormone levels, and enabled prolactin and estradiol levels to be directly and completely controlled. Furthermore, by including treatment groups of estradiol alone and prolactin then estradiol, it enables comparison and so demonstrates the cumulative effect of the two hormones - this combination (which is more representative of pregnancy) is far more effective in initiating maternal behaviour.

Rosenblatt & Poole [9]. In the above experiment, castrated male mice were treated with estradiol and progesterone, then received injections of 20 (EB20) or 100µg (100EB) estradiol benzoate, or were given blank capsules and injected with oil. This demonstrates the increase in parenting behaviour that can be instigated by treatment with hormones which mimics the changes that would occur in a pregnant female rat. The fact it was conducted on castrated males is a strength as the effect of testosterone is eliminated, and it demonstrates that these hormones effect the same

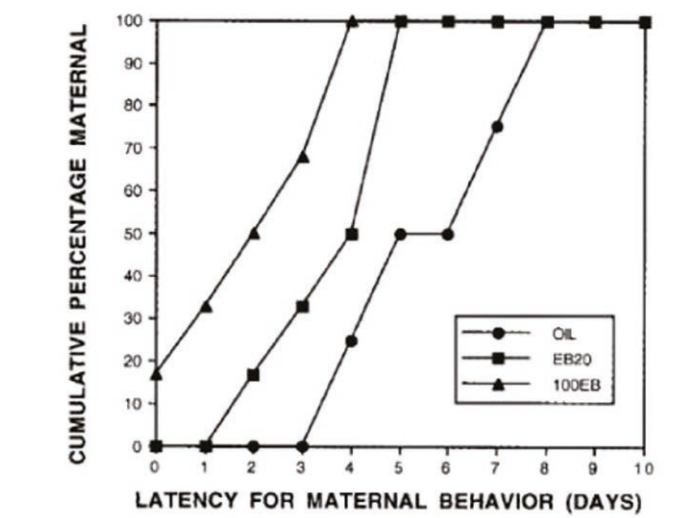


Figure 7.

The relation between hormone levels and subsequent behavioural output is due to the ability of a given hormone to alter neuronal activity. For a designated brain region to be affected by hormones it must contain receptors for those hormones. The receptors enable the hormone to enter the neuron and alter the proteins it expresses, making this neuron more, or less, easy to activate. The medial preoptic area (MPOA) contains a high density of receptors for various hormones which increase due to pregnancy - including prolactin, oestrogen [10] and oxytocin [11] or decrease, including progesterone [10]. This abundance of receptors for pregnancy hormones in the MPOA is what makes it so heavily influenced by such hormones, as demonstrated in Ribero et al's [12] experiment shown below, fig. 8. When estradiol receptors in the medial preoptic area were removed, mothers were licked and nursed pups less frequently, took longer to retrieve pups, and were less aggressive towards intruders. This illustrates the crucial role of estradiol in activating the MPOA and subsequently instigating maternal behaviours.

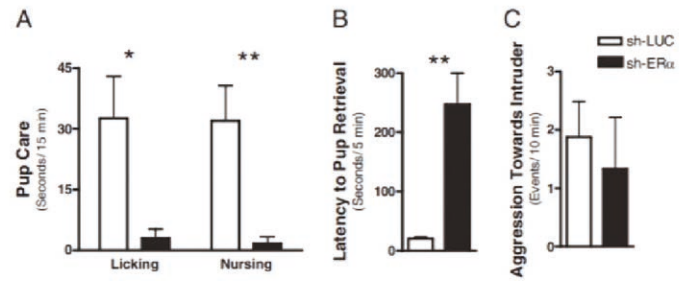


Figure 8.

Ribero et al [12] used viral vector RNA to remove estradiol receptors in medial preoptic area neurons. Removal of the estrogen receptors caused a considerable reduction in pup care, lengthened the latency for pup retrieval, and made mothers less aggressive towards intruders (i.e less protective of pups).

Effectively, the hormonal events of pregnancy, through facilitating increased MPOA activity and the switch to caring, enable the mother to respond to her pups' needs. Evolutionarily, this can be explained in terms

of the reproductive benefits for parenting behaviour - providing care to offspring enhances the survival of offspring, promoting the propagation of that organism's genes. Though maternal care is a costly investment, pups are vulnerable at birth and do not reach self-sufficiency for some time. Thus, rodents' parenting behaviour; including feeding, grooming and protection of infants, greatly enhances the likelihood that offspring are going to survive and ultimately reproduce themselves. Hence, the behaviour is adaptive - because in rodents, it has proved a successful measure to meet the challenge of offspring's vulnerability.

Undermining the avoidance circuit: paternal care and sensitisation

An alternative to increasing the activation of brain regions within the parenting circuit is reducing activity in the avoidance circuit; through the negative response to a pup cue diminishing. In male mice, Dulac et al [13] found that the experience of inseminating and then cohabiting with a female mouse for the duration of pregnancy brings about a shift from avoidant or infanticidal behaviour to parenting. The critical point at which this shift occurs corresponds to the birth of the father's pups (see fig. 9), which, after inseminating and living with the mother throughout gestation, are almost certainly his. There is a clear evolutionary reason for this suppression of infanticide: if males remained infanticidal, they would risk killing their own pups, reducing their own reproductive success.

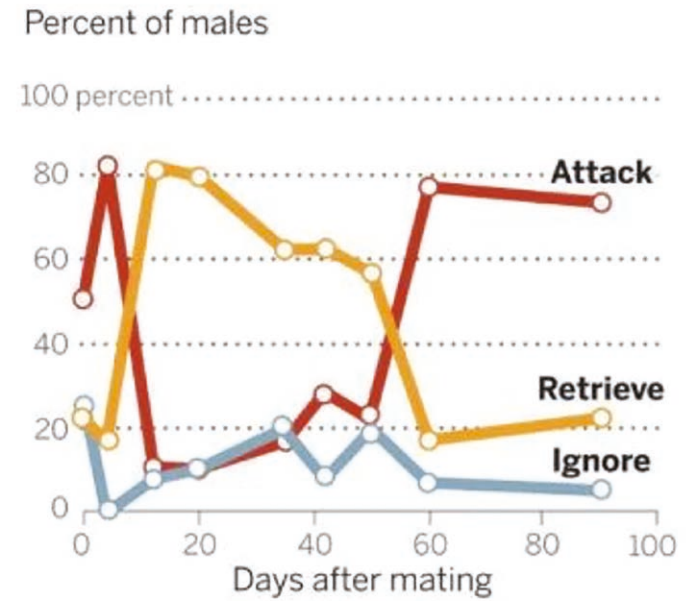


Figure 9.

Evidence suggests this is brought about by the deactivation of the vomeronasal organ (VNO). Tachikawa et al [14] investigated the role of the VNO in male rats' response to pups. As the data in figure 11 (N) shows, deactivation of the VNO via leisioning produces paternal behaviour in mice. In a natural setting, this deactivation of the VNO occurs via the process of desensitisation. The dampening of neural responses resulting from repeated exposure to a stimulus is a key principle of learning, and is applied in human psychopathology in exposure

therapy. Cohabiting with the female is essential to this process, as it is she who provides the repeated exposure to sensory stimuli which leads to the weakening of the VNO response, and in turn, the associated increase in parental behaviour that the male displays. Tachikawa et al's experiment demonstrated firstly that pup exposure causes significant activity in the VNO of sexually naive males versus fathers (fig. 10), and provides evidence that lesioning the VNO produces an increase in paternal behaviour equivalent to that of fathers, implying that deactivation of the VNO causes paternal behaviour.

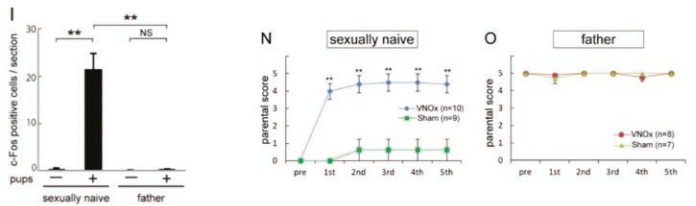


figure 10, figure 11.

Tachikawa et al [14] conducted an experiment with four different groups: sexually naive male mice with their VNO lesioned or intact, and fathers with and without VNO lesions. In figure 10, Chart I shows the expression of c-fos, a protein which can be used to measure the activity of neurons, in sexually naive and fathers with or without pup exposure. In figure 11, N demonstrates that inactivation of the VNO increases paternal behaviour. O shows that for the fathers, the lesioning made no difference to parental responsiveness, showing firstly that the VNO is deactivated in fathers, and also that this facilitates paternal behaviour. This study involved control procedures, with the control mice undergoing sham lesions. Further, the difference between groups is measured by both neuronal activation and behavioural observation. The study therefore is effective evidence for the role of the VNO in the suppression of paternal behaviour.

Fathers in monogamous rodent species often invest significantly in their young. For instance, the California mouse has a biparental system, and for these mice paternal care contributes significantly to reproductive success; a study by Cantoni & Brown [16] found, when parents must forage for food, the presence of a male enabled four times as many pups to be reared over a 74 day period versus a female on her own. Analogously, the absence of paternal care has a notable effect on the social activity of California mice, with one study finding paternally deprived female mice to be abnormally aggressive [17]. It has, however, been pointed out (Bales & Saltzman [18]) that it is unclear to what extent the results of studies such as this one stem from paternal deprivation specifically. This is because in many biparental species, when the father is absent, the mother does not compensate for the care that he would have provided, so any observations may result from pups simply receiving less care.

The induction of parental behaviour through repeated exposure to pup cues, known as sensitisation, similarly involves an animal becoming parental as the inhibition of the parenting circuit is overcome by the depression of

the neural responses involved in avoidance. Though an olfactory cue may at first stimulate the medial amygdala (figure 1) and subsequently enact a negative response, neurons will eventually become fatigued, leading to an exhaustion of response such that the avoidance circuit is eventually less easy to activate [27]. Relating this back to the mutual inhibition of the behavioural circuits, this acclimatisation to the pup cue makes it possible for regions involved in a care response to overcome their suppression by the medial amygdala (see figure 5). Martin-Sanchez et al found that when virgin females were exposed to pups, they carried out more maternal behaviour and were quicker to retrieve pups. Both godmothers and pup-sensitised virgin females were considerably maternal, having a fairly similar (or even higher for some behaviours) level of maternal responsiveness to mothers (figures 12, 13) despite not having undergone the hormonal changes of pregnancy. However, the mothers were the only group to exhibit maternal aggression - mice in the other groups seldom attacked intruders (figure 14), only carrying out less motivated forms of pup care. This demonstrates that exposure to pups leads to a shift in response. The role of neurotransmitters in this process includes oxytocin activity in the MPOA. Okabe et al found that oxytocin in the MPOA promoted sensitisation induced parental behaviour, finding higher c-fos in OXTR expressing neurons in MPOA of mice exposed to pups repeatedly vs exposed once [24].

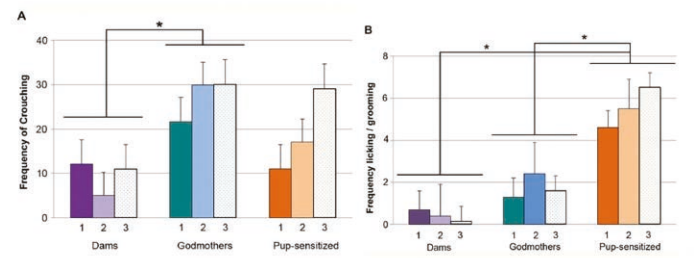


Figure 12.

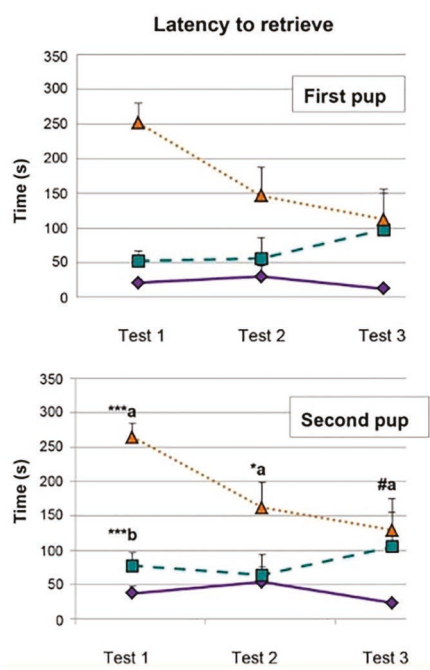


Figure 13.

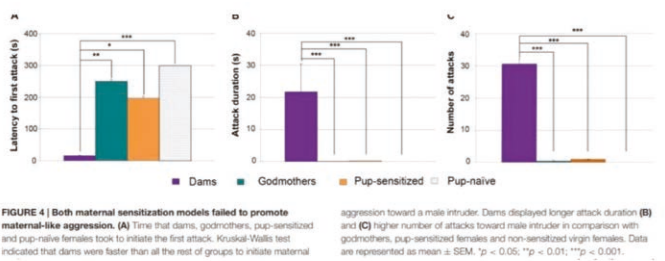


Figure 14.

This experiment by Martin-Sanchez et al [25] involved 3 groups - dams (mothers) who were housed with a 'godmother' (the dam's sister), godmothers housed with dams and pup-sensitised virgin females housed with another virgin female. The dams from the first grouping, the godmothers from the second, and the virgin pup-naive females which were exposed to pups during 2-hour sessions following the first test session, were tested on various measures of maternal responsiveness. The data demonstrate that for female mice, exposure to pups can instigate maternal behaviour. For the pup-sensitised group particularly, maternal responsiveness increased with experience as seen in the increasing frequency of crouching and grooming (figure 12) and decreasing latency of retrieval across the three test days (figure 13). However, a potential weakness of the experiment is that the three groups underwent quite different procedures, for instance, the dams were the only mice to have cohabited with males prior to the testing period. Additionally, as the study required experimental animals to be housed with a companion, it is possible that due to them being used to 'sharing' care duties maternal behaviour was reduced from the level that would occur otherwise.

Examples of spontaneous parenting behaviour

In contrast to the two previous sections, it is possible for rodents to display parental behaviour 'spontaneously' i.e. without having been through pregnancy or even previous exposure to pups. This has been observed in female mice - Alsina-Llanes et al's study [19] below (figure 15) found 50% of adult female mice showed some degree of maternal behaviour upon first exposure to pups, which increased to 100% by the fifth exposure.

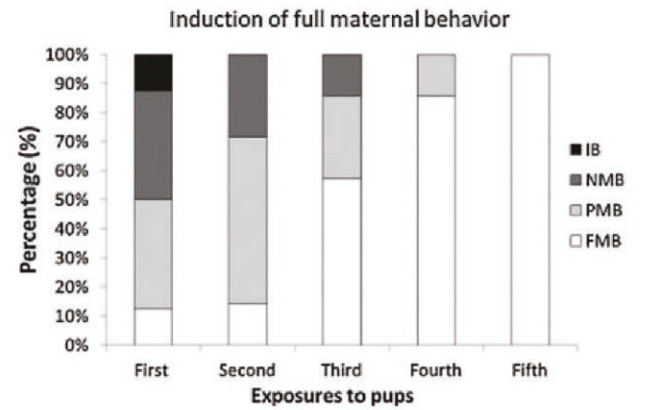


Figure 15.

During this study adult female mice were exposed to mice pups for 60 minute sessions. Their percentage carrying out maternal behaviour during the first 15 minutes of these sessions was recorded. On first exposure, half of the mice were partially or fully maternal - 'spontaneous' maternal care occurred in 50% of cases. This study also further demonstrates the effect of sensitisation - by the fifth pup exposure all subjects showed full maternal behaviour.

Whilst female mice are about equally likely to avoid or attack pups as to display maternal behaviour towards them, in certain rodent species both males and females are generally parental towards young, and as such exhibit what is known as alloparenting. Alloparents display care behaviours independently of hormones and experience [20]. This represents a shift from aggression by default towards pups. For instance, most naive male mandarin voles show parenting behaviour; Song et al [21] found this socially monogamous, biparental species presents a high level of oxytocin receptors in the nucleus accumbens. Wider implications of this include community parenting, in which the evolutionary benefits of care are no longer restricted to parents and offspring, but provide what is known as inclusive fitness. Comparative studies have examined the underlying neural differences that allow this - Insel & Shapiro observed differences in oxytocin receptor distribution reflected the social organisation of voles, with the monogamous and more social prairie vole displaying a higher oxytocin receptor density in areas linked with parental care such as the nucleus accumbens than the less sociable and less parental montane vole [23]. This more cooperative organisation can come with benefits such as the division of labour within social groups, an extreme example of which being the naked mole rat where a single female, the 'queen', bears offspring, while other colony members forego reproduction to gather food [22].

Concluding remarks

Among rodents, there exist a variety of mechanisms to initiate parenting behaviour. Such behaviour varies interspecifically between rodents but in all instances, it is underwritten by neuronal activity in those key areas of the brain which form the 'care circuit'. In rats and mice, by default, pup cues trigger the response of brain regions which culminate in ignoring or attacking the pups. Hence, behaviour towards pups is generally hostile, but this can be reversed through experiences including recurrent exposure to pups. Paternal behaviour is induced in male mice ensuing cohabitation with the inseminated female. While these mechanisms all induce a shift from hostility to nurture, the most reliable and powerful basis for this substitution of response is the cumulative effects of hormonal changes during pregnancy, which prime rodent mothers to meet their offspring's needs. The nature of parental behaviour is observed to differ correspondingly to a rodent's social structure, for example prairie voles are more innately caring towards young, and are an accordingly sociable species. Environmental pressures that favour social breeding appear to extend the scope for cooperative behaviour and social interaction between conspecifics, as the extent of innately aggressive or avoidant responses is lessened. These more social species exhibit differences within their neural circuitry meaning

pup cues preferentially gain access to a care response rather than inducing aggression. Implications of this increasingly caring disposition can be seen in other social mammals, such as the community parenting approach of elephants, or humans; regardless of experience we tend to respond positively to infant cues, to such an extent that this is hypothesised to underlie our affection toward pets [26].

References

[1] Higgs, M. (2020) Tutorial 2, slide 29
[2] Lee, A., Clancy, S., & Fleming, A.S. (2000). Mother rats bar-press for pups: effects of lesions of the MPOA and limbic sites on maternal behaviour and operant responding for pup-reinforcement. Behavioural brain research, 108(2), 215-231
[3] Higgs, M. (2020) Tutorial 3, slide 30
[4] Numan (2017) Parental Behaviour, reference module in Neuroscience and Biobehavioural Psychology
[5] Higgs, M. (2020) Tutorial 3, slide 30 [6] Higgs, M. (2020) Tutorial 3, slide 25
[7] Numan M, Numan MJ (1993). Excitotoxic amino acid injections into the medial amygdala facilitate maternal behavior in virgin female rats
[8] Bridges (1984)
[9] Rosenblatt, J.S., & Poole, J. (1996). Maternal behaviour in male rats: effects of medial preoptic area lesions and presence of maternal aggression. Hormones and behaviour, 30(3), 201-215.
[10] Higgs, M. (2020) Tutorial 3, slide 39
[11] Kohl, J., Autry, A., & Dulac, C. (2017) The neurobiology of parenting: A neural circuit perspective
[12] Ribero et al (2012)
[13] Higgs, M. (2020) Tutorial 4, slide 20
[14] Tachikawa, K.S., Yoshihara, Y., & Kuroda, K.O. (2013). Behavioural transition from attack to parenting in male mice: a crucial role of the vomeronasal system. Journal of Neuroscience, 33(12), 5120-5126.
[15] Higgs, M. (2020) Tutorial 3, slide 12
[16] Cantoni, D., & Brown, R. E. (1997). Paternal investment and reproductive success in the California mouse, Peromyscus californicus. Animal Behaviour, 54(2), 377–386.
[17] - Bambico, F. R., Lacoste, B., Hattan, P. R., Gobbi, G. (2015) Father Absence in the Monogamous California Mouse Impairs Social Behavior and Modifies Dopamine and Glutamate Synapses in the Medial Prefrontal Cortex, Cerebral Cortex, Volume 25, Issue 5, May 2015, Pages 1163–1175.
[18] Bales, K. L. & Saltzman, W. (2016) Fathering in Rodents: Neurobiological Substrates and Consequences for Offspring
[19] Alsina-Llanes, M., De Brun, V., & Olazábal, D. E. (2015). Development and expression of maternal behaviour in naive female C57BL/6 mice. Developmental psychology, 57(2), 189-200
[20] Higgs, M. (2020) Tutorial 4, slide 31
[21] Song Z., Tai F., Yu C. et al. (2010) Sexual or paternal experiences alter alloparental behaviour and the central expression of ERalpha and OT in male mandarin voles (Microtus mandarinus)
[22] Walter Koenig & Janis Dickson 'Animal social behaviour' <https://www.britannica.com/topic/animal-social-behaviour/Social-interactions-involving-cooperative-breeding-and-eusociality> [6 March 2020]
[23] Insel, T. R., & Shapiro, L., E. (1992) Oxytocin receptor distribution reflects social organization in monogamous and polygamous voles Neurobiology Vol. 89, pp. 5981-5985 [24] Okabe S. et al (2017) Pup exposure facilitates retrieving behaviour via the oxytocin neural system in female mice.
[25] Martín-Sánchez, A., Valera-Marín, G., Hernández-Martínez, A., Lanuza, E., Martínez-García, F., & Agustín-Pavón, C. Wired for motherhood: induction of maternal care but not maternal aggression in virgin female CD1 mice.
[26] Higgs, M. (2020) Tutorial 5, slide 26 [27] Higgs, M. (2020) Tutorial 4, slide 14

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