Stephenson College
Durham University

Astonish The World: Proceedings of the ATW Postgraduate Conference 2022

Contents of Proceedings

Conference abstract

We are delighted to present this Conference Proceedings of the inaugural Astonish the World conference. Held in July 2022, this conference organised by the Stephenson College Middle Common Room, provided a supportive and engaging space for the postgraduate community in college and more widely to share their valuable knowledge and experience, as well as collaborate and network. This was our first postgraduate conference, covering a wide range of topics and approaches to the concept of astounding the world through the exploration of different fields of research. We counted on an extensive variety of contributors and presenters, with many nationalities and cultures represented, inspiring multi-disciplinary collaborative links, fomenting intellectual encounter and development.

The conference opened with an all-female panel discussion, followed by a total of 14 presentations produced by scholars as well as two workshops focusing on EDI and mental health as a PhD student delivered by practitioners. The conference provided new perspectives to the thought-leaders and decision-makers of today and tomorrow by offering constructive environments for dialogue and interchange, and we hope that all participants found the experience positive and constructive.

The publication process for the proceedings aimed to offer space for the students' academic development. Two peer reviewers blind reviewed all submitted manuscripts. The opportunity to offer and receive feedback provided a learning opportunity for both the authors and the editorial team.

Katie Stobbs

Vice Principal, Stephenson College

Author Information

Eleanor Elizabeth Chipps

Eleanor has recently completed her MSc degree in Human Bioarchaeology and Palaeopathology in the Department of Archaeology, at Durham University. She researches the ways in which past societies used the body as a canvas for cultural expression. In this paper she explores the possible meanings of purposeful Viking Age adult male anterior tooth modifications found in Northern Europe.

Laura Jane Hepworth

Laura is a PhD student currently completing her ESRC funded thesis on victim-survivor identity using arts-based research, in partnership with Survivors West Yorkshire and the RSACC. She is particularly passionate about creating empowering research in partnership with people with lived experiences of sexual assault, as well as teaching future criminologists.

Fraser David Logue

Fraser Logue is a ESPRC funded Physics PhD student in the Quantum, Light and Matter group. His research considers atomic filters which can distinguish over 1000 colours between red and orange alone. In his spare time, he sings with a local choir, and writes and performs sketches in university theatre.

Madeleine Rose

Madeleine is an English Studies MA student at Durham studying ecocriticism and transatlantic modernism. She is currently working on her dissertation, exploring how encounters with the American landscape influenced Harriet Monroe's editing of the influential

little magazine *Poetry*, linking into broader questions about the relationship between American and European modernism.

Ruxandra Victoria Steriu

Ruxandra Victoria Steriu is a Durham University alumnus and Senior Buyer for Belfour Beatty. She is currently completing her Master of Business Administration (MBA) at Imperial College London. With extensive commercial experience across multiple industries, she has worked in various business strategy roles, including business analysis, managing contracts as well as developing and implementing commercial strategies.

Christopher Williams

Christopher Williams is Professor in Strategy at the University of York. His research interests include international strategy, innovation in international firms and contexts, health R&D and organizational resilience. He worked in industry for 20 years, has lived in 5 countries, and has published over 50 peer-reviewed articles, three books, and over 30 teaching cases.

About the Astonish the World Conference

In July 2022 we welcomed staff and students from across Durham University and beyond to an inaugural research conference at Stephenson College. The aim of this conference was to exhibit some of the incredible work being done by our students and staff, as well as offering students the chance to present their research to an audience. Our conference gains its name from a letter, written by our eponymous namesake George Stephenson, where he wrote that that 'one day I will astonish the world'. This, translated into Latin, is the motto of our college here at Durham University.

Harriet Axbey

Middle Common Room President 2019-2022

Abstracts

Eleanor Chipps

Across Sweden, Denmark and England, adult males with intentional dental modifications have been identified, characterised by horizontal grooves across the labial surface of anterior teeth. Based on groove morphology, location and regularity, such markings are unlikely to be the result of enamel hypoplasia, dental trauma, injury to deciduous teeth or using teeth as tools. The most likely cause is deliberate modification. Radiocarbon dates indicate that the phenomenon was present during the Viking Age (AD. c.750-1050). More than 130 male Vikings with filed teeth have been recovered. This research asks: can theoretical perspectives shed light on why Vikings modified their teeth?

Laura Jane Hepworth

Photographs created by victim-survivors of sexual assault can function to visually display the compelling, shocking and honest emotions behind identity and labels, in a way that words may not fully encapsulate. Yet arts-based methods are still not often conducted in violence and abuse research. This research demonstrates how art can be used as a powerful tool when conducting research with people with the lived experiences of violence and abuse. Utilising an innovative arts-based framework, staged photo-taking and photo-elicitation interviews were utilised with eighteen UK university students who identified as victim-survivors of sexual assault. Forty-nine photographs were produced, comprising of staged and captured photography, as well as some images of artwork produced by victim-survivors themselves. Theoretically, this study was underpinned by feminist standpoint theory, a symbolic interactionist understanding of identity and an arts-based framework. The purpose of

this study was to understand the multiple realities of identity and associations surrounding the terms 'victim' and 'survivor' for victim-survivors of sexual assault. It also sought to explore how art could be used in innovative ways in victim-survivor identity research, as well as violence and abuse as a whole. Thus, this research has provided a unique glimpse into how victim-survivors view 'victim' and 'survivor' identities, as well as the deeper meanings and implications behind those terms. The themes that emerged have implications for furthering our understanding of how we can utilise more creative methodologies when researching emotionally challenging, sensitive topics.

Fraser Logue

Thermal vapour spectroscopy is one of many ways to probe the interaction between light and matter, providing a platform for studying quantum technologies. Unlike cold atom setups, which require highly specialised equipment to cool atoms to near absolute zero temperatures, glass cells are filled with an atomic species which can be heated to form thermal vapours at lower expense. In this paper, we give an estimate of the costs involved in going from a room with electrical outlets to a fully functioning thermal vapour lab which is less than £100,000. We investigate whether this lower expense correlates with published research in peer reviewed journals (impact factor greater than 1) from more countries. We conclude that countries which only publish thermal vapour data, as compared to those which also publish cold atom data, have lower mean HDI, GDP per capita and GERD % of GDP. We discuss the importance of impactful low-cost science in enfranchising scientists internationally.

Madeleine Rose

In 1912, Harriet Monroe launched the little magazine *Poetry: A Magazine of Verse* with the ambitious aim of fostering a new American poetic tradition. Modernist literature sought to disrupt and astonish, to, in Ezra Pound's famous phrase, "make it new" but Monroe has often been side-lined in critical tradition as overly conservative. As editor, she was accused of limiting the modernising ambitions of her contributors, yet Monroe's editorial decisions were crucial in launching the careers of some of the most prominent modernist poets. Robin G. Schulze (2013) argues that Monroe found inspiration for a new American poetry in the landscapes of the American West and directed poets towards this 'wilderness' in her *Poetry* editorials. However, the pages of *Poetry* are not without contradiction. The November 1915 issue contains Monroe's 'A Nation-Wide Art' which urges the American poet to look west and away from Europe. Included in the same issue is the poem 'War' by the British poet Catherine Wells, alluding to the horrific events that were drawing many eyes to Europe. This paper will explore how far Monroe's call to attend to the American landscape necessitated a move away from transatlantic modernism. The call to look west was predicated on a turn away from Europe but the gaze of the American poet did not have to stay fixed in this direction. Monroe's poetics of the American landscape offers a new perspective on the transatlantic exchange so central to early twentieth century modernism.

Christopher Williams and Ruxandra Steriu

Following our recent research into multinational enterprise (MNE) strategy in battle-weary countries using the case of Heineken in Ethiopia and Myanmar (Journal of World Business, 2022), we now consider managerial and policy implications in light of the Business for Peace agenda. We identify three salient dimensions that should guide policy and managerial action in international firms operating in battle-weary countries: (1) the underlying trends for

violence, (2) the extent to which partners are involved, and (3) local needs for sustainable development. We argue that the interplay between these dimensions will determine the extent to which policy and action are deemed responsible vs. irresponsible.

Meaningful Modification: Elucidating the 'Grim Grins' of the Vikings

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Meaningful Modification: Elucidating the 'Grim Grins'[1] of the Vikings

Adult males with horizontal grooves across the labial surface of maxillary anterior teeth have been identified across Sweden, Denmark, and England. Radiocarbon analysis has dated the phenomenon to the Viking Age (A.D. c.750-1050). The most likely cause is *deliberate* modification since groove morphology and location patterns are dissimilar from alternative causes such as enamel hypoplasia (produced by stress in childhood), dental trauma, toothpick striations, or the effects of tool use. This research synthesises current literature on Viking tooth modifications, identifies data patterns and applies theoretical perspectives to shed light on this practice. The teeth of 136 Viking Age adult males, mostly from Sweden, were analysed; dental data were integrated with information on age and health. Burial context was analysed to understand the expression of identity in death, including intersectionality, cultural conformity, and achieved status. Tooth modification varied in terms of the position, depth and number of grooves. Weak links were found between groove depth and increasing age. No correlation was found in relation to status, disease, or stature. Investigating Viking tooth modifications from an intersectional perspective demonstrates that they were created when several facets of identity, including achieved status, aligned in a way that was culturally meaningful.

Keywords: Bioarchaeology, Dental Modifications, Vikings, Identity, Purposeful Pain.

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[1] Arcini, C. (2011). *The Viking's grim grin.* Fornsalen Publishing.

Introduction:

Across Northern Europe, adult males with intentional dental modifications have been identified, characterised by horizontal grooves across the labial surface of maxillary (and, more rarely, mandibular) anterior teeth (Arcini, 2005, 2020; Arcini Ahlström, 2018) (see Figure 1). Based on groove morphology, location and consistency, such markings are unlikely to be the result of linear enamel hypoplasia, dental trauma, injury to deciduous teeth, toothpick/brush striations, or using teeth as tools. Deliberate modification is the most plausible cause (Arcini, 2005). Reconstruction of the process of modification suggests that the labial surfaces of the teeth were filed flat and horizontal marks added (Arcini, 2020), ranging from subtle furrows to crescent moon-shaped features (Arcini, 2005; Arcini Ahlström, 2018). Radiocarbon dates indicate the phenomenon was present during the Viking Age (Arcini, 2020) (A.D. c.750-1050). More than 130 male Vikings with filed teeth have been recovered to date, representing those who raided, traded or farmed (Arcini Ahlström, 2018). In this paper, the current literature on Viking tooth modification is synthesised. Data on age, sex, geographical location, inferred identity and modification morphology from 136 individuals are analysed and key patterns are identified. Subsequently, theoretical perspectives are applied to the results of the data analysis and the motivations behind this practice are investigated. This research explores the question: can theoretical perspectives shed light on why the Vikings modified their teeth?
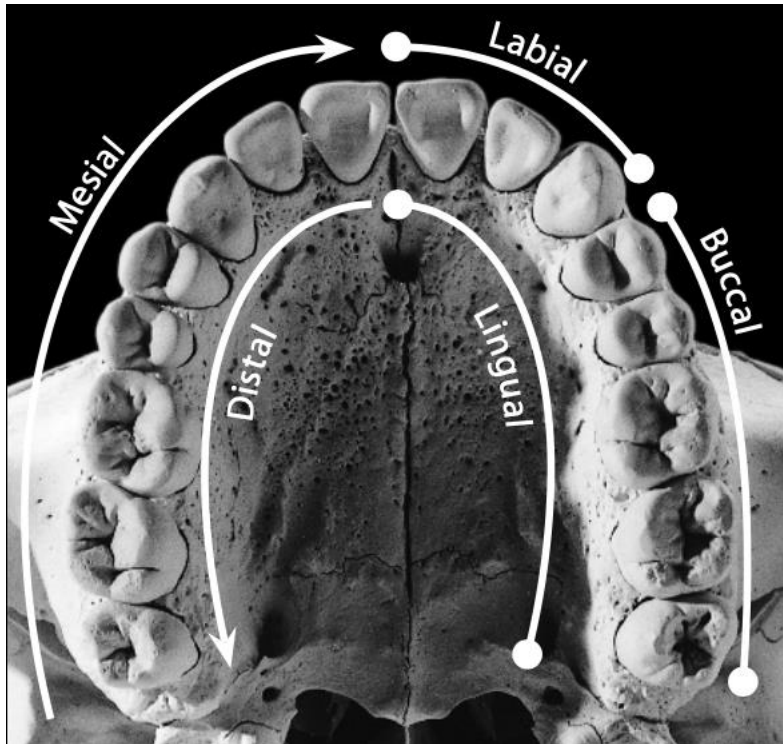
Figure 1: Diagram of the maxillary (upper) teeth from an inferior view, adapted from White et al. *(2012). Viking tooth modifications appear on the labial surface of the anterior (front) teeth.*

The Phenomenon of Viking Age Male Tooth Modification:

Despite the long history of Viking Age archaeological research, the very first case of dental modification was only discovered in 1989 among Late Viking Age material (A.D. 1000-1050) and it was not until 2005 that such modifications became a recognised phenomenon practised by North European males (Arcini, 2020). The first case originated from the early Christian town of Lund in the province of Skåne (in Sweden) (Arcini Ahlström, 2018; Arcini, 2020). Subsequently, further cases have been found in Denmark (Arcini Ahlström, 2018), England (Loe *et al.*, 2014) and even at the Oxyrhynchus burial ground of Al Minya, in Byzantine Egypt (Arcini Ahlström, 2018). However, the vast majority of known cases of Viking tooth modification are from Sweden and 80% are from Gotland in Sweden (Arcini

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Ahlström, 2018; Arcini, 2020). Examples date from throughout the Viking Age, from the late 8th to early 11th centuries (Ahlström Arcini, 2011; Kjellström, 2014; Arcini, 2020). Figure 2 presents the general geographic locations of the cases of Viking tooth modifications published in the literature.

Figure 2: Map of Northern Europe. Red points indicate where cases of intentionally modified Viking teeth have been found. The largest point (Gotland) shows that 80% of cases were found there. The map omits the case from Byzantine Egypt which, while morphologically similar, is anomalous (adapted from Google Maps, 2022).

The recent identification of the practice of Viking tooth modification may reflect the

apparent rarity of this practice; however, it is also possible that many further examples have gone unnoticed due to the subtlety of the phenomenon. The practice comes in several forms and the labial surfaces of the anterior maxillary teeth are most frequently affected. Markings include simple anterior filing, filing flat with subtle horizontal grooves (of variable count), multiple furrows, subtle semicircles, and deep crescent-moon shapes that extend into the tooth dentine. Differences exist in groove number, depth, location and distribution. The various expressions of tooth modification currently known are presented in Figures 3 and 4.
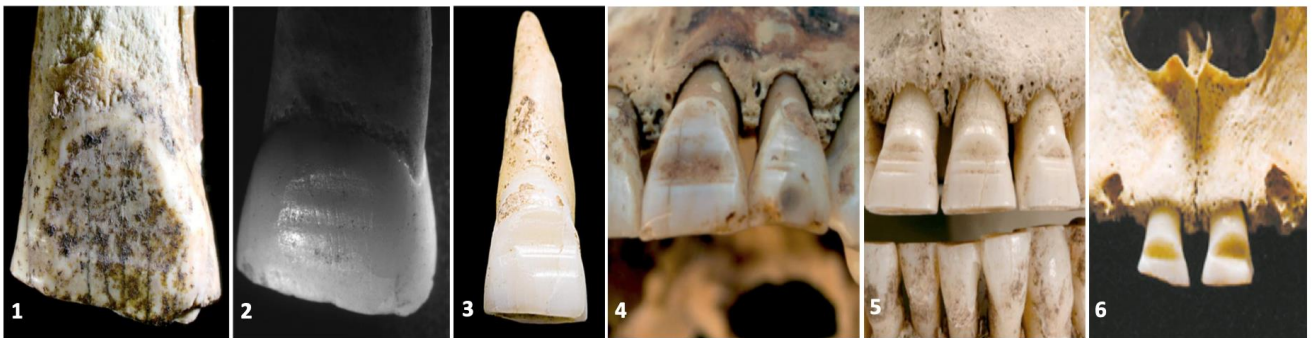
Figure 4: Images of the variation seen in Viking tooth modifications (anterior views), organised from left to right in order of increasing complexity. 1 shows simple anterior filing. 6 shows extreme modification to the dentine. 1, 2, 5, and 6 originate from Sweden. 3 is from England and 4 is from Egypt (adapted from Arcini, 2005; Arcini Ahlström, 2018).

Figure 3: Illustrations of the various expressions of Viking maxillary anterior labial surface dental modifications (adapted from Arcini, 2005, Table 2).

Understanding how Viking dental modifications were produced is important to investigating why they occurred. Teeth are known as important indicators of biocultural interaction; however, dental markings can occur due to metabolic conditions, and adaptations to environmental circumstances (El-Najjar *et al.*, 1978). Linear enamel hypoplasia (LEH), caused by nutritional stress in childhood (Jurmain, 1999), is responsible for some linear striations across the anterior surface of teeth (El-Najjar *et al.*, 1978). LEH is recognisably different from the intentional flat-filing of the anterior surface, characteristic of Viking tooth modifications. It does not cause sharp lines, grooves and geometric semicircles noted in modified teeth.

Alternatively, the process of yarn production has been associated with dental marks. Yarn making can involve fibres being passed through the teeth as the mouth acts as a tool. This undertaking can create dental striations. However, such striations are often on the occlusal, not the labial surface, of the teeth, since the yarn is anchored between the maxillary and mandibular teeth (Scott and Jolie, 2008; Figure 5). Creating striations across the labial surface of the anterior teeth would not occur in yarn production. Furthermore, dental trauma (e.g. accidental injury to the tooth) is unlikely to create the uniform marks associated with intentional modification, nor would injury to deciduous teeth, or tooth-pick striations (Arcini, 2005; Scott and Jolie, 2008; Kjellström, 2015). In summary, the modifications observable in certain Viking Age individuals were purposefully made and were not the result of metabolic disease or using the mouth as a tool. The careful, sharp, incised nature of the grooves and the flatness of the labial surfaces suggest that the marks were created using a metal, likely iron, file (Arcini, 2020). However, why teeth were intentionally modified remains debated as does why this phenomenon appears to have been entirely restricted to one demographic: adult males (Arcini, 2005, 2020; Toplak, 2015; Arcini Ahlstrom, 2018).
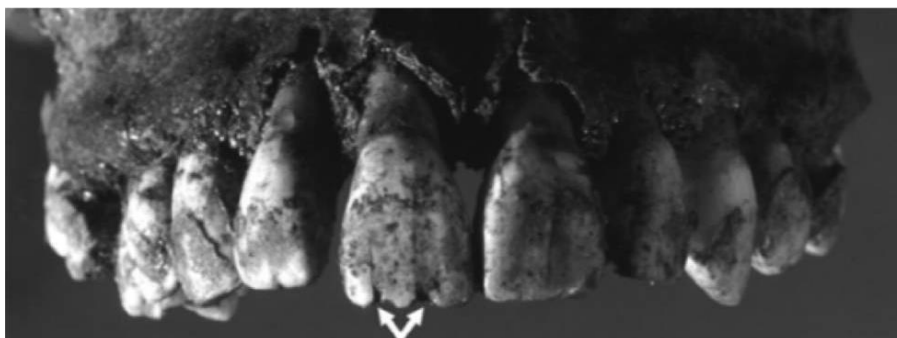
Figure 5: Example of the type of dental modifications created as a by-product of yarn production. Note the marks are produced on the occlusal, not labial surface (adapted from Scott and Jolie, 2008, Figure 1c).

Materials and Methods:

In this project, data from 136 individuals described in the literature were investigated. Information previously gathered on geographical location, age, sex, and social identities, inferred through grave goods and burial conditions, were explored. Table 1 presents the data gathered on Viking tooth modifications currently published in the literature. 132 adult males were from Sweden and 80% of the total number of individuals were from Gotland. Two individuals were found in Denmark. One case was unearthed in England and a further case was discovered in Egypt. Lead and strontium isotope analyses can be used to identify 'non-locals' and 'locals' within a skeletal population (Carlson, 1996; Bentley *et al.*, 2003). Arcini Ahlström (2018) was able to perform strontium isotope analysis for several individuals from Sweden and found that there was an intriguing mix of locals and non-locals found with tooth modifications, meaning that some affected individuals grew up in a different area from where they died. Furthermore, affected individuals were found from various sites, revealing exciting differences in aspects of identity inferred through burial goods and conditions. Potential motivations behind this practice were investigated through anthropological theoretical perspectives, including understanding the practice as identity expression; a form of fashion; the result of

structural violence; an example of costly signalling; or the culmination of several experiences and characteristics that can be best viewed through intersectional analysis.

Table 1: Data gathered on Viking Age adult male tooth modifications published in the literature. "-" indicates that more primary analysis is required.

Site	Number of individuals (showing tooth modifications)	Individuals sampled for strontium isotope analysis? (Arcini Ahlström, 2018)	Local or non-local? (Arcini Ahlström, 2018)	Social statuses/indications regarding possible identity characteristics
Lund (Skåne, Sweden)	132 (80% from Gotland)	Yes (1)	Non-local	Early Christian graveyard (Arcini Ahlström, 2018)
Fjälkinge (Skäne, Sweden)		Yes (1)	Non-local	Possible human sacrifice burial (Kjellström, 2014)
Trelleborg (Skäne, Sweden)		No	N/A	Healed fractures may suggest prior warrior/raider role (Arcini, 2005)

Vannhög (Skäne, Sweden)		Yes (2)	1 local; 1 non-local	-
Birka (Uppland, Sweden)		No	N/A	Trading centre, merchants (Toplak, 2015); warrior and slave burial (A129); sacrificial thralls and decapitated slave burial (A29); warrior (Burial Bj138) (Kjellström. 2014)
Sigtuna (Uppland, Sweden)		No	N/A	Trading centre, merchants (Toplak, 2015)
Orthems (Uppland, Sweden)		No	N/A	Trading centre, merchants (Toplak, 2015)

Bollstanäs (Uppland, Sweden)		No	N/A	-
Kopparsvik (Gotland, Sweden)		Yes (14)	8 locals; 6 non-locals	Trading centre, merchants, military centre? (Arcini, Ahlström, 2018; Toplak, 2015)
Slite (Gotland, Sweden)		No	N/A	Trading centre, merchants (Toplak, 2015)
Vibble (Gotland, Sweden)		No	N/A	-
Broa (Gotland, Sweden)		No	N/A	-

Hallvards (Gotland, Sweden)		No	N/A	-
Havor (Gotland, Sweden)		No	N/A	-
Kulle (Gotland, Sweden)		No	N/A	-
Varnhem (Västergötland, Sweden)		No	N/A	-
Hammar (Västergötland, Sweden)		No	N/A	-

Sörby-Störlinge (Öland, Sweden)		No	N/A	-
Folkeslunda (Öland, Sweden)		No	N/A	-
Alby (Öland, Sweden)		No	N/A	-
Galdegil on Fyn (Denmark)	2	No	N/A	-
Weymouth (Dorset, England)	1	No	N/A	Warrior/mercenary? Trader? Settler? (Loe *et al*., 2014)

Oxyrhynchus (Al Minya, Egypt)	1	Yes	Local (to Egypt)	Traveller? Unrelated – perhaps an example of a similar practice evolving independently?

Results:

All individuals who had been identified in the literature as displaying Viking Age tooth modifications were adult males from Sweden (Topak, 2015), with 80% from the island of Gotland (Arcini Ahlström, 2018). From Arcini Alhström's (2018) strontium isotope study, it is clear that a mixture of non-locals and locals were found to have modified teeth. Therefore, whilst 80% of affected individuals may have been buried in Gotland, many of them were not Gotlandic by birth (Arcini Ahlström, 2018). Furthermore, almost all individuals investigated were from Northern Europe, except one intriguing outlier from Oxyrhynchus in Egypt. (Arcini Ahlström, 2018). This individual was local to Egypt (Arcini Ahlström, 2018) and may represent a trader who received tooth modification whilst travelling around Northern Europe.

In terms of social identity, inferred through burial conditions and grave good accompaniments, individuals plausibly from different social strata were found to have these tooth markings. Adult male members of the elite have been noted with these dental modifications (Hägg, 2003; Kjellström, 2014; Arcini, 2020). One opulent example is the Bj886 chamber grave from the site of Birka. This grave contained a board game and weapons (Kjellström, 2014), usually interpreted as items of social distinction. The presence of weapons in this grave may indicate the occupant was a warrior of status within the community.

Furthermore, an example of Viking tooth modification exists in an individual found in Weymouth in Dorset, England (Loe *et al.*, 2014). This individual, who was decapitated and buried in a mass grave, is the only known person from a site in England to display such markings. This individual's skeleton showed clear evidence of perimortem trauma to the skull and cervical column

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(Loe *et al.*, 2014). Isotope analysis of other individuals within this mass grave suggests a Scandinavian origin, consistent with current knowledge of the demographic content of Viking armies (Loe *et al*., 2014). This individual may have been a part of a raiding party or perhaps he was a mercenary fighting for the English and was executed by the Vikings. Alternatively, this individual may have been part of a group of settlers who were victims of the St. Brice's Day Massacre in A.D. 1002 when all Scandinavians in England were ordered to be killed by King Æthelred the Unready. Furthermore, individuals ostensibly of both early Christian faith and Old Norse religion appear to have had tooth modifications. Most cases of tooth modification occur in Viking sites; however, at the site of Lund (Sweden), at least one non-local individual was buried in an early Christian graveyard (Arcini Ahlström, 2018).

There have also been individuals identified with tooth marks that appear to have lived as slaves: for instance, the Birka burial A129 and the Bollstanäs burial A29 (Kjellström, 2014; Loe *et al.*, 2014; Holmquist, 1990). Burial A29 is particularly interesting as it contained sacrificial slaves, one of which seems to have been decapitated (Hemmendorff, 1978; 1984). Additionally, as Toplak (2015) argued, many men with tooth modifications were found at key trading centres in Sweden, suggesting that these individuals may have been merchant traders.

When analysing the descriptions of tooth modifications in the literature, variation in position, depth and number of tooth grooves were notable. Interestingly, when groove morphology was compared to age, weak links were evident between increasing age and tooth groove depth, as two individuals with the deepest marks were older than average (Arcini, 2005). However, there seems to have been no correlation between social identity, possible occupation and the presence

or the type of modification received. As stated above, individuals ostensibly from different social strata appear to have received dental modifications so this cannot be described as the mark or social practice of one particular group of Viking men. In addition, whilst some evidence of trauma was found in association with tooth modifications, this is by no means the rule. Very few affected individuals actually display evidence of warrior activities, as weapon grave goods and skeletal traumata were rare (Arcini 2005; Mortágua, 2006; Toplak, 2015; Loe *et al.* 2014). Furthermore, no significant correlations with particular pathologies or stature were noted (Arcini Alhström, 2018; Arcini, 2020; Kjellström, 2014).

Discussion:

Identity expression:

Clearly, understanding why this practice occurred is challenging. However, several possible motivations can be explored. Firstly, it is possible that Viking Age adult males modified their teeth as a form of identity expression (Arcini, 2020). Tooth modification may have denoted status, certain occupations or affiliations: for example, warriorhood (Arcini, 2005; Toplak, 2015), enslavement (Kjellström, 2014), counter-cultural connections (Sheridan and Gregoricka, 2020) or merchant trading affiliations (Toplak, 2015). Interestingly, since so many examples were found at key trading sites, it is entirely possible that marks denoted status or occupation within merchant social roles. However, there are several notable exceptions, with slaves and warrior examples suggesting that these markers may not have been specific indicators of occupation or status. There are no clear links with social position. Whilst Gotland appears to be the central locus for this practice, strontium isotope analysis shows that individuals need not have held a native Gotlandic

identity to undergo tooth modifications. Indeed, if the practice did relate to a form of identity, it is unlikely to have been considered fixed for life as different individuals with the same modifications held contrasting identities (e.g. slave/elite, local/non-local, warrior/civilian, trader/farmer, etc.).

It is also important to note that an early Christian graveyard site in Lund (Sweden) included at least one non-local individual with tooth modifications (Arcini Ahlström, 2018). This may suggest that tooth modifications were not expressions of religious beliefs, associated primarily with Viking beliefs. Since this individual was non-local, it is possible that the individual was a traveller to Lund and happened to be buried here, but it is possible that if he was not Christian he may not have been granted burial in a Christian graveyard. Possibly, he converted to Christianity and thus his tooth markings were from an earlier part of his life, unconnected with his new spiritual self. However, it is also important to remember that tooth modifications may not have been connected with Viking religious belief and thus were accessible to adult male Vikings and Christians alike. A Viking cultural heritage could have been more important.

Fashion choices or structural violence:

It is possible dental modifications were simply considered fashion choices (Sheridan and Gregoricka, 2020), perhaps as an act of cultural conformity or a counter-cultural act of defiance. Across many societies, painful body modification is endured for aesthetic reasons (Labajo *et al.* 2010; Sheridan and Gregoricka, 2020), spiritual self-improvement, reputation building (Dumas *et al.*, 2021) or future reward (Sheridan and Gregoricka, 2020). Tooth modifications amongst the Vikings may have been socially understood in similar terms to how modern westerners tend to view tattoos and piercings. However, if dental modifications were simply a fashion choice, one

might expect to see more examples in the archaeological record. Thus, perhaps tooth modification was a form of structural violence or branding. The act could have been socially mandated for some men, or perhaps seen as a moral duty, designed to assuage perceived needs or promote social beliefs.

Costly signalling:

Viking dental modifications may have been an example of costly signalling, a hypothesis that suggests that seemingly 'wasteful' and painful behaviour (like modifying one's teeth) actually functions to convey information benefitting the signaller (Barnes, 2010). Body modifications can be unconscious advertisements of biological fitness, since they cause injury and demonstrate the efficacy of the immune system, yielding an advantage regarding mate attraction (Lynn *et al*., 2010). However, such an interpretation correlates with improved status, which is not archaeologically supported here.

Achievement and status:

Modification of men's teeth in the Viking Age may have even been understood as marks of achievement. Modifying the body can have positive social connotations (Graham and Haidt, 2010). Cultural dialogues on overcoming pain often reference achievement (Sheridan and Gregorika, 2020) and coping with pain can correlate with social capital. In this light, Viking tooth modifications may have signified specific achievements. Variations in groove number and depth, evident across the sample, may reflect variable pain tolerances (Arcini, 2020). However, since deeper grooves appear with older individuals (Arcini, 2005), perhaps additions were actually

symbolic of related achievements collected over time. It is possible men would gain tooth markings over several sessions, conceivably at various sites across Scandinavia or as a result of certain life events which may correspond with specific teeth or groove positions. It is important to bear in mind that the practice was not widespread and cannot have marked an event all men experienced. Thus, from an intersectional perspective, tooth modification may only have occurred when specific facets of identity, experience and achievement aligned in a meaningful way.

To be seen or not to be seen…

With any form of cultural expression which uses the body as a canvas, it is important to understand how visible such modifications may have been during life. Overall, I argue Viking dental grooves can be seen as outwardly informative or inwardly significant (Table 2). In essence, either they represent a statement to the world about identity, occupation, achievement, aesthetic affiliation, social membership or biological fitness OR they represent highly personal symbols of identity or commemorate private events and experiences. Tooth modifications would not have been overtly visible under lips and moustaches even if they had been coloured in some black soot or paste, as suggested by some researchers (Arcini, 2005; Toplak 2015; Kjellström, 2014). Today, tattoos and piercings can often be placed discretely across the body and are imperceptible to others. People often ascribe highly personal meanings to their modifications and frequently describe them as personal symbols which are not for public display. Perhaps Viking tooth modifications functioned in a similar way. Indeed, the general lack of visibility of Viking dental marks suggests that the practice was intended to be more inwardly significant than outwardly informative since

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there are much more obvious ways of conveying information through less painful ornamentation and augmentation of the body.

Table 2: Interpreting the purpose of Viking Age tooth modifications.

Interpreting the Purpose of Viking Tooth Modifications	
Outwardly informative (being noticed by others was its main purpose)	*Inwardly significant* (being noticed by others was not its main purpose)
• Outward expression of identity, social/spiritual affiliations, social position or occupation	• Personal marker/symbol of identity, social/spiritual affiliations or occupations
• Conforming to cultural aesthetic standards	
• Unconscious 'costly signal' of fitness	• Commemorating important personal or spiritual achievements/events
• Signalling high status achievements	

Conclusion:

Viking tooth modification, restricted to adult males, displays weak links with increasing age or the achievements that cumulate with age, but connections to specific identities are unclear. It does not appear to have been a closely-guarded cultural practice specific to Gotland, nor was it likely a costly signal of fitness or a mere fashion (as more males would have engaged in the

practice). The exact reasoning may never be fully elucidated. However, I argue that viewing the practice as outwardly informative or inwardly significant is productive. Furthermore, this research is the first of its kind to consider Viking tooth modifications from an intersectional perspective, demonstrating that they likely arose when several facets of identity, experience and achievement aligned in a way that was culturally meaningful. This research has provided new insights into interpreting the phenomenon of Viking tooth modification. Crucially, it highlights the importance of dedicating scholastic attention to how the body may have been used as a canvas for identity expression and cultural practice.

Future work in this area must include reinvestigation of the teeth themselves, as well as a thorough investigation of previous Viking Age collections curated before 2005. A reappraisal would benefit from 3D imaging techniques to map the different types of groove patterns and compare these data with other variables such as age range and inferred status. More extensive isotope analysis could prove interesting for interpreting the country of origin of those with tooth modifications and aDNA analyses might reveal noteworthy genetic relationships between the men bearing these elusive markings.

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'The butterfly is only beautiful because the caterpillar is brave': Exploring victim-survivor identities of people who have experienced sexual assault through arts-based research methods

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'The butterfly is only beautiful because the caterpillar is brave': Exploring victim-survivor identities of people who have experienced sexual assault through arts-based research methods

Utilising an arts-based framework, staged photo-taking and photo-elicitation interviews were conducted with eighteen university student victim-survivors of sexual assault, producing fifty-two photographs. Theoretically, this study is underpinned by feminist standpoint theory, a symbolic interactionist understanding of identity and an arts-based framework. The purpose of this study is to understand the multiple realities of identity and associations surrounding the terms 'victim' and 'survivor' for victim-survivors of sexual assault. Photographs created by victim-survivors can function to visually display the powerful emotions behind identity and labels, in a way that words may not fully encapsulate. Thus, this research has provided a glimpse into how victim-survivors view 'victim' and 'survivor' identities, as well as the deeper meanings and implications behind those terms. The findings from this study have implications for furthering our understanding of the depths and nature of the negative associations with the term 'victim;' such as victim-blaming, brokenness and fear. It has also somewhat confirmed and contributed to our understanding of how survivorship is explicitly tied to positive associations; for example, resilience, healing, fighter imagery and recovery. Findings from this study have also affirmed the idea that victim-survivors move from a victim-identity to occupying a survivor mentality, but also appreciating that survivors may reject the notion that this is a simple, linear journey.

Key words: Arts-based research, victim-survivors, identity, sexual assault

Background

There is an ongoing, unresolved debate within violence and abuse literature surrounding what is the most appropriate label to be given to someone who has experienced sexual violence (Williamson and Serna, 2018). Within contemporary society, people who have been sexually assaulted are typically labelled as either a 'victim' and/ or a 'survivor' (Dunn, 2010; Jordan, 2013). Although, the concept of a victim-survivor is also referred to in feminist discourse (Jean-Charles, 2014). However, both the labels of 'victim' and 'survivor' have differing connotations associated with them (Schwark and Bohner, 2019). The term 'victim' has a long-established history, particularly in trauma literature; the term may have a negative impact on the person who has experienced sexual assault (Kelly, 1988; Warshaw, 1988; Dunn, 2005). Alongside these connotations, research has found that the meanings attached to these labels may also influence the identities of victim-survivors (Hocket and Saucier, 2015). This is because labelling may add to the reinforcement of certain stereotypes associated with potentially stigmatised identities (Setia, Marks and Sieun, 2020). Therefore, it is imperative that we have a firm understanding of these labels in order to understand the potential consequences and implications they may have for victim-survivors.

The overall aim of this study is to enhance and contribute to existing knowledge surrounding victim-survivor discourses for people who experienced sexual assault. The ways whereby victim-survivors have been studied and represented, both within academic research and socio-politically, do not always fully take into account victim-survivors' voices, offer participation throughout the entire research process and give insight into their unique experiences (Desyllas,

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2014). It was crucial for this research to place victim-survivors at the heart. This research moved beyond a traditional qualitative research approach historically used with victim-survivor identity research, instead implementing a methodology of photo-taking and photo-elicitation interviews with victim-survivors. Thus, with its innovative approach to violence and abuse research, creating art that clearly shocks and stirs, it seemed like a natural fit for the Astonish the World Conference.

Research design

Theoretical and practical framework

Arts-based research is distinct from other, more traditional, forms of qualitative inquiry due to the creative means of representing participants' experiences of a phenomenon using different mediums and representational forms of expression (Desyllas, 2014). This study utilised the medium of photography, through producing staged photographs and conducting photo-elicitation interviews to explore the meanings behind victim-survivor identities. Staged-photographs refer to photographs deliberately created to showcase how a participant feels about an identity and their place in the world (Booth and Booth, 2003). As with other visual arts research, the art itself becomes data (Leavy, 2014); where the participant either creates a piece of artwork themselves and it is captured, creates a photograph to their own design or the researcher creates the artwork/ photograph themselves to the participants instructions. The meanings ascribed to said photographs are discerned through photo-elicitation interviews (Ponic and Jategaonkar, 2012); whereby the photographs themselves are used as prompts in qualitative interviewing to unlock understanding through participants voices (Leavy, 2015; Holm, 2008).

By utilising this method, participants were then in the driver's seat regarding how they represented the two identities and how they depicted their feelings about the labels ascribed to them (Wang and Redwood-Jones, 2001). Staged photography in qualitative research is informed by a variety of theories and approaches within violence and abuse research; feminist standpoint theory, tenets of participatory documentary photography and Freirean philosophy. Although each approach to research is distinctive, they all accept that underrepresented groups and their absence from research perpetuates the powerlessness of the members of these groups (Strack et al., 2010; Lopez et al., 2005).

Recruitment process and sampling

Due to the sensitive nature of this topic, the study utilised a self-selection sample (Duffy, 2010). The sample comprised of eighteen people who self-identified as victim-survivors of sexual-assault; where sixteen of the participants were female and two were male. Participants were between the ages of nineteen and twenty-four years old, all were either university students (both postgraduate and undergraduate) or had recently graduated from an undergraduate degree in the past academic year, with three being international students. Eleven of the participants identified as White British, three identified as White European, two as British Asian, one as Black British and one as biracial Black and White British.

Implementing the method

This study used photo-elicitation interviews to give participants the voice to ascribe meaning to their photographs (Ponic and Jategaonkar, 2012). The use of this interview technique

was chosen to enhance participant safety and autonomy, principles of vital importance to feminist participatory action research (Ponic, Reid and Frisby, 2010). The selection of this technique provided participants with as much control as possible over the interview process, particularly in comparison to a standard interview, as they were able to focus on the aspects of their photograph that they wished to highlight. All photo-elicitation interviews were recorded, and transcribed verbatim.

The eighteen participants in this study participated in at least two sessions with the researcher: 1) an initial dialogue session to discuss the production of their photographs and 2) a follow-up photo-elicitation interview once photographs were approved by the participant. What happened in-between the two sessions was entirely up to the participants; some chose to complete one or more of their photographs themselves, whilst others opted for the researcher to complete their photographs with their input. Most photographs created for this study were staged-photographs. In total, fifty-two photographs were created by eighteen participants.

Data analysis procedure

The data consisted of fifty-two photographs created with and/or by participants, as well transcripts produced by the researcher of eighteen photo-elicitation interviews. Consequently, the analysis of the data was performed in two major parts: (1) an analysis was conducted of each participant's photographs and interview transcript; (2) and then an analysis was conducted across all of the participants' photographs and transcripts together. Interview transcripts and photographs were analysed for overarching themes using thematic analysis. Thematic analysis is a method used to elucidate the realities and experiences of a specific group and their personal conceptualisation

of a phenomena (Joffe, 2012). The researcher explored the participants' photographs in depth in relation to the description of the photograph given by the participant in their follow-up interview, then subsequently comparing similar themes across all the victim-survivors' photos for each identity, namely 'victim' and 'survivor.'

Findings and Discussion

Negative associations with victimhood

Whilst there were some positive associations discussed surrounding the term 'victim', it soon became clear that most participants (twenty-four out of twenty-six victim images) centred their victim images around the negative associations. Feminist theorists and commentators have since notably pointed out the implications of using the term 'victim' to describe someone who had experienced sexual-assault due to the myriad of negative associations with the term and identity role (Dunn, 2005).

Victim-blaming

Several participants created images showcasing the societal belief that victims may have engaged in a certain risky behaviour or worn provocative clothing, that increased their likelihood for assault. For example, Rose chose to place terms commonly associated with victims on a "risqué" item of nightwear, including, 'powerless', 'helpless' and 'shame' (Figure 6). The piece of nightwear was specifically chosen by Rose as she believed it was both "slinky" and "sexy."

Figure 6 – Rose (Victim photograph 1)

At the top, she repeatedly wrote 'it's my fault' in the largest size, reflecting how this was both the central and first thought she imagined entered people's minds when she revealed she had been sexually assaulted. Rose wanted to emphasise how the societal perceptions of victims' assaults tend to revolve around images of the victim wearing provocative clothing, in a public setting where their own actions potentially may have placed them in danger and increased the likelihood of their assault. Thus she chose to express her thoughts on a piece of lingerie to symbolise the sexualisation of victims. She noted that:

"Whenever I tell people I was sexually assaulted...I don't know, I just feel like they imagine me in something sexy" (Rose).

Amira echoed similar sentiments of how victims were often subjected to blame due to the clothing they wore at the time of their assault. Amira discussed how she was wearing "provocative" clothing at the time of her assault. This made her particularly anxious about disclosing her experiences for fear of judgement, particularly from her conservative South-East Asian parents, whom she knew already disapproved of her clothing choices prior to the sexual assault. Amira particularly emphasised that her parents believed a "respectable girl is expected to cover her body. It's as simple as that. Girls who don't, they're perceived as problem girls, prostitutes, whores, you know what I mean?" Here, she is clearly echoing a common cultural rape myth of victim precipitation, namely that provocative clothing can increase the likelihood of sexual assault (Kelly, 1988), where men cannot control their sexual impulses if aroused (Cooper-White, 2019).

She described how she worried that people discovering what she was wearing at the time of her assault would make them perceive her as sexually immoral and 'asking for it' (Figure 2):

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Figure 2 - Amira (Victim Photograph)

Fear

The term 'victim' connotes a sense of helplessness (Young and Maguire, 2003) and feelings of fear and being afraid (Leisenring, 2006). Several participants chose to revolve their victim image around the themes of helplessness and being afraid; some opted to create images that showcased how they believed society perceived victims, whilst others focused on displaying their own personal fears as a victim.

Rachel created a drawing centring around socio-cultural messages and images of victims. Rachel drew Figure 3 to display deep-seated beliefs that victims were 'terrified creatures' in need of protecting from monsters. Figure 3 depicts "a terrified woman who has just been assaulted by her partner," bruised, and sobbing into her pillow; she is depicted "helpless," "terrified," and "afraid."

Figure 3 – Rachel (Victim photograph)

Along a different trail of thought, Penny, and Starr also created images surrounding feelings of fear and victims being afraid, but their photographs were rooted in their own experiences of victimisation. Starr created a photograph where she let the clothes that she was assaulted in wash away into the ocean. She described the process as her need to get rid of the memories of fear surrounding her assault and this act was symbolic of her choosing to not let her fear consume her (Figure 4).

Figure 4 – Starr (Victim photograph)

Alongside this, Penny chose to create a photograph highlighting the fears she experienced at her moment of victimisation, and subsequent helplessness she felt as a result. Penny recalled her struggle at the time of her assault to voice her lack of consent, due to fears of repercussions for her own physical safety and "making it worse." As such, she chose to create a photograph (Figure 5) that emphasised how some victims can feel afraid not just after their assault, but also at the time.
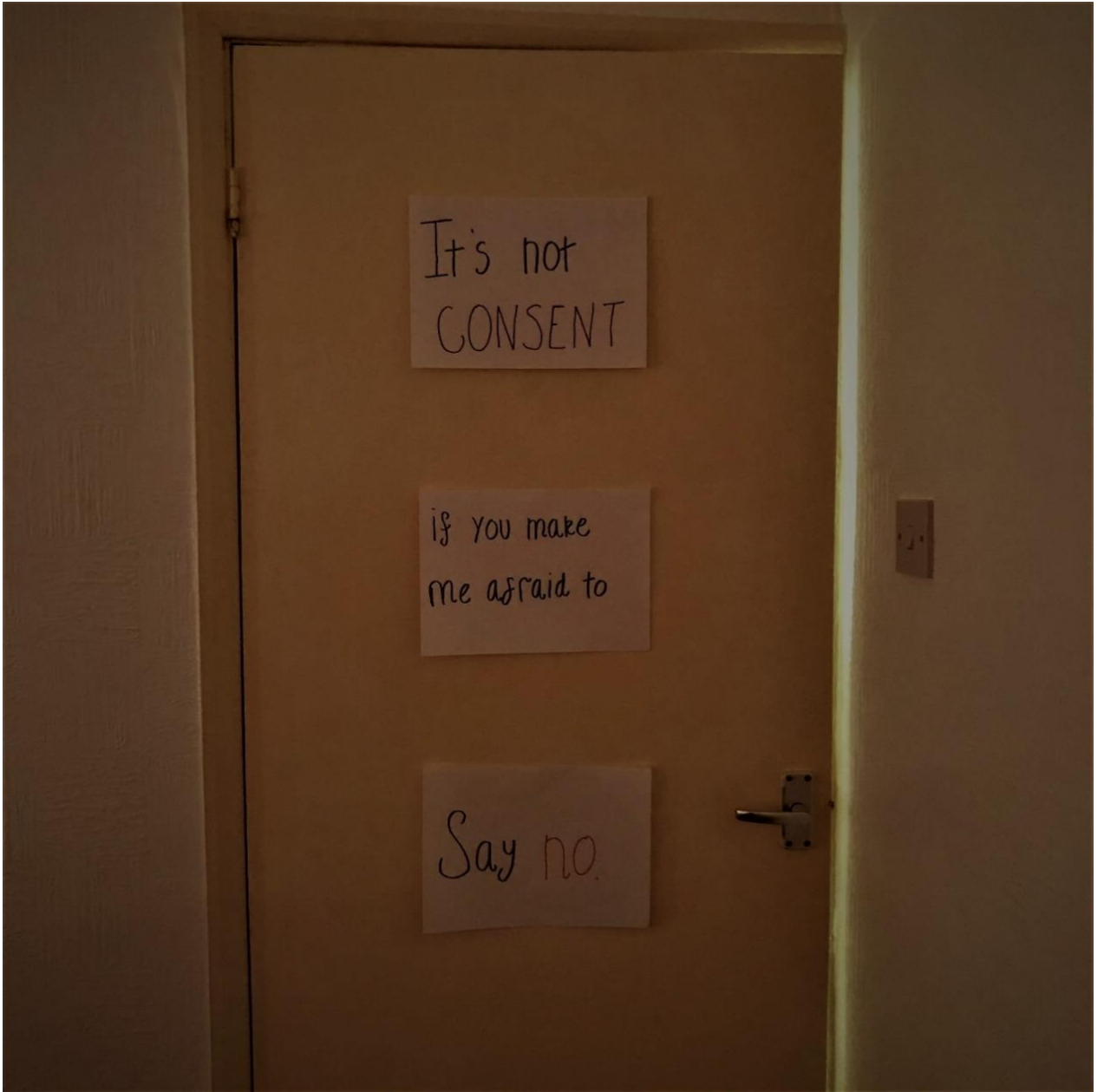
Figure 5 - Penny (Victim photograph)

Positive associations with the term 'survivor'

Whilst the study provided every victim-survivor with an opportunity to create their own unique photographs, there were some meaningful similarities. When completing their survivor image, victim-survivors created a large body of images that emphasised associations with healing and recovery, with nineteen out of the twenty-six images following this track. However, victim-survivors approached these concepts in distinctive ways. Several victim-survivors created imagery showcasing their own steps towards recovery and emphasising their bravery whilst engaging with the recovery process.

Resilience, healing, and recovery

The term 'survivor' has a historic association with strength and resilience (Walklate, 2011; Jordan, 2013). Many participants created survivor photos that echoed associations of strength, healing, and recovery. Chanel, Amber and Stevie created images surrounding the idea that survivorship is the result of victims engaging with the recovery and healing process, to move away from a victim-status, to a survivor identity. Chanel and Amber both discussed how after their assault they had received various types of therapies to help them engage in the recovery process. Both recounted stories of being given 'self-help' tasks encouraging them to focus upon positive aspects of their identity and use these as a basis to form a more optimistic self-identity (Figure 7 and Figure 6).

Figure 6 – Chanel (Survivor photograph)

Things that I love...

Me

Cat videos

Dancing in summer rain

Walking my dog on the beach

Harry Potter

Binge Watching Netflix

Peppermint tea

Eating Cereal at midnight

Football

My bed and Sleeping

Nutella

College Potatoes

Me

In an echoing sentiment, Eliza, Katherine, Sara, Penny, Amira and Luna all created images to emphasise the association with survivors and strength. Eliza captured an image of where she used to work in her first job, a job that she described as incredibly tough. She selected this spot to showcase how after her sexual-assault, she was pushed out of her comfort zone, just like in her first job working as an attendant looking after people renting boats on Lake Windemere. She described how even though she was reluctant to use the commonly held phrase 'what doesn't kill you makes you stronger,' she did feel she had shown great resilience to move on after her assault (Figure 8).

Sometimes you don't know what you're capable of until you step out of your comfort zone. Sometimes you choose to jump and sometimes you're pushed. And first it hurts, and then it changes you...
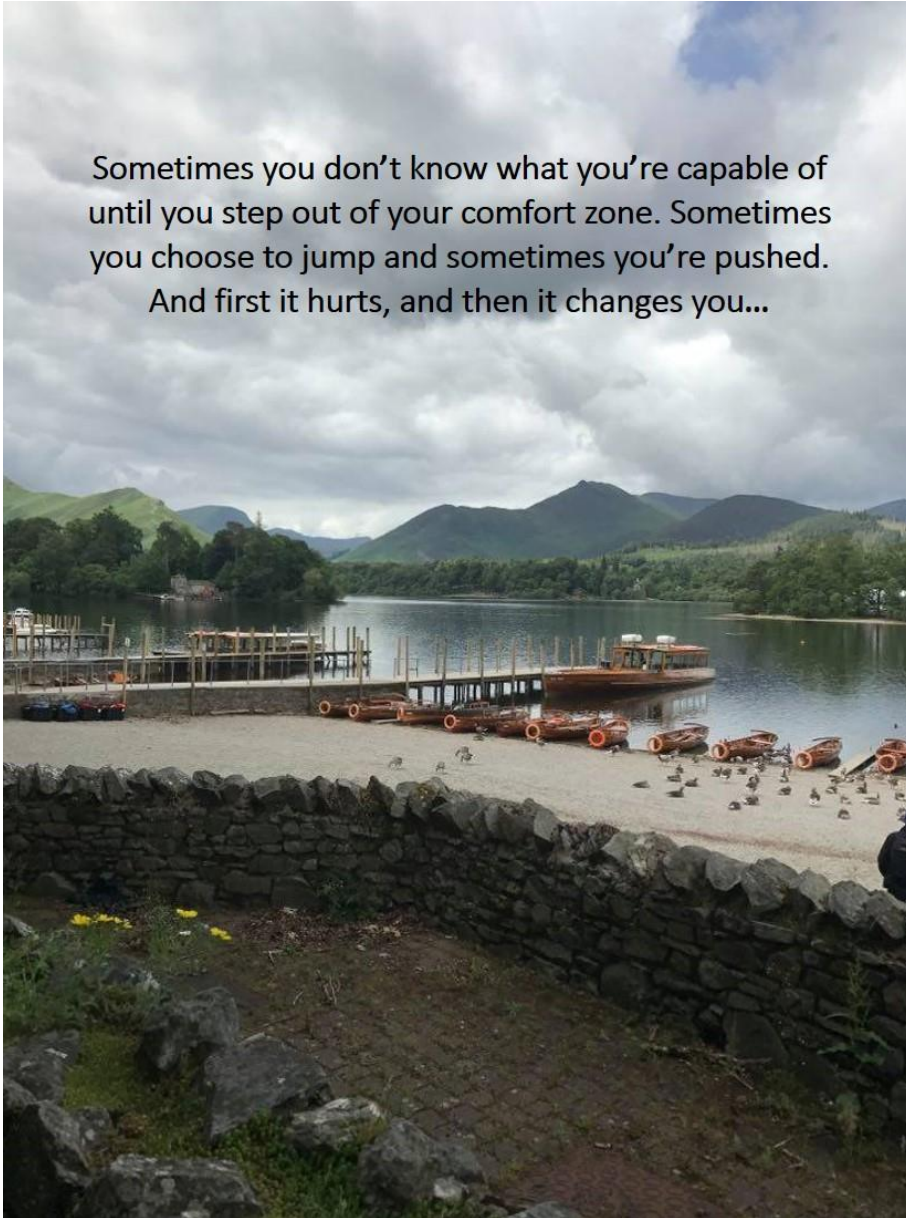
Figure 8 - Eliza (Survivor photograph)

Along a similar train of thought, Penny created an image of butterflies on a door to serve as a metaphor for the transformation of victim to survivor. She described how butterflies were regarded as beautiful, to illustrate how survivors were held in high regard. However, in order for

survivors to emerge, the caterpillar (representing victims) must show courage and bravery to enter hibernation, akin to victims undergoing the healing process. As she chose this for her survivor image, it has been included here (Figure 9).
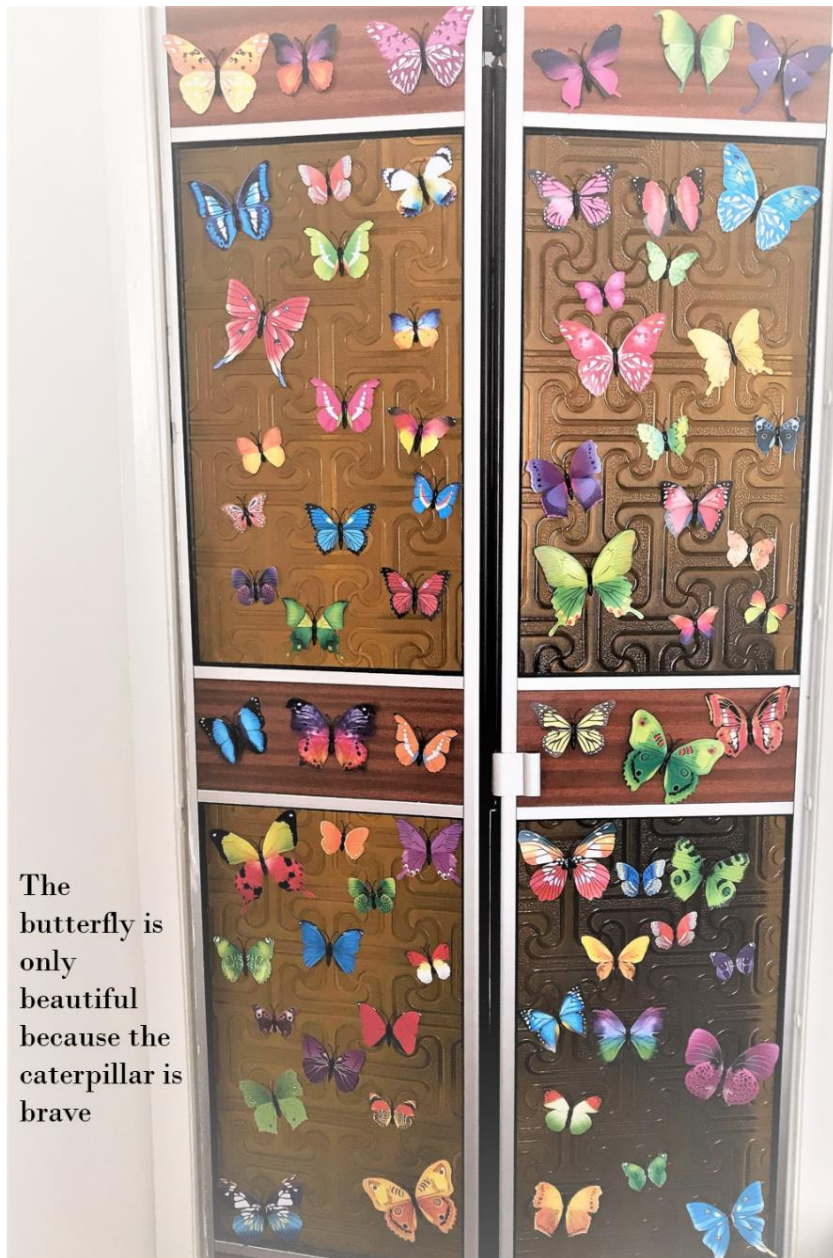

Figure 9 - Penny (Survivor photograph)

Luna also centred her survivor photographs on how their transformations towards survivorship drew upon her own strength and resilience. Luna discussed how the recent birth of her own daughter made her want to become a survivor. She emphasised how she wished to appear strong and resilient for her daughter's sake, to show her how she can overcome any obstacles, including sexual assault. Figure 10 is a recreation of a milk bath, an increasingly popular maternity photoshoot involving bathing in milk and often with decorative flowers. The milk symbolises purity and the flowers are evocative of new life, both new life that she brought into this world and the newfound strength she wished to display as a survivor for her daughter.

Figure 10 - Luna (Survivor photograph)

Warriors

Alongside associations with strength, survivors have often drawn comparisons with warriors and fighters (Larson, 2018). Larson (2018) described how wartime vocabulary can be used to describe survivors; they are warriors who are fighting to recover from the wounds that their sexual-assault has inflicted upon them, both emotionally and physically. Indeed, some of the victim-survivors drew upon fighting imagery to showcase how resilient and strong survivors of sexual-assault were.

For example, Natasha drew inspiration from the Second World War, creating an image where 'survivor' was written out in Morse code; a tool used by the Allies to conceal messages from the enemy and win the war (Figure 11):
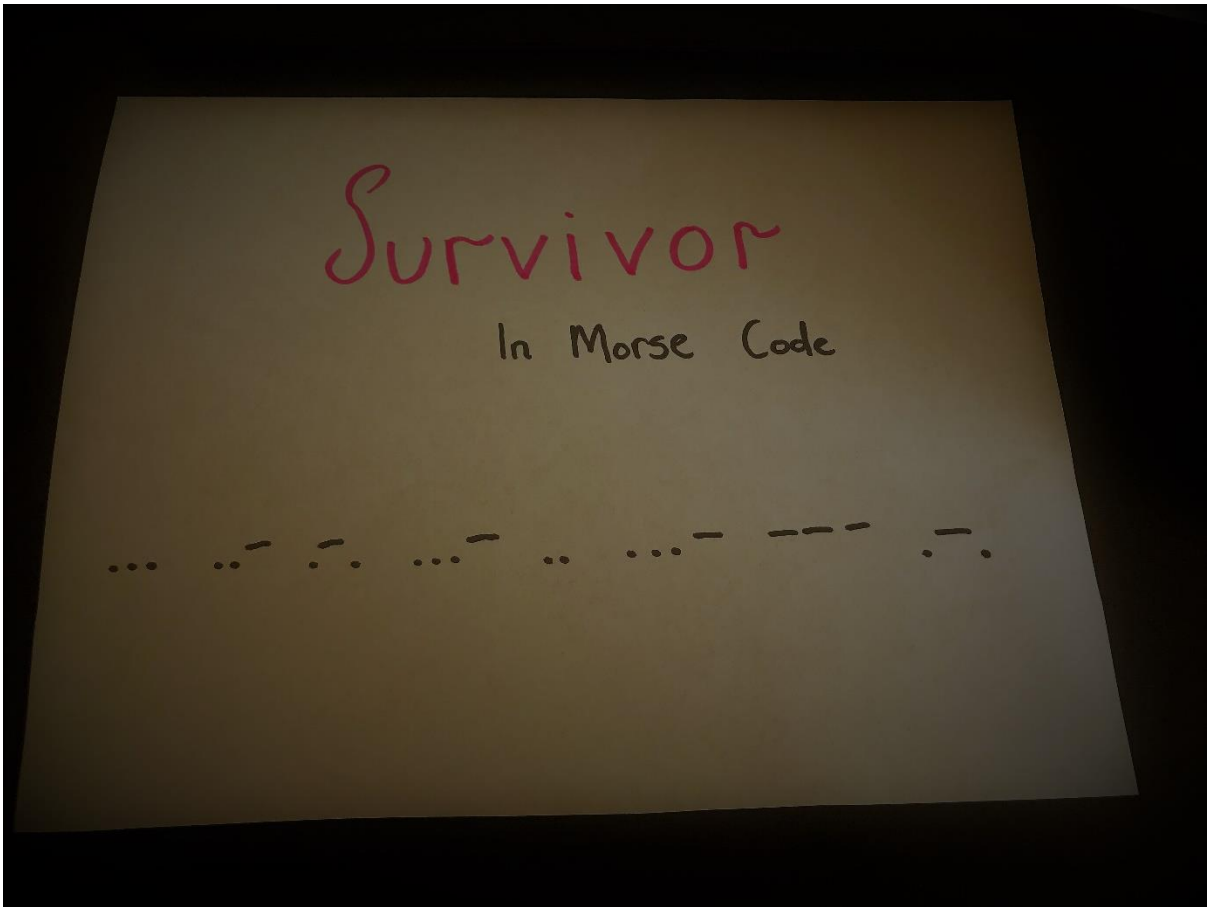
Figure 11 - Natasha (Survivor photograph)

In a similar sentiment, Rachel also utilised a fighter metaphor in their photograph. Figure 12 is a drawing of what Rachel believed is the archetypal survivor. She explained the pictures as:

"In my head I see an image of a strong person who is like…I suppose in a way I see a protest; I see someone with their fist in the air and they're like, I've done this!"

Rachel went onto explain how survivors are fighters, but stereotypical underdog fighters, an archetype Rachel believed "Rosa Parks" was emblematic of. They are fighters who struggle

through adverse circumstances but stand up for what they believe in and show great determination, fighting against an oppressive system.

Figure 12 - Rachel (Survivor photograph)

Healing is not linear

Thompson (2000) proposed that after sexual-assault, victims take steps to move towards a survivor mentality and this process can be conceptualised as a metaphorical journey (Jordan, 2013). Many of these images emphasised the emotional strength and resilience that survivors rely upon to progress on this journey.

In sharp contrast to traditional survivor ideology, some victim-survivors (four participants) openly questioned this idea of a journey. Penny chose to create a fluctuating graph to illustrate how she perceived the healing trajectory to be in reality. She used butterflies to symbolise growth and changing, positioning them as having both an upwards and downwards trajectory at different points, to showcase how healing is not necessarily linear for survivors (Figure 13). This was created specifically to emphasise how the transition from victim to survivor is fraught with difficulty, and how victim-survivors can fluctuate between the two identities.

Figure 13 – Penny (Survivor photograph)

Similarly, Starr emphasised her own belief that healing was not linear for all survivors. Figure 14 depicts herself in water of the seaside town of Brighton. She believed that Brighton represented her future as she had chosen to move there, escaping the city where she previously resided and the location of her own assault. However, she did not simply want to create a survivor photo where she had moved on, as this did not represent her own position in her recovery as a survivor. Hence, she opted to wear the clothes she was assaulted in as symbolic of her past and to

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showcase how the past and the future blend together in the present, revealing how recovery is not

linear.

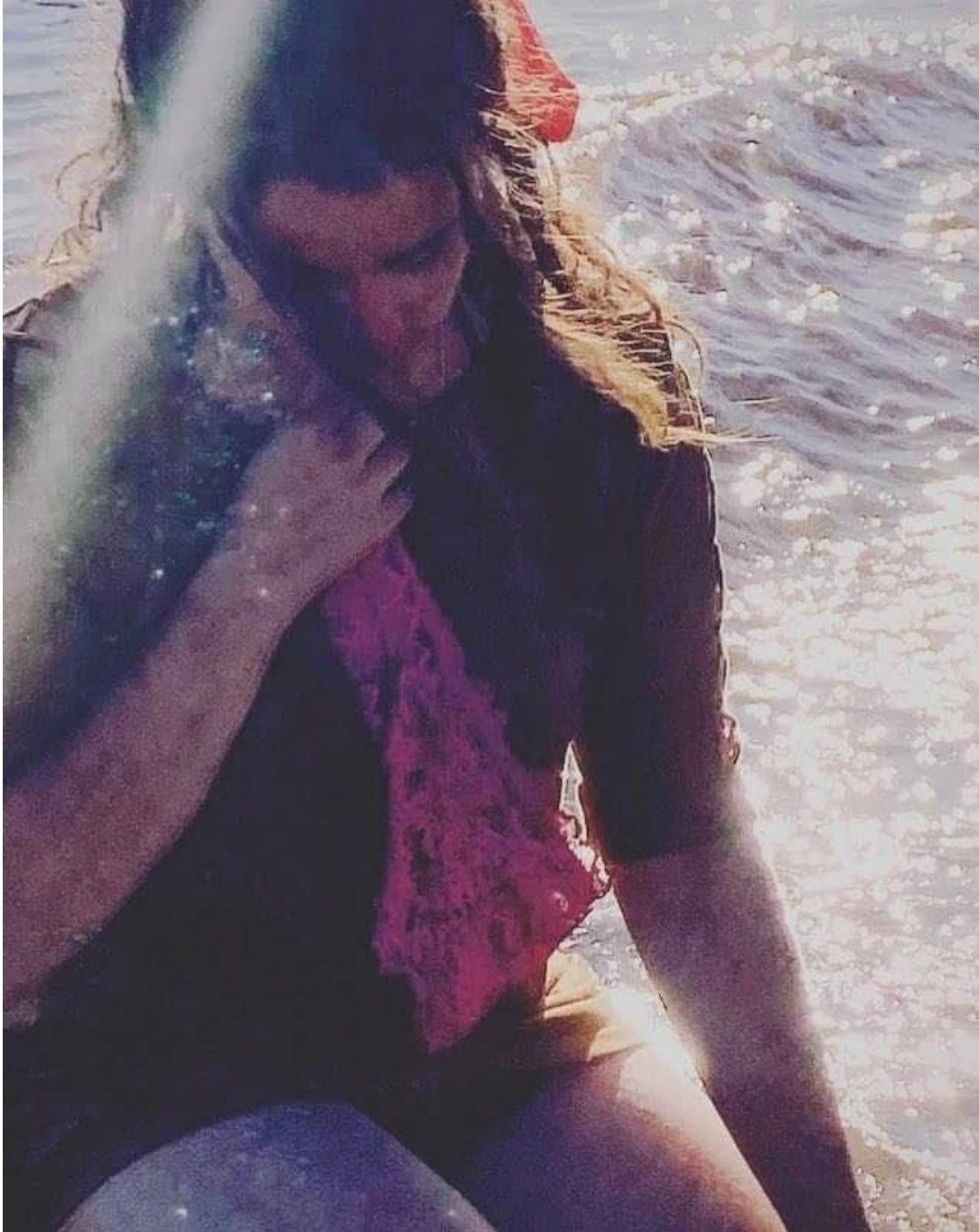*Figure 15- Starr (Survivor photograph)*

Mason took a different approach, however his image still highlights how healing is not linear. Mason wished to create a photograph that made some reference to his place of work where his assault took place. As he worked with children, he chose to write six words he associated with survivors on balloons (Figure 16).

Figure 16 - Mason (Survivor photograph)

These words were a mixture of positive (tough, phoenix and powerful) and negative (powerless, shame, jealousy and scars) adjectives, emotions and feelings. The incorporation of both forms of feelings showcase how survivors can be healed, strong and resilient, but also can still have some negative emotions about their assault, highlighting how it is not a simple linear journey of moving from hurt to healed. Rather, instead, identity fluctuates.

Conclusions

Arts-based research with victim-survivors offers a powerful tool to fuel social change around the issue surrounding identity, both within academia and beyond. Photographs created by victim-survivors can function to visually display the powerful emotions behind the negative associations with victimhood, in a way that words may not fully encapsulate. This research aimed to understand the multiple realities of identity and associations surrounding the terms 'victim' and 'survivor.' Historically, research has tended to focus on the language and associations victim-survivors hold with each term; for example, outlining what a victim-identity means to them and how they relate to a survivor mentality. Or in contrast, research had concentrated on societal representations of both identities and how victim-survivors feel in response to those perceptions. This has created a clear, apparent gap within violence and abuse research.

Consequently, this research has aimed to bridge the gap to allow participants to create images and give voice to the aspect of victim-survivor identities that they wish to shed light on. As such, participants were able to draw attention to normative societal caricatures and responses to victim-identity and survivor ideology, and/or share their own personal feelings, attitudes and experiences surrounding those terms. Thus, this research has provided a small glimpse into how

victim-survivors view 'victim' and 'survivor' identities, as well as the deeper meanings and implications behind those terms. This study relied on a self-selection sample due to the high commitment needed to participate and the sensitive content. However, an unintended drawback of this may have led to certain viewpoints being underrepresented, particularly male victim-survivors, victim-survivors beyond the age of twenty-four and ethnic minorities as only four participants identified as BAME. As a result, the study is limited in making assertions regarding the specific dynamics of identities along the dimensions of age, ethnicity and gender.

Within victim-survivor research, it is increasingly important that future research continues to use arts-based methods to allow for the exploration of the complex, multi-layered, multi-dimensional individuals who have been sexually-assaulted. There has been a historical understanding within sexual-violence research that victims initially occupy a victim mentality, embark on an emotionally draining journey and follow the path of resistance to become a survivor; the preferred status for people who have been assaulted (Jordan, 2013). However, whilst some victim-survivors may wholeheartedly accept this standpoint, it does not fully capture the complex nature of victim-identity and how it is occupied in differing circumstances, situations, and facets by some victim-survivors. Therefore, this research shall hopefully add to the growing number of studies seeking to challenge the polarising categories of 'victim' and 'survivor,' offering a small insight into how victim-survivors may occupy both labels, as there is still a pressing need for additional research into victim-survivor identities using arts-based methods.

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Do low-cost thermal vapour experiments (< £100,000) result in published research from more countries in quantum technologies?

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Do low-cost thermal vapour experiments (< £100,000) result in published research from more countries in quantum technologies?

Yes. Thermal vapour spectroscopy is one of many ways to probe the interaction between light and matter, providing a platform for studying quantum technologies. Unlike cold atom setups, which require highly specialised equipment to cool atoms to near absolute zero temperatures, glass cells are filled with an atomic species which can be heated to form thermal vapours at lower expense. In this paper, we give an estimate of the costs involved in going from a room with electrical outlets to a fully functioning thermal vapour lab which is less than £100,000. We investigate whether this lower expense correlates with published research in peer reviewed journals (impact factor greater than 1) from more countries. We conclude that countries which only publish thermal vapour data, as compared to those which also publish cold atom data, have lower mean HDI, GDP per capita and GERD % of GDP. We discuss the importance of impactful low-cost science in enfranchising scientists internationally.

Introduction

Quantum Technology is a fast-growing area in physics with applications that will soon be mainstay. Financial markets will keep time using atom based optical clocks (Poli, 2013; Ludlow, 2015). New forms of imaging such as LIDAR (Ohneiser, 2020; Vargas, 2022), ghost imaging (Cho, 2022) and filtering (Logue, 2022; Guan, 2022; Yan, 2022) will allow us to study the impact of climate change, reduce the number of invasive diagnostic procedures in medicine, and allow us to study solar weather patterns (Speziali, 2021; Erdélyi, 2022). Precision measurements of temperature (Gotti, 2020) and gravity (Luo, 2019) will improve GPS and communication services. Most exciting of all, quantum computing (Adams, 2019; Wu, 2021) will give us an advantage to solve certain kinds of problems that are difficult for classical computers.

We consider two broadly defined platforms to study and work with light-matter based quantum technologies. The first involves laser cooling atoms (or molecules/ions) to ultracold temperatures (Metcalf, 2003; Tarbutt, 2018). The objects of interest can be controlled more precisely leading to more ambitious projects. This comes at the cost of long build times and high costs (> £100,000). Alternatively, one can conventionally heat the atoms to a thermal vapour (Pizzey, 2022) and then probe the atoms with a laser. The build times on these setups are a matter of days, and the expense is below £100,000. However, because the atoms are moving about at higher speeds due to thermal motion, there is less control and hence may not be suitable for all applications.

In this paper, we claim the low-cost of thermal vapour platforms increases international participation in quantum technology. The rest of this paper is structured as follows. First, we show

that thermal vapour platforms can be constructed for under £100,000 by compiling an example cost breakdown. Second, we consider countries publishing experimental results on thermal vapour and cold atom platforms. We calculate relevant statistics and show that countries publishing only thermal vapour experiments have statistically lower science funding than those which publish on cold atom platforms. With this information, we discuss the importance of each nation contributing to scientific progress. We affirm the value of high-impact low-cost platforms for their inclusion of the global community in published research. We suggest that the scientific community seek ways to reduce the cost of expensive platforms so that lower-funded institutes may have more options to participate.
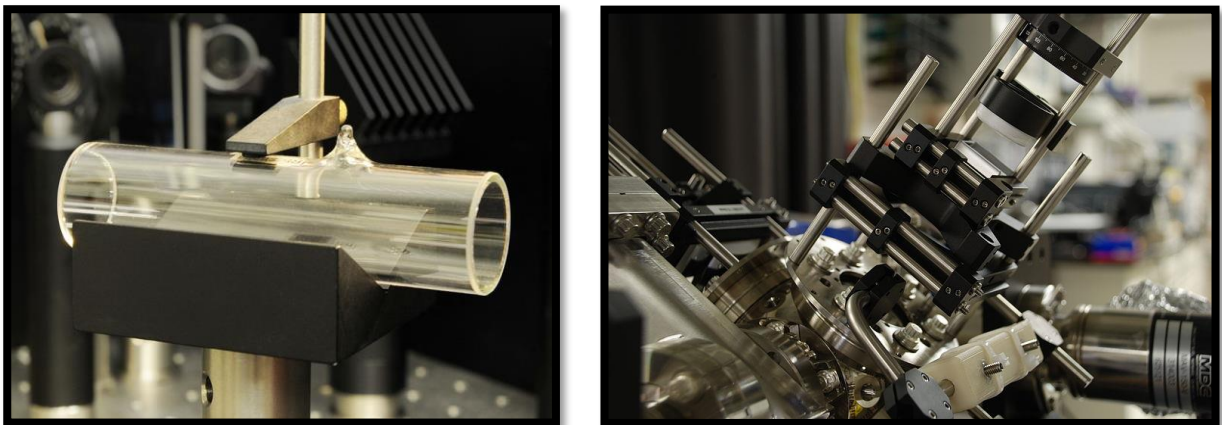

FIGURE 1: (Left) A 75mm thermal vapour glass cell. The cost of a cell of this type is ~£500. (Right) The device pictured is an arm of a magneto-optical trap which is used to cool atoms/molecules to ultracold temperatures. Its estimated cost is > £100,000. Both images shared under Creative Commons Share Alike licenses. See https://commons.wikimedia.org/wiki/File:Rubidium_vapour_cell.jpg and https://commons.wikimedia.org/wiki/File:2DMOTarm.jpg for licenses.

Costing a Thermal Vapour Lab

In this section, we give a rough cost breakdown of an example thermal vapour lab. Our budget assumes we start with an electrified air-conditioned room and buy all the items needed to perform the experiment published by Logue (2022). Details can be found in Table 1. These prices are for the UK market in 2022 and exclude VAT. Different distributors cover different regional markets, and prices can vary dependent on location. Other providers such as Edmund Optics and Newport Corporation can also provide many of these items. Requirements can be so specific that it is often easier and cheaper to manufacture certain parts in-house. In our case, the cell heaters were designed and built in Durham.

This costing does not account for salaried work. Only one person is needed to operate a simple thermal vapour experiment. However, science thrives on discussion of ideas, and therefore groups of scientists tend to work on one experiment e.g. one in the lab, one supervising, one analysing the data. Most labs work successfully alongside a wider departmental framework including administration, Health and Safety, IT and mechanical and electronic workshops, which will add considerably to working costs (Altbach, 2003; Woolston, 2023).

A thermal vapour experiment can be set up, results taken, and dismantled in a matter of days if the researcher knows beforehand what they want to achieve. In a cold atom setup, several months or years may be needed to build and take results. Having said this, many cold atom groups publish preliminary data periodically on the experiment's progress.

The power consumption of the DL Pro Laser is quoted in the specification as typically < 30 W and max 250 W. Computers and oscilloscopes consume 100s W, and the quoted power supplies have maximum output less than < 100 W. Therefore, power costs for the setup can be estimated to be on the order of running four computers. The final power costs are determined by how long the experiment must run. Snapshot results can be obtained immediately but we may want to measure long term change. We have not considered lab lighting, air conditioning or other electrical costs.

We can conclude that starting from an electrified air-conditioned room, it is possible to build a thermal vapour experiment in the U.K. for under £100,000.

TABLE 1: Breakdown of Costs for Thermal Vapour Lab

Capital (>£1,000):		
DLC Pro 100 Laser System @ 780nm with Controller	~ £16,000	(Unofficial quote from ThorLabs Salesperson)
Optical Table and Workstation	~ £11,000	(Thorlabs.com)

Assorted Optics: (Mirrors, Beamsplitters etc.)	~ £5,000	(Thorlabs.com)
Fabry-Pérot Etalon	~ £3,000*	(Thorlabs.com)
Posts and Holders for Optical Elements	~£2,500	(Thorlabs.com)
Basic Four Channel Oscilloscope	~ £1,500	(TekTronix.com)
Consumables (<£1,000):		
2x 24 Volt Power Supplies	~£200 each	(rs-online.com)
2x 75mm Alkali Vapour Cell	~£500 each	(Thorlabs.com)

In house-built 5mm Vapour Cell	< £500	(Durham Chemistry Dep.)
Screws, Nuts and Bolts	~£100	(Thorlabs.com)
Neutral Density Filter Kit	~£500	(Thorlabs.com)
Screws, Nuts and Bolts	~£100	(Thorlabs.com)
3x Photodetectors	~£300 each	(Thorlabs.com)
BNCs and Power Cables	~£200	(rs-online.com)
Magnets	< £100	(First4Magnets.com)
In-house built Heaters	< £500	(Durham Physics Dep.)
In-house built Magnet Holders	< £500	(Durham Physics Dep.)

Laptop with Open-Source software to process data	~£500	(Various suppliers)
TOTAL:	~ £45,000	

* Can be manufactured in-house for considerably less (~£100s)

Publishing by Country and Platform

Of interest in this paper is whether there are differences between countries that publish experimental data on different-costing platforms. We test this hypothesis in the context of quantum technology and compare cold atom and thermal vapour publication data.

We set as our criteria that a *country has published experimental work on platform X* if:

a) Data was gathered, though not necessarily analysed, at an indigenous lab.

b) The data was published in a peer reviewed journal of two-year impact factor of one or greater[2].

Point a) rejects collaborative publications where an institute/researcher in the country of interest provided theory, analysis, or other input to a paper but researchers in another country gathered data. This is extremely common where one research group may specialise in theory and the other in experiment. It also excludes countries where nationals have gone abroad to take data. For example, many universities currently fund PhD students to carry out their research in another nation while maintaining affiliation.

Point b) excludes groups who have working experimental setups but have not yet published. Setting the bar at impact factor one prevents us from counting journals which are not read internationally. Our criteria ensures that countries counted have made an original contribution to quantum technology with at least modest research impact. More details on this criterion can be found in Appendix A. The results are shown in Figure 2.

As many cold atom setups incorporate thermal vapours, we want to compare so called 'blue' countries which have published cold atom setups and 'red' countries which have *not* published cold atom setups but *have* published thermal vapour data.

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[2] For ease of searching, we only require that the journal has achieved the required impact factor in any year.
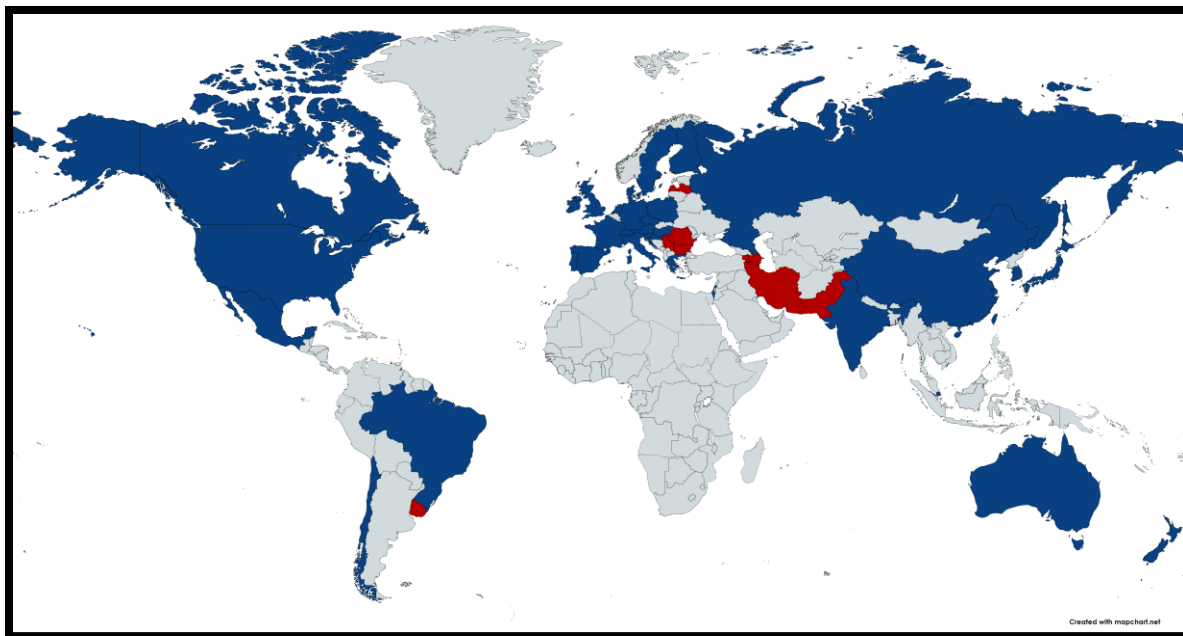
FIGURE 2: Countries which have published at least one paper in a peer-reviewed journal of impact factor one or greater which includes experimental data gathered in an indigenous lab using a cold setup (blue) and if not but in a thermal vapour (red). Note countries in grey may have published research that meets the criteria but our search could not find evidence for this. See Appendix C for details on search methodology. Image created with MapChart.net.

We do not make any conclusions about countries in grey. Science is highly specialised and a country's lack of publication in one specific area of physics may mean it is a leader in another. We do however want to make comparisons between 'blue' and 'red' countries. These countries publish experimental data in the same niche field with 'red' countries only publishing data on a cheaper platform.

Relevant statistics are shown in Table 2 including Gross Domestic Product (GDP), GDP per Capita, Human Development Index (HDI) and Gross Domestic Expenditure on Research and Development (GERD) as a percentage of GDP (Human Development Reports, n.d.; UNESCO,

n.d.). All these statistics were calculated using the datasets referenced in the bibliography (See Appendix D for more info on data availability and the calculation process). We calculate means of these values averaged over the number of provinces in the sample. We do this since we want to gain a picture of an 'average' blue or red country. Does the lower price of a thermal vapour platform permit countries with lower ranking indicators to participate in quantum technology research?

We assume the 'blue' and 'red' samples are independent but do not assume normally distributed source populations. We therefore conduct one tail Mann-Whitney U tests (Mann, 1947) using the python scipy package (Virtanen, 2020) and find that all statistics show significant rank sum differences at the 5% level. We can conclude that 'blue' countries statistically rank higher than 'red' countries on these indicators.

TABLE 2: Comparison of 'Blue' and 'Red' Countries

	Blue	Red
Mean GDP (2019)	$2100 billion ± $ 700 billion	$130 billion ± $ 40 billion
Mean GDP per Capita (2021)	$41,000 ± $4,000	$10,000 ± $2,000
Mean HDI (2021)	0.89 ± 0.01	0.77 ± 0.03
GERD % GDP (2019) (excl. India & Taiwan)	2.1 ± 0.2	0.5 ± 0.1

Discussion

We hypothesise that the lower expense of the thermal vapour platform has permitted several countries with lower science funding to participate in quantum technology research. It is important that we enfranchise researchers from across the world to do science. While many scientists in countries without appropriate research opportunities move and work abroad (Baruffaldi, 2016), this may not be possible due to personal circumstance and finances.

Additionally, leaving development of quantum technologies to those abroad is not a sustainable option. Quantum technologies will soon universally underpin new standards such as time. For countries to run markets, internet services, and be compatible with processes abroad, optical clocks will need to be built within their borders (Kock, 2016; National Institute Japan, 2022). Indeed, quantum technology may soon provide the state-of-the-art security to be used by governments, banks and important agencies. Without quantum computing resources, countries leave themselves open to cyberattacks by ransomware, terrorists and belligerent governments (Tucker, 2010; Denning, 2019).

In countries with successful science programs, technological developments have led to commercial and public products with reduced costs and better functionality, changing the way people work and spend their free time. Technological development has lifted people out of poverty and improved quality of life and life expectancy (Cecchini, 2003; Kassie, 2011; Cascio, 2016).

However, an aspect we do not often think about as researchers is *technological development for making science more inclusive.* Advancements in quantum technology platforms

could bring down costs for lower-funded institutes increasing the number and diversity of researchers able to work in the same field. The benefits to the whole world could be numerous, including faster development times and the possibility of larger trans-national collaborations leading to more ambitious projects (Freshwater, 2006; Chen, 2019; Fitzgerald, 2021). In recent years, the commercialisation of highly specialised research equipment has shown promise for reducing costs. For example, ColdQuanta Inc. (Perez, 2020), founded in 2007, offer a range of off-the-shelf magneto-optical traps (Olson, 2012; Huang, 2018) at £10,000s.

We leave the reader, which we assume to be a researcher, with this question: how can you advance your field so that others are enabled to contribute and advance your field as well? For the present, we underline the importance of high research-impact low-cost platforms which are enfranchising more global scientists to be part of the active community.

Conclusion

We have introduced two platforms for quantum technologies and investigations: cold atoms and thermal vapours. Giving a breakdown of costs, we showed that thermal vapour platforms could be built for under £100,000 making them at least an order of magnitude cheaper than cold atom setups. We demonstrated a statistically significant difference between key indicators in countries with cold atom experimental publications and those with only thermal vapour experimental publications. We hypothesised that the cheaper thermal vapour platform allowed countries with lower science funding to participate in quantum research. In our discussion, we emphasised the importance of enfranchising scientists from around the world regardless of

political or economic situation. We put forward a mandate that scientists should not only develop platforms to decrease costs for commercial and public use but also for other academic use abroad.

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Appendix A: Justification of Criteria

In the section entitled 'Publishing by Country and Platform', we put forward our criteria for determining whether a country has published experimental work on platform X. In this appendix, we want to give some context to criterion b) where we demand a publication in a journal of two-year impact factor of one or greater.

Impact factors are notoriously controversial ways of evaluating the research quality of a journal (Seglen, 1997; Bordons, 2002; Casadevall, 2014). An article's merit and, in many cases, its impact are not dictated by the journal impact factor. For example, Siddons (2008) is a key paper in the field that has outperformed the 1.5-2 impact factor of *Journal of Physics B* receiving on average more than 10 citations a year with ~80% of those from outside the Durham group. Nonetheless, we are using this criterion for a specific purpose: to compare research outputs on two different platforms using the same metric. For this we need something easily measurable (which we choose to be impact factor) with a high chance that all papers meeting this criteria will be found in our searches (journals with impact factor 1 are well indexed online). We admit that the 'yardstick' of impact factor 1 is somewhat arbitrary and could be set higher or lower. We do not pass any judgement on the standard of any research that did not meet the criteria set out in this investigation. In Appendix B, we highlight countries conducting research that did not meet this criterion.

We agree that it would be inappropriate to use impact factors to provide an in-depth survey of cold atom and thermal vapour research worldwide. Journal publication and readership remains

a barrier for many across the globe. For the remainder of this section we discuss some of these issues briefly.

Journal publication may entail publication fees thus increasing the price of research (Fontúrbel, 2021). In the field of atomic, molecular and optical physics, there now exist several journals that offer free publication provided the article is made available behind a paywall. Examples include IOP's *Journal of Physics B, European Journal of Physics, Laser Physics Letters,* Optica's *JOSA, Optics Letters* and APS' *Physics Review, Physics Review Letters[3],* all of which are well regarded journals in the field.   Additionally open-access submission fees can be waived or reduced if the authors meet certain requirements or are submitting from low or lower-middle income countries in accordance with Plan S (Rabesandratana, 2018). However, there is evidence that these programmes have not increased participation from researchers in the Global South (Smith, 2021; Kwon, 2022) or from researchers without a paying institution (Burchardt, 2014). We cannot comment on the specific situation in physics.

Publishing requires good writing skills in English with citation rates of papers in other languages being statistically lower (Liang, 2013; Di Bitetti, 2017) hindering researchers without English language education. Additionally, what classes as impactful to a scientist in the Global South may be at odds with journal publishers in the Global North (Bryant, 2014) preventing

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[3] Note these publishers may encourage the authors to pay a processing charge – these are voluntary, and non-payment will not impede publication.

research from being introduced into the international forum. Indeed, there are many other issues that we will not discuss here.

In short, we recognise that criterion b) discriminates against certain research unfairly, particularly that originating in the Global South. We believe our metric while flawed can be used to infer the correlations we have asserted. These factors only reinforce our conclusion that we need to enfranchise scientists by changing the way we think about platforms.

Appendix B: Other Evidence of Research

We comment briefly on countries that did not meet criterion b) but which nonetheless show strong evidence of indigenous experimental research on thermal vapour or cold atom platforms. This is by no means an exhaustive list. These include countries which have published in conference proceedings such as SPIE (Wang, 2022), on preprint sites such as the ArXiv (Larivière, 2014) and in journal articles with impact factor less than 1. We have also included countries which have posted news bulletins indicating indigenous labs carrying out this area of research.
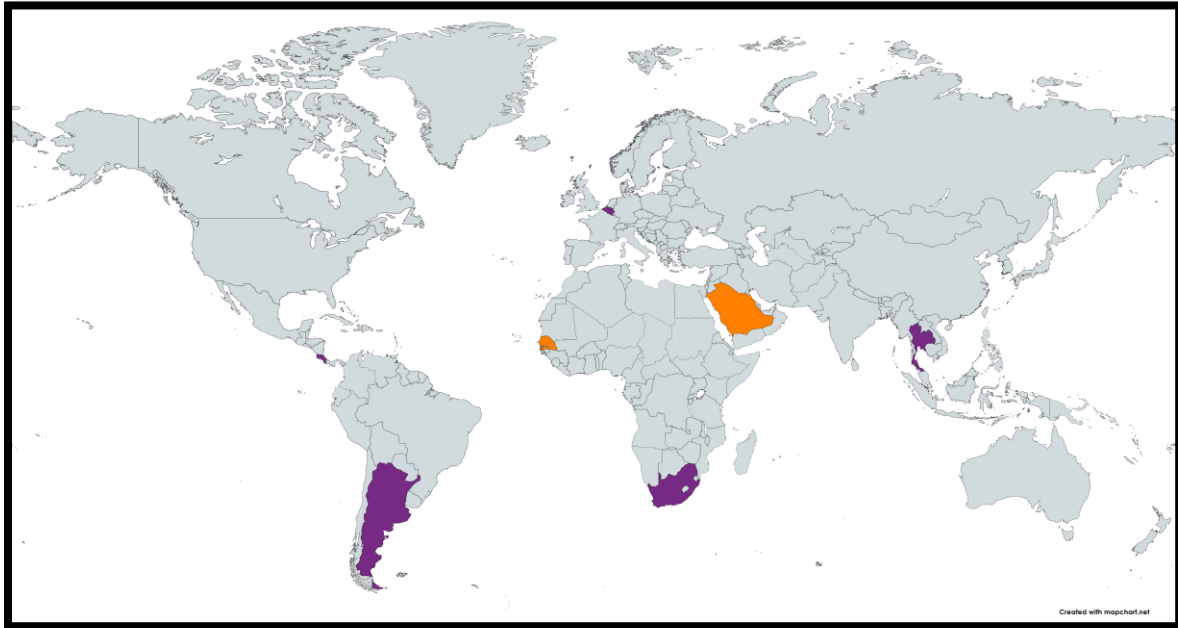
FIGURE 3: Countries which do not meet the criteria set out in 'Publishing by Country and Platform' but have shown strong evidence of indigenous experimental research on cold atom platforms (purple) and if not but on a thermal vapour platforms (orange). Image created with MapChart.net.

Opening up our discussions to optical, atomic and molecular physics in general, the African LAM network has laser labs in at least five countries and runs workshops across the continent (Wague, 2017). Nonetheless there have been barriers to progress (Kenmoe, 2022). We invite the reader to explore the progress and setbacks in physics research across Latin America (Ciocca, 2017; Wiederhacker, 2023), Central Asia (Twas Team, 2009; Ovezmyradov, 2023), the Middle East (Uzun, 1996; Zewail, 2014) and South East Asia (Lim, 2015; Schirber, 2019; Lee, 2023).

Appendix C: Search Methodology

Paper searches were conducted entirely online using various platforms including Google Search, Google Scholar and Scopus. Key words in searches included but were not limited to 'cold atoms', 'magneto-optical trap', 'thermal vapour', 'rubidium', 'caesium', 'potassium', 'sodium', 'spectroscopy, 'cooling', 'light-matter', 'laser', 'optical', 'atomic' and 'molecular'. Most searches were conducted using English keywords though we also searched keywords in Spanish, Russian, French and Arabic.

Of considerable help was the site everycoldatom.org which gives a good starting point for finding cold atom experiments around the world. In addition, we sought names of key physics institutes and faculty members in certain countries and used them to link with appropriate research. Several authors have penned national and continental reviews of physics progress which helped identify other trends to explore.

For each paper, we ensured the impact factor was verified by an approved source. We made decisions on each paper as to whether it related to a thermal vapour or cold atom/ion/molecular setup. A paper was deemed to relate to a thermal vapour if it employed a thermal vapour cell or a hollow cathode lamp. A paper was deemed to relate to a cold atom/ion/molecular setup if it featured a material being laser cooled to at least the approximate Doppler temperature or a device was built that could achieve such temperatures.

We would like to emphasise that the search was not exhaustive. However, we believe the indexing of journals with impact factor of one or greater to be particularly thorough on most

scholarly platforms. We hope that other researchers might correct or update countries that meet the criteria in years to come.

Appendix D: Data Availability and Test Details

A .csv file containing all data alongside a python jupyter notebook can be found at: Logue, F.D. Do low-cost thermal vapour experiments ($< £100,000$) result in published research from more countries in quantum technologies? [dataset]. Durham University. doi.org/10.15128/r1xs55mc08t. These include all the calculations need to produce the statistics in Table 2 and verify the outcomes of the Mann Whitney-U tests.

We use exact p-values for all statistics apart from the HDIs. The HDIs show tied ranks in our data and so we use asymptotic p-values and add a continuity correction. We note that whether the correction is made or not, the HDIs of the two samples are still significantly different.

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Editing Transatlantic Tensions and the New American Poetry in *Poetry: A Magazine of Verse*

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Editing Transatlantic Tensions and the New American Poetry in *Poetry: A Magazine of Verse*

In 1912, Harriet Monroe launched the little magazine *Poetry: A Magazine of Verse* with the ambitious aim of fostering a new American poetic tradition. Monroe's vision for this new poetic tradition was significantly influenced by her belief in the importance of the relationship between wild US landscapes and American identity. Recent criticism has drawn attention to the importance of little magazines and their editors (Monroe among them) in shaping modernism and this paper will use one issue of *Poetry,* published in November 1915, as a lens through which to view Monroe's actions as editor. Building on Robin Schulze's (2013) analysis of Monroe's editing of Wallace Stevens's poem 'Sunday Morning', I will consider the poem in its wider publication context. In particular, I will consider the implications of writing focused on the power of American nature appearing alongside bleak depictions of the First World War. While Monroe's call to look to American landscapes was apparently in tension with an inevitable focus on war-torn Europe, it is by considering this issue of *Poetry* as a whole that Monroe's skilful navigation of such transatlantic tensions becomes evident.

Keywords: Harriet Monroe, *Poetry*, little magazine, modernism, nature

Introduction

Autumn 1912 saw the publication of the first issue of *Poetry: A Magazine of Verse*. Harriet Monroe, *Poetry's* founder and editor, launched the magazine with the ambitious aim of fostering a new American poetic tradition. This aim aligned with the burgeoning modernist movement in the US and Europe; a desire to innovate that spawned such developments as the skyscraper and Pablo Picasso's art. Monroe could not have foreseen that the magazine would still be publishing monthly issues 110 years later, but *Poetry's* endurance seems a fitting realisation of her early ambitious aims. Recent critical work has done much to revive the importance of little magazines in themselves, not simply as vessels of important modernist writers (Newcomb, 2012). Numerous modernist writers sought to shock, even astonish, the cultural establishment with radical new approaches towards literature but this would not have been possible without the opportunity for publication provided by magazines like *Poetry*. Many of the most significant modernist experiments began life in the little magazines (termed 'little' because of their small circulation) of the early twentieth century. *Poetry* was one of the most successful of these little magazines and, during Monroe's editorship from 1912 until her death in 1936, formed a vehicle for her vision of a new American poetry. For Monroe, the American landscape was key to this vision. She aligned with contemporary discourses which viewed wilderness environments as one of America's "most distinctive cultural resources" (Buell, 1995, p. 56). This interest in the American environment as a source for American poetry becomes evident both in Monroe's writing and in her editorial alterations to works included in *Poetry*.

I will start with the infamous example of Monroe's editing of Wallace Stevens's poem

'Sunday Morning', which Robin Schulze (2013) identifies as a key example of Monroe's belief in the importance of American nature. Moving beyond the poem in isolation, I will consider the wider context of the November 1915 issue of *Poetry* in which it was published. This issue features Monroe's article, 'A Nation-wide Art', which calls on American poets to look towards the American wilderness. The issue also contains poems and features referencing the ongoing First World War which was pulling attention towards Europe. These different directional pulls signal a central tension for *Poetry* as a publication seeking to foster specifically American art while remaining invested in transatlantic exchange. However, by considering the issue's contents in conversation with one another, what becomes evident is the way in which Monroe used these tensions to strengthen her call for American poetic ascendance.

Editing 'Sunday Morning'

Wallace Stevens's 'Sunday Morning' is a notable example of controversial editorial choices on the part of Monroe. She required Stevens to cut the poem, a decision that Ellen Williams (1977) goes so far as to call "the biggest single blunder in her editorship" (p. 268). Stevens became one of the most prominent twentieth century American poets and 'Sunday Morning' was among his first mature works, which goes some way towards explaining the negative reaction to Monroe's alteration of his poem.

When presented with the shortened version of 'Sunday Morning', Monroe asked that Stevens also add stanza VII, originally the penultimate stanza, as the conclusion, a move that Schulze identifies as particularly significant. In the poem, an unnamed woman spends Sunday morning thinking about religion and the natural world. The poem considers the cyclical processes

of nature in contrast to the Christian tradition of salvation, with a particular interest in the inevitability of mortality (for a more detailed discussion of the poem as a whole, see Rehder, 2007). Despite its focus on mortality, the poem's final stanza, as published in *Poetry,* provides a somewhat hopeful conclusion. Stevens describes a group of men who chant in harmony with an idealised natural scene and the poem ends with these lines:

> They [the group] shall know well the heavenly fellowship
> Of men that perish and of summer morn—
> And whence they came and whither they shall go,
> The dew upon their feet shall manifest. (Stevens, 1915, p. 83)

Compare this to the lines that concluded Stevens's original version of 'Sunday Morning', a version which he restored when the poem was published in his collection *Harmonium* (1923):

> And, in the isolation of the sky,
> At evening, casual flocks of pigeons make
> Ambiguous undulations as they sink,
> Downward to darkness, on extended wings. (Stevens, 1915, p. 82)

Both conclusions demonstrate Stevens's interest in the natural world but while the latter ends in a fall to obscurity ("Downward to darkness"), the former emphasises nature's role in helping humanity endure, making ephemeral human movements "manifest". Thus, Monroe's request that Stevens conclude 'Sunday Morning' with the specific stanza quoted from above has a significant effect on the overall impact of the poem.

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Monroe's request that Stevens conclude the poem with this stanza is not, for Schulze, an indication of her failure to appreciate Stevens's vision but rather demonstrates Monroe as editor advancing her own message about the values of nature. Schulze (2013) explains that, in this final stanza, "The men choose nature as their poetic subject and their song perpetuates nature's power to restore" (p. 103). Stevens's concern with mortality is still evident but, in turning to the natural world, the men's song can endure "long afterward" (Stevens, 1915, p. 82). As published in *Poetry*, 'Sunday Morning' concludes with a hopeful indication of the renewing potential of nature for both people and art. In a later issue of *Poetry*, Monroe (1918) writes that "Mother Earth is the great renewer of the race, both physically and spiritually" (p. 320), echoing contemporary discourse that viewed a turn towards nature as a defence against supposed urban over-civilisation. Until the late nineteenth century, Americans were forced to encounter the wilderness through colonial expansion, but this fantasy of infinite westward movement came to an end with the closing of the frontier and raised anxieties how this change might affect the American populace. For example, one contemporary commentator argued that:

> In the future as never heretofore, our cities with their multiplying wealth and lavish luxury are likely to need the country for that steady renewal of their better life which shall keep them from relaxing into sensuality and sinking into decay. (Dickerman, 1913, p. 353)

In his examination of the importance of the concept of wilderness to American culture, Roderick Nash (2001) identifies the turn back to nature and rise in popularity of primitivism with "racism" and "Darwinism" (p. 151). Stevens's poem and Monroe and Dickerman's comments

make this link clear. Contact with nature is repeatedly invoked as a way to racially revitalise America. As both Schulze and Nash suggest, Monroe's interest in the American environment and the editorial actions she took as a result went beyond a desire to generate new American poetry. Like many of her contemporaries, Monroe's actions reflected a broader contemporary anxiety about the supposed degeneration of the white American 'race'. For Monroe, the celebration of nature in American culture was an essential aspect of maintaining a strong national identity.

'A Nation-wide Art' and the Call to Look West

In his call to shift modernist studies' attention towards the material forms and original publication contexts of texts, Edward Bishop (1996) argues that "we must go back to the original books […] feel the pages and look at the typefaces" (p. 314) and this essay seeks to do just that. A poem featured in a magazine with a wide variety of writers and styles (much like a paper featured in an interdisciplinary collection) may be received very differently to the same poem published in a single-author volume. 'Sunday Morning' is widely anthologised now, presented alongside such literary giants as T.S. Eliot or Ernest Hemingway (see Rainey, 2005; Levine, 2022), but it is important to consider the significance of its original positioning in *Poetry*. Going beyond Schulze's analysis of 'Sunday Morning', I will now consider the poem in conversation with other parts of the November 1915 issue.

A reader of the November 1915 edition of *Poetry* who had just finished reading 'Sunday Morning' would turn the page to find an editorial written by Monroe entitled 'A Nation-wide Art'. Like 'Sunday Morning', 'A Nation-wide Art' is also concerned with American nature. In the editorial, Monroe urges American artists to turn to the American landscape. Not just any landscape,

but specifically those most associated with wilderness and expanse. Monroe (1915) opens with this musing:

> During my recent travels through our scenic West, I was moved to wonder what would be the ultimate effect upon our art and literature of those great heights and depths and spaces, those clear skies and living waters, those colors incredible and magnificent. (p. 84)

She constructs an environment characterised by spaciousness ("great heights and depths and spaces"). This is not an empty spaciousness but rather one filled with an amazing vibrancy of "living waters" and "colours incredible and magnificent". For Monroe (1915), appreciation of these qualities of American landscape should inspire "a new richness, a new spaciousness" (p. 84) in American poetry. Monroe (1918) uses these spatial metaphors to directly contrast America and Europe, writing in another *Poetry* editorial: "Twenty years ago I travelled from Italy to Arizona, and to my profound surprise found Arizona the bigger thing of the two" (p. 325).

Monroe's emphasis on expansive and ostensibly uninhabited landscapes is typical of American pioneering attitudes which viewed the wilderness as an untamed space to be explored and conquered. This construction of wilderness was reliant on the dismissal of indigenous people's rights to and presence in these places and artistic depictions of the landscape, such as Monroe's 'A Nation-wide Art', were key to this violent erasure (Hore, 2022). This American interest in wild landscapes is, Lawrence Buell (1995) argues, part of the broader phenomenon of "new world pastoral" (p. 61) in which European colonial settlers constructed a cultural identity in opposition to the Old World, contrasting expansive New World wilderness with stifling European

urbanisation. Buell (1995) argues that "The American environment became one of its most distinctive cultural resources" (p. 56) and was therefore central in attempts to assert American cultural nationalism. Monroe enacts Buell's argument as she calls on poets to take inspiration from that which she views as uniquely American, the astonishing landscapes of the West.

In her editorial comment, Monroe locates a source for new American poetry, the poetry that she was attempting to develop in her magazine, in specifically American environments. This emphasis on American nature as a source of direct artistic inspiration recalls these lines in the final stanza of 'Sunday Morning':

> And in their chant shall enter, voice by voice,
>
> The windy lake wherein their lord delights,
>
> The trees, like seraphim, and echoing hills,
>
> That choir among themselves long afterward. (Stevens, 1915, p. 83)

In these lines, the landscape itself becomes part of the men's chant and creates the potential for it to endure "long afterward". Monroe may not specify exactly what she means when she calls for "a new richness, a new spaciousness" in American poetry but, in these lines of 'Sunday Morning', Stevens suggests how the American landscape may enrich the artistic expression that is located firmly within it. By considering this poem and editorial together, as they were originally printed in the magazine, a more detailed picture of Monroe's aims for American poetry and the ways they might be realised begins to emerge. While she urged poets to turn towards American nature, Monroe was altering some of the poems featured in *Poetry* in a way that conformed to this vision.

Wartime Tensions

However, this issue of *Poetry* was produced at a time when war cast its shadow over Europe and beyond. 'A Nation-wide Art' may urge Americans to look westwards, but the First World War was drawing American eyes towards Europe. A year earlier, the November 1914 issue of *Poetry* was entirely devoted to war poems and this November 1915 issue features two poems which deal directly with war: Grace Hazard Conkling's 'Refugees' and Catherine Wells' 'War'. In 'War', Wells (1915) considers a time before war and ends gloomily with the lines 'Never, I believe, shall I see their like again | In the dark horror of these days.' (p. 72). As a British poet living through the horrors of war, even on the home front, Wells depicts a world in which war eclipses all other concerns. Although America was not itself involved in the War at this point, Europe was still viewed by many Americans as a cultural centre and the War further increased Europe's prominence in American newspapers and American minds.

The two poems are not the only items in this issue of *Poetry* to mention war directly. An article entitled 'Autumn Leaves from England' catalogues various leaflets featuring the work of such prominent modernists as D.H. Lawrence, describing them as "an adventure of poets in war-ridden England today" (1915, p. 99). The article advises readers to "subscribe for all of them [the leaflets]" because "the art [poetry] in England needs fostering if it is not to be crushed under the heels of war" (p. 99). The reader is presented with a somewhat bleak picture for British poetry. Wartime pressures on paper production as well as the constraints of the 1914 Defence of the Realm Act were restricting cultural production in Britain whereas America, not yet a part of the war, was increasingly a centre of cultural innovation (La Casse, 2017). Even the title, with its reference to

'Autumn Leaves', evokes the ephemerality of an art on the decline. Significantly, it is the (predominantly American) readers of *Poetry* who, this article suggests, may prevent the decline of British poetry through their cultural and economic support. Rather than the traditional titan from which a young American poetry must separate itself, British poetry is here presented as suffering, like the country as a whole, from the devastations of war, requiring the charity of an aesthetically inclined American public for its survival. While Monroe (1915) criticises American poets' "obstinate preoccupation" (p. 84) with dominant European artistic traditions in 'A Nation-wide Art', the devastations of war were threatening these same artistic traditions.

The First World War may have challenged Monroe's focus on American sources of inspiration for American poetry but 'Autumn Leaves from England' demonstrates another way in which *Poetry* advocated American cultural dominance. The article suggests that American readers' influence extends beyond American art, even going so far as to protect the poetry of the Old World from the "heels of war" (1915, p. 99). Art's survival, according to Monroe, depended not just on artistic creation, but also the process of buying and reading.

However, it is important to recognise the specific context of this issue of *Poetry*. In April 1917 the US joined the War and rising costs and supply difficulties, similar to those seen earlier in Britain, followed. La Casse (2017) argues that these wartime pressures were especially problematic for *Poetry* because the magazine was already facing funding difficulties unrelated to the War. Ultimately, *Poetry* weathered this storm, but the charitable tone of 'Autumn Leaves from England' belongs to a specific moment in time and a specific issue of *Poetry*.

Conclusion

Taken as a whole, this November 1915 issue of *Poetry* demonstrates American poetry at a stage of flux, both in its relationship to national identity and transnational cultural networks. In 'A Nation-Wide Art', Monroe (1915) calls for "a new richness, a new spaciousness" (p. 84) in American poetry, inspired by specifically American environments. While Monroe's editorial suggests that this ambition had not yet been achieved, there are signs of movement towards it in the rest of the issue. Monroe's editing of Stevens's 'Sunday Morning' emphasises the themes she takes up in 'A Nation-Wide Art' demonstrating how, as editor, she was directly pushing poets towards her vision of the new American poetry. References in 'Autumn Leaves from England' to a British poetic culture weakened by the pressures of war gestures to a new space for American art. Monroe's attempts to "astonish the world" with a new American poetry were only one part of a broader pattern of growing American international influence that was more fully realised thirty years later, in the aftermath of another World War. It is by considering the issue as a whole, with varied articles and poems alongside one another, that this broader editorial picture emerges. Monroe may not have shaped each issue of *Poetry* to convey a specific message but her consistent emphasis on the importance of American nature and American cultural ascendency emerges most clearly when this November 1915 issue is considered, not as separate and ephemeral leaves, but as a coherent whole.

Acknowledgements

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Responsible behaviour in conflict zones? Exploring policy and managerial action in international firms

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Responsible behaviour in conflict zones? Exploring policy and managerial action by international firms

Following our recent research into multinational enterprise (MNE) strategy in battle-weary countries using the case of Heineken in Ethiopia and Myanmar (*Journal of World Business*, 2022), we now consider managerial and policy implications in light of the Business for Peace agenda. We identify three salient dimensions that should guide policy and managerial action in international firms operating in battle-weary countries: (1) the underlying trends for violence, (2) the extent to which partners are involved, and (3) local needs for sustainable development. We argue that the interplay between these dimensions will determine the extent to which policy and action are deemed responsible vs. irresponsible.

Key words: Business for Peace (B4P), MNEs, entry strategy, social investment, conflict zones

Introduction

As we enter the third decade of the 21st century, the world continues to be blighted by armed conflict and violence. According to the Uppsala Conflict Data Program (ucdp.uu.se), there were 120, 648 deaths across the world in 2021 alone that were attributed to armed conflict. This bucked a falling trend over the previous 6 years. There were 54 state-based conflicts in 2021 with 25 in Africa alone. The number of conflict deaths obscures the true cost to humanity; it is estimated that the ratio of injuries to deaths in armed conflicts ranges from 1.9 to 13 (Murray et al., 2002). The overall trend across the last century has been away from inter-state conflict (wars between countries) and towards intra-state conflict (armed violence amongst combatants originating within the same country). While there are exceptions to this, such as the recent invasion of Ukraine by Russia, violent conflict persists.

In this context, multinational enterprises (MNEs) continue to expand to conduct business across the world. The presence of bloody conflicts does not deter MNEs investing in countries with armed conflicts. MNEs expose themselves to the risks of violent contexts and continue to invest in countries where there are armed struggles and dangers to personnel and assets. In one study, it was estimated that 5% of the world's greenfield foreign direct investment (FDI) went to countries actually experiencing a war (Witte et al., 2017). Greenfield FDI occurs when the investing company builds new operations from scratch (manufacturing plants or distribution centres, for instance), as opposed to acquiring assets that pre-existed. Other studies support this trend of MNEs increasing their investments in war-torn countries (Dai et al., 2013; Driffield et al., 2013).

The risks for MNEs investing in conflict zones are not immaterial. There are risks associated with property damage, direct or indirect destruction of assets, safety of personnel, and instability in the local supply and distribution chains that make the costs of doing business in the country higher than would otherwise be the case (Williams and Steriu, 2022). In addition, there is an ongoing risk of adverse consumer behaviour and reaction against the investing company from stakeholders in other countries, including the home country of the MNE. This is especially the case when the MNE is perceived to be colluding with warring parties or otherwise contributing to the violent conditions. Boycotts back in the home country represent a major public relations risk to MNEs in these types of settings (Yaprak and Sheldon, 1984).

An important question has been posed by commentators, academics and experts on international development, peace and business relating to the role played by MNEs in helping to establish the conditions for peace in conflict zones. One the one hand, MNEs could make matters worse when they invest in conflict zones by siding with combatants or contributing resources and finance for warring parties (Ballentine and Nitzschke, 2004). This includes paying taxes to a conflict government - not just rebel group engagement.This falls into the category of corporate social irresponsibility (CSIR) as it is undesirable, makes the MNE culpable, and because affected parties (victims) are non-complicit (Lange and Washburn, 2012). On the other hand, MNEs can act responsibly and help establish the conditions for peace through corporate social responsibility (CSR), proactive social investment (i.e., supporting humanitarian or community projects) or even facilitating policy dialogue (Lenfant and van Cranenburgh, 2017, p. 40). It can be very difficult in practice for MNEs to know what the responsible choice is as these options carry an air of subjectivity, and can require firms to "pick a side" politically, a fraught endeavor in such spaces.

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We reflect on the scholarly work of the Business for Peace (B4P) paradigm, and the challenges and opportunities it has created in recent years. We also reflect on our recent study published in *Journal of World Business* on the entry strategy of Dutch-brewer Heineken in the battle-weary countries of Ethiopia and Myanmar. We then discuss implications for policy and coordination by MNEs as they seek advantages by entering conflict zones while contributing to peace where possible.

The Business for Peace (B4P) paradigm

The B4P paradigm is seen as an umbrella term that "…urges MNEs to enter conflict zones and fragile post-conflict environments as an alternative to traditional development aid" (Miklian and Schouten, 2014). It sees MNEs as partners in local peacebuilding and as powerful actors that can engage in actions that contribute to peace. MNEs are increasingly interested in doing this to secure early market access and also to be seen as good global citizens. Miklian, Schouten and Ganson (2016) identify five ways in which business can claim to contribute to peace: (1) growing markets to create a 'peace dividend', (2) bolstering local development capacity, (3) importing international democratic norms, (4) tackling the root causes of conflict, and (5) direct diplomatic efforts with conflict actors.

However, there are also detracting voices. The opposing view makes a number of claims: (1) that businesses can be complicit in driving conflict, (2) that CSR is little more than public relations and 'peacewashing', (3) that businesses can worsen inequality and exacerbate conflict, (4) that MNE efforts are simply corporate window-dressing for neo-colonist exploitation, and (5) that MNEs can contribute to the roadblock economies (Miklian, Schouten and Ganson, 2016).

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Indeed, Miklian and Schouten (2014) raise a number of pertinent questions: Should MNEs be peace-builders? What should MNEs do (nothing, or something?) Who gets to define peace? How should MNEs operate in conflict zones? How should MNEs relate to the informal economy?

These are clearly challenging questions, and the scholarly community has not resolved them yet. The situation becomes more complex when one considers the roles of other actors in peacebuilding in conflict zones, including local business (Joseph et al., 2021) and intergovernmental organizations (IGOs) such as the United Nations (UN). The UN launched its United Nations Global Compact (UNGC) in 2000, with a B4P platform in 2013. This is not without criticism and only 73 signatories within the B4P initiative are shown on their website (under B4P initiative) as per November 2022. Bache (2018) is critical of the situation where foreign private sector companies pursue a purely 'do no harm' strategy in fragile conflict zones. Left without oversight and influence from government, they can avoid conflict sensitive practices, including humanitarian or community social investments, that can contribute to peace.

Recent work has proposed evidence-driven ways for companies to promote peace. There is a groundswell of opinion amongst scholars that engagement with local communities is an essential component for this (Miller, Ganson, Cechvala and Miklian, 2019). Katsos and Forrer (2022) categorized the impacts of business actions on peace using a 3-staged process model. Murphy et al. (2021) showed how framing mechanisms – the way the problem is framed – helped achieve system-wide change in the context of the Northern Ireland Conflict and Peace Process. Katsos and Fort (2016) examine the link between ethical leadership and peace promotion through interviews of the honorees of the 2015 Business for Peace Foundation awards. They find that in

unstable environments ethical leadership has a role to play in peacebuilding in various ways, including helping disputing parties settle disputes, working in the interests of the community rather than the company's interests, taking a long-term and incremental approach to change cultural practices, being a central player in bringing other companies together to promote peace, having characteristics as leaders that included agreeableness, conscientiousness, and lack of neuroticism, and making social investments locally. Running through all these activities is the engagement with stakeholders in the local community and working with them in partnership; it takes ethical leadership within the MNE to do this effectively.

Our study on Social Investments by Heineken in Ethiopia and Myanmar

In Williams and Steriu (2022) we examined the social investments made by Dutch brewer Heineken in fragile states. The brewing industry is a global one and big brewing companies have been very active in conflict zones, not only in terms of distributing beer in perilous conditions using subcontractors, but also in operating breweries that are sometimes forced to close under threat of violence from armed groups (Oetzel and Miklian, 2017).

There were two parts to the analysis. The first part looked at the relationship between violent deaths in a country and how the MNE entered the country given the context for violence. Here we examined absolute levels of violence as well as the overall trend for violence (improving, i.e., a trend towards less violent deaths, vs. worsening, i.e., a trend towards more violent deaths). In terms of entry strategy, we looked at ownership mode (whether the investment was a full / majority ownership in which the MNE has control, or whether it was through a minority stake where it has less control) and establishment mode (whether the investment was through a

greenfield or an acquisition). These are the two main dimensions of strategy that MNEs consider when they invest in countries (Chen, 2008). After controlling for factors that are known to influence entry mode and identifying a sample of 73 entries made by Heineken over a two-decade period, we found that ownership mode was determined by the overall violent death trend in the country. It was in improving contexts for violence that the MNE seeks higher control.

Then, in part two of the study, we conducted a qualitative comparison between two contrasting conflict zones in which Heineken has invested. We chose two countries that differed in terms of overall violent death trend: Ethiopia (that was improving at the time of Heineken's entry) and Myanmar (that was worsening). By comparing the reports of local social investments made by the company following its entry into these countries, and validating them against various other sources, we found that the overall intensity, duration, and breadth of social investment was higher in Ethiopia compared to Myanmar. An example of social investment in Ethiopia was Heineken's CREATE initiative, a multi-year, multi-stakeholder program to support local farmers and ensure local sourcing and promote local barley production. There was less evidence of a similar program for Heineken in Myanmar.

This finding was the first time that violent death trend, ownership mode and the pattern of subsequent social investments were shown to be connected for an MNE entering a conflict zone. The period of our analysis was just before the onset of the Tigray War in Ethiopia (2020) and the military coup in Myanmar (2021); future research will need to validate our findings in light of these subsequent violent developments. These developments serve to remind us how any single

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company's social investment will never be enough to stop deep-rooted tensions resurfacing and violence re-emerging.

Implications for Policy and Managers

Set against the existing literature in the B4P space, our study on Heineken's entry and social investment in battle-weary countries has some important implications for policymakers and managers.

Firstly, actors that promote investment (governments, regional agencies, investment promotion agencies) need to be cognizant of the conditions for violence in fragile states. They need to pay attention to whether the trend is improving (less violence) or worsening (more violence) over time. Such actors advise and guide MNEs on appropriate entry strategies into those countries. This advice needs to incorporate well thought-out plans for subsequent peace-building. Our study suggests that guiding MNE entry strategy in conflict zones needs to go beyond 'top-level' decisions about ownership mode and establishment mode. They need also to include some clear thinking about the efforts that the MNE may be able to undertake to promote the conditions for peace following the initial investment. The fundamental choices between 'do no harm', a deliberate sequence of social investments involving humanitarian and community projects ('do some good'), and an effort to facilitate dialogue between warring parties and combatants. These options for subsequent engagement following entry have different implications for the MNE in terms of finance, skills needed, and partners to be involved. If policymakers are aware of the importance of the link between violent trends and ownership mode, they will be able to guide MNEs appropriately.

Secondly, MNE managers can also review these options for peacebuilding considering the nature of violence and local context in the host country. The MNE will understand its own strengths and deficits in terms of capabilities to deploy in conflict zones more than anyone else. External consultants and policymakers can guide and advise, but MNE managers will be key actors in developing and deploying assets that will best support appropriate peacebuilding strategy in each location. Our study suggests this will vary from country to country as the nature of violence varies, and it will also be associated with the entry strategy adopted by the firm in terms of ownership mode. MNE managers will need to understand the specific local context and invest time and effort in working closely with local communities to understand their needs for social investment over time.

Thirdly, MNE managers will need to review how they coordinate internally and externally as they seek to promote peacebuilding in the violent contexts where they want to operate. There is an ethical leadership component at headquarters level, the ways in which violent contexts are framed strategically, and the engagement of the MNE with other international actors such as IGOs and international NGOs. And there is the external engagement with local actors too, including local NGOs, on the ground in places very distant from the headquarters. This raises questions about how efforts for peacebuilding coalesce with entry strategy in specific locations and the overall strategic coordination of capabilities across the MNE. When done efficiently, the MNE will be able to transfer best practice from one location to another, manage public relations through evidence-based communication, and learn from engagements in violent contexts at a corporate level. Coordination has an internal and an external dimension, and it is based on knowledge management and dissemination within the firm. Knowledge management systems – which are

already very common in MNEs - can be redeployed for the purpose of coordination of strategy around entry into violent contexts.

Conclusions

Large and powerful MNEs are investing in conflict zones around the world more than ever. While this presents a risk to them, it also offers potential for peacebuilding. B4P scholarship provides multiple lenses and insights into how this potential can be realized. Our study on the case of Heineken links this to the more traditional international business theory by showing the relationship between the nature of violence, the ownership mode adopted when entering, and the pattern of social investments that can create the conditions for peace over the long-term. Implications for policy and managerial practice are based on taking this perspective and treating peacebuilding as an important component of entry strategy.

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