Bleed-out on the Brain:
The Neuroscience of Character-to-Player Spillover in Larp

Abstract: This paper investigates the psychology of bleed-out, in which in-character dynamics spill over into out-of-character thoughts and feelings (Montola, 2011). We pair emerging neuroscience theory and research with classic models of emotion and motivation to examine the causes and consequences of this important larp phenomenon. Regarding positive bleed, hormones associated with trust and love may promote social bonding between players through shared in-character experiences (Kosfeld et al. 2005). Negative interpersonal dynamics could also develop, however, during antagonistic character interaction via "neural alarm bells" -- increased activation in brain areas associated with social rejection (Eisenberger, Leiberman, and Williams 2003). Such neural activity could in turn set off defensive aggression or social withdrawal (Twenge et al. 2001), behaviors that could bleed over into out-of-game interactions. The impact of these and other neuropsychological reactions on players' behavior may be determined by the degree to which the line between self and character becomes blurred during play. According to Lankoski and Järvelä (2012), however, such blurring is a baked-in feature of human embodied cognition. Therefore, we propose that compartmentalizing "in-character" reactions requires immense self-regulatory control – a limited resource which is known to be depleted through many activities common to larp, e.g., effortful decision making and self-presentation (Vohs, Baumeister, and Ciarocco 2005; Vohs et al. 2014). Connecting self-regulatory resource models with bleed in this way is especially important since negative bleed-out can be a source of conflict in player communities (Bowman 2013). As such, we offer proactive solutions for those players or designers who wish to tailor a particular larp experience in order to avoid bleed-out, building on pre-existing best practices: informed consent, safe-spaces, and debriefing (Burns 2014; Atwater 2016; Brown 2016; Bowman, Brown, Atwater, and Rowland 2017).

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1. INTRODUCTION

The purpose of this research is to investigate the neuropsychological components of *bleed-out*, when in-character dynamics spill over into out-of-character thoughts, feelings and actions (Montola, 2011; Bowman, 2013). This paper specifically focuses on the interpersonal consequences of bleed-out for relationships between players. Whereas positive interpersonal bleed-out can create and strengthen relationships within a larp community, negative bleed-out can be a source of conflict. Additionally, players' goals for their role-play experience may differ, with some players choosing to embrace some or all types of bleed-out, while others seek to compartmentalize their in- and out-of-character experiences. To further our understanding of this phenomenon, we pair emerging literature on larp bleed with neuroscience theory and research. We hope that this work will inspire more interest in the neuropsychological aspects of larp.

2. INTERPERSONAL BLEED-OUT IN THE BRAIN

This section highlights a few of the neural components that are likely central to experiences of bleed-out.

First, we discuss attachment-mediating processes that likely characterize positive bleed-out via the release of hormones that heighten trust and reinforce rewarding behaviors. Next, we address antipathy-mediating processes that likely characterize negative bleed-out via social pain. These processes are fundamental, biological, and often outside of conscious awareness and control, which likely makes direct influence over bleed-out a fleeting or even illusory concept. This is consistent with Lankoski and Järvelä's (2012) view that player/character blurring is a baked-in feature of human embodied cognition. Here we view the character as the narrative entity which is personified and inhabited by the player (Montola 2008).

2.1 Attachment-Mediating Processes

A majority of recent research on the neuroscience of human attachment has investigated the role of oxytocin, also known as the "cuddle hormone" (Pappas 2015). Oxytocin is implicated in adult-adult bonding and mother-infant attachment for human and non-human animals. For example, in one study (Kosfeld et al. 2005), oxytocin was administered to male participants via an intranasal spray. Those who

received oxytocin (vs. a placebo) showed an increase in trust, specifically willingness to accept social risk for others.

Particular larp experiences may make these attachment-mediating effects of oxytocin more likely. In particular, oxytocin is likely released as a protective response to acute stress (Heinrichs et al. 2003). Thus, working with other characters under stressful conditions (e.g., a simulated battle or high stakes puzzle) in common larp experiences may activate a prosocial orientation of heightened trust and sharing motivation via this neurohormone (Von Dawans et al. 2012). Since it is likely impossible to intentionally down regulate the neural chemical cocktail that underpins prosocial connection, those attachments may spill out to shape feelings about the player as well.

Finally, any in-character experience that repeatedly links pleasure and positive affect with other characters will likely activate the reward system. This system is mostly housed in the nucleus accumbens and centers on a neurochemical known as dopamine. For example, oxytocin exposure has been shown to increase activity in this reward network of the brain in men viewing photographs of their romantic partners (Scheele et al. 2013) and mothers viewing videos of their own (vs. other) infants (Atzil et al. 2017). Learning and habituation likely encourages reinforcement of in-character liking even under conditions of mere exposure (Montoya et al. 2017). Without careful reflection on the distinction between in-character and out-of-character experience, such unconscious learning may readily bleed-out into everyday player interactions.

2.2 Antipathy-Mediating Processes

A focal experience of bleed-out that likely encourages antipathy between players is in-character social rejection. According to social pain theory (MacDonald and Leary 2005), social rejection generates a potent neuropsychological response that enables humans to identify and respond proactively to cues of social exclusion. For example, in one study by Eisenberger, Lieberman, and Williams (2003), participants were invited to play a ball toss game with others over intranet. In reality, the "other players" were a computer program calibrated to exclude the participant from the game after a few turns. Rejection was associated with greater activity in the anterior cingulate cortex (ACC), an area of the brain that reacts to the distressing emotional component of physical pain – like when you almost bump your knee and get a sudden jolt despite no actual harm. As

a result, Eisenberger, Lieberman, and Williams (2003) and others suggest that the human social attachment system recruited this "neural alarm" over the course of human evolution, as this was an adaptive response to the threat to survival and reproductive capacity posed by rejection.

An ironic consequence of social rejection is defensive aggression – lashing out in response to cues of rejection that can often precede social withdrawal. This response may protect the individual's psychological well-being and social status (Twenge et al. 2001), but may also create conflict in larp communities. For example, in an ethnography by Bowman (2013), player-identified features that promote schisms in larp groups included players refusing to role-play with one another after recurring conflict and, relatedly, lack of opportunity to smooth over in-character tension via out-of-game social events. She argues "when groups lack social activities outside of game, their primary interaction occurs in-character, which can affect their interpretation of the 'real life' personality traits and motivations of other players" (Bowman 2013, 6). Thus, defensive aggression may cause interpersonal bleed-out to spread into community-wide tension, and consequently shut off opportunities to smooth over this tension going forward.

2.3 Integration of Neuropsychology and Experience

The foregoing section suggests that varied neural processes such as the reward system and the social pain network likely facilitate bonding or antipathy between players, respectively. However, prevailing theories of emotion suggest that an intervening step is required between these neural responses and interpersonal outcomes: interpretation. For example, the two-factor theory of emotion (Schachter and Singer 1962) describes emotional experience (e.g., "I am afraid") as the integration of biofeedback (e.g., "my heart is racing") with concurrent appraisal of relevant cues (the interpretation, e.g., "there is a bear in front of me"). This interpretation can sometimes misfire, however, resulting in misattribution and false associations.

In one telling study, male participants were more likely to phone a female experimenter they encountered on a rickety bridge than a safe one (Dutton and Aron 1974). The researchers concluded that participants had mislabeled their emotional experience ("I fancy this person") due to the flawed connection of their physical state ("my heart is racing") with the woman in front of them rather than the real source of arousal

(the scary bridge). The individual's interpretation is key to their emotional experience, and in turn, determines the corresponding reaction to a social target.

According to this classic model of misattribution, the most significant bleed-out experiences would occur when players interpret that their feelings of attachment or antipathy are connected to the other players in the mix rather than the characters they are role-playing in that scene. This can occur because, as Andreasen (2003) argues, the player exists in a double diegetic state such that they are simultaneously present in the out-of-character play space as well as in the game universe. Thus, neurophysiological reactions to in-character experiences could become paired with the players, and thus cause the diegetic experience to leak out. Repeatedly linking such experiences with another player could result in habitualized, abstract representations of the out-of-character relationship via activation of reward/cost expectancy reinforced by dopamine release (Cacioppo et al. 2013). Due to this sequence of events, the larper may begin to view those out-of-character relationships as having emergent properties such as "love" or even "hate," and become motivationally driven to persist in the interpersonal dynamic.

To a degree, a player may be able to reduce bleed-out if they consistently and carefully label their experiences as solely due to in-character dynamics. However, as such interpretations are often constructed collaboratively (e.g., during post-event debriefs) and shaped by unconscious learned associations, such deliberate control may be beyond reach. Further, checking these unconscious associations likely requires players to exert conscious control over thoughts, feelings, and impulses (Baumeister, Gailliot, and Oaten 2006). Such *self-regulation* requires cognitive resources that have been experimentally shown to dissipate over the course of the day following activities requiring cognitive control. Thus, players may be more prone to bleed-out if they have had to choose between alternatives (Vohs et al. 2014), regulate their emotions (Schmeichel, Vohs, and Baumeister 2003), suppress unwanted thoughts (Baumeister, et al. 1998; Muraven, Tice, and Baumeister 1998), present themselves a certain way (Vohs, Baumeister, and Ciarocco 2005), or experience a drop in blood glucose levels (Galliot et al. 2007) – all frequent experiences in larp.

Not only are activities that deplete self-regulatory resources common in larp, they are often intentional design features. Burns (2014) points out that Nordic larp incorporates features of psychodrama in order to prompt exploration of the space between player and character. Further, Kessock (2013) points to players' inability to always immediately disengage from triggering content as a possible source of psychological and emotional discomfort in larp. Thus, the importance of managing bleed-out is especially paramount when larp designers and players purposefully engage with intense themes. Next, we turn to possible applications of the link between neuroscience, emotion, and bleed.

3. POSSIBLE APPLICATIONS

There has recently been a call for larp organizers and players alike to engage in ethical management of content (Kessock 2013; Brown 2016), safe spaces during play, and debriefing (Burns 2014; Atwater 2016), largely to avoid or mitigate unwanted psychological and emotional fallout of immersive roleplay. These community best practices all bear links to the key features discussed in this paper that can support management of bleed-out: preservation of regulatory resources, maintenance of the line between player and character, and careful interpretation of in-character experience.

First and foremost, Järvelä (2012) argues that larpers need to be informed of what they are going to experience in order to give consent. In non-academic writing on this theme, Kessock (2013) has called for *ongoing* transparency from game designers and organizers given that larps evolve during play. This transparency may include providing a script or content warnings in advance of an event, and avoiding undue deviation from those expectations during play. Player-to-player consent can also be navigated, such as via the opt-in/opt-out system discussed by Koljonen (2016) whereby a series of gestures can be used to communicate comfort levels and negotiate consent during an ongoing scene without disrupting immersion.

Informed consent practices such as these can help players to manage bleed-out since they can set intentions in advance for interpreting and compartmentalizing in-character experiences. This can work by creating a contingency for a likely event, e.g. "as soon as situation y occurs, I will initiate goal-directed behavior x" (Webb and Sheeran 2003, 280). Indeed, setting implementation intentions like this has been shown to lessen the self-regulatory resource depletion from tasks requiring inhibition and self-control (Webb and Sheeran 2003). Thus, when the situations that arise in play are accurately described up front and carefully navigated during events, players can handle impactful emotional

role-play in a way that preserves self-regulatory resources. However, such preparation and steering (taking in-character actions for out-of-game reasons; Montola, Stenros, and Saitta 2015) may be viewed as detrimental to organic role-play and immersion, and therefore may not be desired by all players. As a compromise, players may choose to fully embrace some in-character emotions in order to free up the self-control needed to regulate emotions at other times during an event (Tice and Bratslavsky 2000).

Next, out-of-character safe spaces have become de rigueur recently as a place for players to retreat to during events; these should allow players to opt-out of resource depleting scenes and activities. To capitalize on these practices, larp organizers can intentionally build safe spaces that offer opportunities to not just halt the depletion of self-regulatory resources, but to restore them as well. For example, they can induce positive mood through humorous activities or surprise gifts (Tice et al. 2007); provide snacks and sugar-containing beverages to replenish glucose (Galliot et al. 2007); and facilitate mindfulness meditation (Friese, Messner, and Schaffner 2012) – all of which have been shown to restore self-regulatory control. However, safe spaces should be used wisely since the very act of shedding immersion may deplete self-regulatory resources, as has been shown with various types of mindset switching such as alternating between concrete and abstract frames or swapping back and forth between two different languages (Hamilton et al. 2011). For example, despite the fact that self-regulatory resource depletion can subjectively feel like fatigue, encouraging players to catch up on sleep may not be an effective way to help them replenish self-control (Vohs et al. 2011).

Given that shedding and regaining immersion costs precious self-regulatory resources, we echo the call by Bowman et al. (2017) for immersive counselors in larp (see also Atwater and Rowland in this volume). Such diegetically embedded staff members can help players to navigate their in-character experiences such as to mitigate unwanted bleed-out. After an event, they might guide careful debriefing (Atwater 2016) and de-roling (using techniques to set the character aside (Gualeni, Vella, and Harrington 2017), which are vital post-event activities for managing bleed-out. We would add then that such counselors might want to encourage player cooperation during de-roling activities in order to restore trust among players who have had tricky in-character interactions (via oxytocin release; Gordon and Berson 2018). Additionally, they or other larp safety team members could communicate and model best practices of

conceptualizing character experiences that make it clearer when things are experiences of the character versus those of the player. This would help reduce spontaneous, collaborative reframing of in-character experiences following events (e.g., during after-game parties) which may be especially prone to blending in-and out-of-character experiences.

4. CONCLUSION

The fundamental neural processes that promote antipathy and attachment likely limit players' ability to control their experiences of interpersonal bleed-out. In response to this challenge, the current paper highlights practices that may sustain or restore the self-regulatory resources required to navigate those boundaries. We view this work as a stepping off point for future research on approaches to managing bleed. For example, it is likely that informed consent, safe spaces, and debriefing operate on multiple levels and have many psychological and emotional benefits and drawbacks that have yet to be fully explored. Further research into their mechanisms will point to improvements in the intentional use of these and other emerging best practices in larp. Further, ego bleed and its management likely apply to many other immersive activities (e.g., method acting). As such, the results of this scholarship are widely applicable.

Finally, one frequently offered piece of advice for managing bleed is that practice makes perfect. To a certain extent, research on self-regulatory control agrees: it appears you can train yourself to have greater self-control over time and these gains can spill over into other domains (Baumeister, Gailliot, and Oaten 2006). Thus, larpers who routinely manage bleed in general may experience easier self-control in other areas such as diet, exercise, and financial planning (Oaten and Cheng 2007). Whether these potential gains are worth the effort of practicing careful bleed management will be up to the individual larper. However, given the broader impacts of interpersonal bleed-out (Bowman 2013), the benefits of optimizing its management likely scale up at the community level. Thus, the neuropsychology of bleed-out and its management has serious, long term implications that go beyond any particular game, larper, or event.

5. ACKNOWLEDGEMENT AND NOTES

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