



(Don't) stand by me: How trait psychopathy and NPC emotion influence player perceptions, verbal responses, and movement behaviours in a gaming task

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ABSTRACT

Social interactions are an essential part of many digital games, and provide benefits to players; however, problematic social interactions also lead to harm. To inform our understanding of the origins of harmful social behaviours in gaming contexts, we examine how trait psychopathy influences player perceptions and behaviours within a gaming task. After measuring participants' ($n=385$) trait-level boldness, meanness, and disinhibition, we expose them to neutral and angry social interactions with a non-player character (NPC) in a gaming task and assess their perceptions, verbal responses, and movement behaviours. Our findings demonstrate that the traits significantly influence interpretation of NPC emotion, verbal responses to the NPC, and movement behaviours around the NPC. These insights can inform the design of social games and communities and can help designers and researchers better understand how social functioning translates into gaming contexts.

CCS CONCEPTS

• **Applied computing** → **Computer games**; • **Human-centered computing** → *Empirical studies in HCI*.

KEYWORDS

gaming, boldness, meanness, disinhibition, interpersonal distance, personality traits, psychopathy, social interaction, behaviour

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1 INTRODUCTION

Social interactions within gaming—whether they be teaming up to fight a boss, competing against each other for resources and bragging rights, or emoting together in gaming lobbies—have helped propel multiplayer gaming into one of the most popular leisure activities [40]. Despite the many known benefits of social play (e.g., providing social support [94, 118], combating loneliness [35], and improving well-being [77]), social interactions within games can also cause harm (e.g., facilitate social exclusion [13], and expose players to verbal abuse [41] or cyberbullying [68, 89]). When players experience harm from interactions with other players, it can negatively affect their game enjoyment [101, 119] and performance [83]. Game companies are also affected, as harmful social behaviour has been shown to contribute to churn, when players who are exposed to harm leave the game in search of more benevolent gaming communities [90, 101].

Previous work looking to understand the origins of harmful social behaviour in online games has examined personality traits, which are then linked to specific harmful in-game behaviours. For example, the traits of toxic disinhibition [62] and moral disengagement [9] have been shown to predict toxic behaviours and rationalizations of harmful actions in online gaming contexts. In considering harmful social behaviours within games, researchers have investigated a variety of personality traits, such as online disinhibition [9], social anxiety [71], and sadism [47]. However, outside of gaming contexts—such as in groups of workers [115], students [23], and within relationships [27]—researchers who investigate personality traits associated with harmful social behaviours often assess trait psychopathy [91, 107].

Psychopathy is characterized by a lack of remorse, an inability to feel empathy, and a degree of ruthlessness with a tendency to exploit others and violate social norms [50]. Although at its extreme end, people very high in psychopathic traits have been associated with personality disorders [16] or criminal activity [105], psychopathy is a personality trait that exists along a spectrum [107] in which

the trait varies in severity from low to high within the general population. The “triarchic” model [92] of psychopathy suggests that the construct is comprised of three qualities: impulsivity or disinhibition, boldness, and meanness. For example, people low in meanness tend to be kind, sincere, and sensitive to the feelings of others, seeking to provide aid to those who are hurting or in need; whereas, people high in meanness tend to be egocentric, insensitive, and lacking in affection, expressing contempt for weakness and indifference to the suffering others [92].

Outside of games, elevated psychopathy has been associated with specific behaviours that are typical of harmful social interactions within gaming contexts; for example, retaliation for perceived provocation [59], swearing [114], harassment [85], trolling (in online dating contexts) [78], and violation of personal space [126, 128]. In the context of digital gaming, it is possible that elevated psychopathic traits might manifest in in-game behaviours that may be considered harmful or toxic by other players, such as toxic language or the violation of personal space. Research does show that people carry their beliefs [20], personalities [130], motives [96], and even their level of self-esteem [14] into their gaming behaviours. However, there are also reasons to believe that psychopathic traits may not manifest in gaming spaces as players are also known to sometimes behave unlike their material-world selves, as game worlds allow for the enacting of different identities [87] or expressions of ideal-self [11, 98] within the magic circle afforded by games [56]. As people high in psychopathy often present themselves as charming to others [117], their in-game responses may also follow this pattern. The little work that has investigated links between psychopathy and gaming has focused on elevated interest in violent games [47, 48, 57] and not on behaviours that manifest during gaming.

To inform our understanding of how psychopathic personality traits—i.e., boldness, meanness, and disinhibition—manifest in social interactions within gaming contexts, we first assess these traits and then measure how they affect social perception and social in-game behaviours toward a non-player character (NPC) after exposure to neutral and negative social interactions. Specifically, we assessed participants’ ($n=385$) trait-level boldness, meanness, and disinhibition using a validated scale of tripartite psychopathy [92], and asked them to engage in a series of social interactions with an NPC in a game scenario. The NPC was either neutral in its emotional display (facial expression and body emotes) and dialogue, or was angry and insulting. Participants approached the NPC, asked them a question relevant to the game scenario using a text box, and then moved their avatar around them to access elevator doors. We measured the participants’ perception of the NPC’s emotion, the social content and prevalence of swearing within their dialogue, the interpersonal distance (IPD) at which they initiated dialogue with the NPC, and movement path characteristics as they moved around the NPC.

Our findings indicate that psychopathic traits affect various aspects of in-game behaviour. We observed that:

- Players with higher boldness and meanness rated the emotion of the NPC as more angry, regardless of its emotion; for disinhibition, this relationship only held for the angry NPC;
- Players with lower boldness, meanness, and disinhibition used more social words in their interactions with the NPC, and this relationship was stronger for the neutral NPC;
- All players used more swear words for the angry than the neutral NPC; however, when interacting with the angry NPC, players with higher boldness also used more swear words;
- All players regulated their interpersonal distance to the NPC based on its emotion, stopping farther from the angry NPC than the neutral one;
- Players higher in boldness and lower in disinhibition stopped closer to the NPC in general;
- When interacting with the angry NPC, players higher in meanness stopped closer to the NPC;
- Players with elevated boldness and meanness altered their movement path around the NPC, staying consistently closer to the NPC when moving past them.

Games research continues to produce evidence suggesting that players carry their social habits, biases, and interaction styles with them into digital games—whether these personal dispositions yield benefit or harm to others. Our findings provide new insights into how trait psychopathy manifests in social behaviours within digital games, expressed in our study through player perceptions, use of language in communicating with the NPC, and violation of the NPC’s personal space. An initial step in preventing problematic gaming communities is to understand how, and for whom, harmful social interactions unfold. Our work adds to this understanding, with the hope of leading toward safer gaming spaces that all players can access to receive the myriad benefits of social gaming.

2 RELATED WORK

We will present the underlying related work from three related perspectives: Gaming as a way to socialize, trait psychopathy, and behavioural biases from psychopathy.

2.1 Gaming as a Way to Socialize

Social needs and the feeling of belonging are essential for human beings. Over the last decades, digital games have become a popular way to socialize with others [37]. However, there is an ongoing debate whether socializing through digital games is desirable, stemming from the still existing stereotype of “gaming nerds” with low social competences who are mostly lonely and socially isolated [64, 102]. In particular, some research argues that in-game relationships are potentially of low-quality in terms of providing social support [21] or that in-game social bonds may displace physical-world social ties [64, 110]. However, in-game relationships should not necessarily be valued as of “lower” quality than physical ones [35, 65]. Through the lens of well-being, research has shown that in-game social interactions are positively associated with the player’s self-esteem [11], perception of social competence [66], reduction of loneliness [28, 79], and increased relatedness [35]. However, when investigating the interplay of relationships enacted within physical or digital spaces, researchers have suggested that the line between physical and digital friendships has become blurred in recent years: Online platforms, such as digital games, have become a powerful tool to maintain existing social connections and to spend time together over a distance [35].

Further, many players form new social ties in digital games that eventually get transferred into the physical world [118].

Many online games feature multiple ways to socialize: Usually, players get access to multiple chat channels in-game as well as on gaming platforms, such as the Epic Games client, Steam, U-Play, or Origin, that provide stores but also social features [30]. In-game chats are adapted to the situation of the game, where chats exist for the local environment, globally, and for teams. Furthermore, many online games include a self-representation of the player, called an avatar. Through this avatar, players can also express themselves, for example through custom animations or poses to react to certain in-game events. Prior work shows that players with a customized avatar feel more socially present within the digital realm [42]. Social presence describes the phenomena that players feel that other entities in the game are human beings, which can help to satisfy their need to socialize [42].

Even though socializing in games may be beneficial [28, 35, 79], there are growing risks of experiencing anti-social behaviour online: Interactions online are not always friendly and helpful but can also be negative or even “toxic” [68]. In a recent literature review, Moor et al. [85] described how personality traits may link to antisocial online behaviours, such as cyberbullying, trolling, or other forms of harassment that found their way into the realms of digital gaming. These antisocial behaviours can have many severe consequences for the targets [121] and harm the overarching gaming community in the long term [131].

Although digital games have an inherent escapism component that allows players to assume roles and identities unlike their physical-world realities [87], Eastwick et al. [38] provide evidence that social biases, such as racial biases, may transfer from the physical into the digital world, suggesting that similar transfer is possible for personality traits that could predict harmful behaviours, including psychopathic traits.

2.2 Psychopathic Traits

To better understand harmful behaviour within multiplayer online games, we consider the personality trait of psychopathy, characterized by a lack of remorse, an inability to feel empathy, and a degree of ruthlessness with a tendency to exploit others and violate social norms [22, 50]. Recent discussions regarding the concept of psychopathy lean towards a multidimensional conceptualization that includes “successful” psychopathy, which does not limit the concept to clinical populations, focuses on socially adaptive/non-adaptive traits, and includes research in non-clinical populations [91]. In this conceptualization, psychopathy manifests in social interactions as a tendency to show superficial charm, grandiose overconfidence, and a lack empathy with a tendency to exploit others. Furthermore, Patrick et al. [92] suggest an alternative but similar perspective on psychopathy, in which the construct of psychopathy is comprised of three distinct phenotypic constructs: boldness, meanness, and disinhibition. Boldness focuses on the aspects of social dominance; Meanness is characterized as aggressive resource seeking where others are ignored; and Disinhibition reflects a general tendency towards impulsive behaviour [91, 92].

Although there has been significant work on social harm within multiplayer games (e.g., see [55]), the relationship between trait

psychopathy and gaming is underexplored. In experiments using econometric games, participants with higher levels of psychopathic traits show adaptive social behavior; they are less sensitive to unfair behavior of others [88] and achieve relatively higher game scores, sometimes by exploiting social game mechanisms [82]. In the context of digital gaming, people higher in psychopathic traits have also displayed an elevated interest in violent games [47, 57]. Further, Tang et al. [116] show that psychopathy relates to increased motivation to play online games and problematic gaming use. This is partly motivated by escapism, but more surprisingly also by a motivation to engage in social activities. At first, this may seem paradoxical, but psychopathic traits do not foster long-lasting social bonds but weak ties that are instrumental in attaining short-term social gains [116]. These results on how social relationships are formed within digital games mirrors findings from real-world social interactions [6]. Therefore, psychopathic traits can be considered a multidimensional personality trait with socially adaptive and non-adaptive effects that change how players make use of social aspects in online social games.

2.3 Behavioural Biases From Psychopathic Traits

Prior work has suggested several biases regarding the behaviour of people with psychopathic traits, including the perception of emotion, communication strategies with others, and behaviour within and around the social space of others. Here, we present several of these biases relevant to the context of online gaming, in which players are expected to react to other players, communicate with them, and move in a 3D space around others.

2.3.1 Biased Perception of Others' Emotion: In the context of psychopathic behaviour, prior research suggests there is evidence that psychopathic traits may cause a biased perception of others' emotion: Researchers found that children with psychopathic traits have more trouble recognizing sad and fearful facial expressions and sad vocal tones [113]. Blair et al. [18] show that individuals with psychopathic traits need more intense stimuli to detect the emotion in facial expressions. Further, individuals with elevated psychopathic traits were shown to be less accurate in detecting disgust [63], fear [18], and sadness [36] in images [84]. According to Blair's emotion-based theory of psychopathy [17], this deficit is caused by the lack of experience with fear and sadness of others being something aversive to avoid, resulting in individuals with psychopathy failing to learn how to avoid causing these emotions [51]. Additionally, prior work suggests that individuals with psychopathic traits may also be less affected by negative conditioning, such as through fear [75] or stress [46].

2.3.2 Communication Characteristics: Prior work characterizes the communication style of individuals with higher levels of trait psychopathy as more aggressive, including the more frequent use of angrier facial expressions as well as emotional gestures and body language [44, 117]. However, prior work focusing on communication skills in the work environment shows that managers with psychopathic traits show good communication skills but also a lack of teamwork and low performance ratings [4].

2.3.3 Personal Space and In-game Movement: When interacting with strangers, we keep a personal space around ourselves, which is not to be intruded on by others. Prior observational studies suggest four circular regions of egocentric spaces, defined by increasing radii, which are reserved for social interactions, referred to as proxemics: Intimate proxemic for partner or family (0–45 cm), personal proxemic only entered by close friends (45–120 cm), and social proxemic for interaction with strangers (120–365 cm) [49, 125]. More recently published experimental investigations revealed a slightly smaller personal space with a radius of one meter [54]. Violation of personal space norms can cause discomfort and arousal [53, 127], along with counter reactions to balance the distance to the other by stepping farther away, aborting the social interactions [106], or signaling to the other person to move away by body realignment, angry facial expression, or gaze aversion [3].

An explanation for why people approach or try to stay farther away is offered by Approach-Avoidance-Theory [26]: Approach behaviour is characterized by an energy and direction towards positive concepts such as motivation, reward, or incentive. Avoidance behaviours are focused on keeping away from any negative consequences, punishments, or other social threats [128]. According to this definition the average person would approach a social situation in which others are sending positive and welcoming signals; however, they would also avoid social encounters that are perceived as hostile or potentially harmful. Personality traits affect approach-avoidance motivation and thus can shift preferences for appropriate interpersonal distance as well as perception of others' social spaces: Research about social anxiety, which is characterized by the fear of social interactions and judgement of others [108, 109], suggests that socially anxious individuals perceive others as relatively too close. This biased distance estimation causes social anxious individuals to prefer a larger distance to others. These preferences can also transfer into the digital realm, such as virtual reality simulations [69] and desktop applications like video games [29]. As a result, it is possible that similar transfer happens for psychopathic traits, which is also evidenced by prior work.

For example, Welsch et al. [128] show that individuals with elevated psychopathy traits may violate others' social spaces in a virtual reality simulation, depending on their facial expressions.

In summary, prior work shows that people higher in psychopathic traits—i.e., boldness, meanness, and disinhibition—may satisfy their needs for social interaction through online gaming. However, prior work does not provide enough evidence as to whether or not typical antisocial behaviours associated with psychopathy manifest within digital games.

2.4 The Scope of this Study

Social interactions in games are important but can sometimes be harmful. To address harmful social interactions and make games safer and healthier environments, it is important to understand the origins of such behaviours. Prior work has suggested psychopathic traits as constructs that can explain harmful social behaviours in the physical and digital world. While there is evidence that personality traits from the physical world manifest in digital worlds, including within games, this has not been studied for psychopathic traits. To address this gap, we conducted a study exploring whether trait

boldness, meanness, and disinhibition affect perceptions of, verbal responses to, and movement behaviours.

3 METHODS

We conducted an online experiment to investigate how boldness, meanness and disinhibition manifest in a social interaction in a gaming task. Participants' main task consisted of interacting with a non-player character (NPC) and moving to a given destination point. The experiment consisted of three blocks: 1) a character editor, 2) a gaming task, and 3) answering questionnaires about personality traits as well as demographic information. Although we considered using a social interaction with another player, or a confederate player, we chose to use an NPC to better standardize the experience across trials and participants, as little is known about how trait psychopathy expresses in gaming behaviours.

3.1 Character Editor

As a first step in the experiment, participants had to create a customized avatar for the gaming task. Prior work shows that customized avatars lead to many improvements in terms of game experience, but also increase the player's social presence as well as the connection between the player and the in-game content [12, 15, 29, 60]. In the character editor, participants had to select the avatar's gender, adjust the height, weight, muscle, head offset, and breast size for the avatar's body, as well as hair-, eye-, and skin colour. Next, participants had to shape the avatar's face using 34 sliders to adjust the distinctiveness of elements, such as eye, nose, and mouth. Participants could choose the outfit of their avatar by selecting clothing for the upper body, the lower body, shoes, and accessories (e.g., glasses, face mask). To further enhance the participant's identification with their avatar, we asked participants to describe the personality of their avatar by adjusting five 7-point Likert scales, which each represent one personality trait based on the 10-item short version of the Big Five Inventory (BFI-10) [99]. We asked participants to spend at least 4 minutes with the character editor. After that, a button appeared that allowed participants to move to the next step of the experiment. Figure 1 shows the editor.

3.2 Gaming Task

First, we introduced the game's background story and the control scheme: As a new intern at a large company, participants had to deliver documents to different teams in a building, with teams named after Greek letters. These teams were shuffled in the beginning of the experiment and assigned to one of two sides (left; right) and a floor number to every team (right: floor number 1–10; left: floor number 11–20). Participants had to interact with an NPC to find out on which side of the building the team sits. This NPC stood centered 5 meters before two elevator doors. The NPC was introduced as a *stranger* to the player within the gaming context. We did not use any explicit implications that this NPC is another human player (See Figure 2). First, a text box showed the name of the team that participants had to look for. Next, the camera focused the NPC, which either showed a friendly or threatening gesture. Additionally, we showed either a friendly message from the NPC or an insulting message. Figure 2 shows the two emotions, the beginning gesture, and the introduction of the NPC in the neutral and



Figure 1: Character editor steps from left to right: (1) selection of gender, (2) adjustments of the body shape and the face, (3) selecting of clothing and accessories, (4) personality traits.

the angry condition. In all trials, the NPC had the same skin and eye colour, but different hairstyles (out of 20) and one randomly selected hair colour.

We then asked participants to move towards the NPC and stop at a comfortable distance to start a conversation. Players had to confirm the comfortable interpersonal distance by hitting the spacebar, which triggered a conversation with the NPC. The NPC greeted the player in either a friendly manner or by insulting them and then asking participants “what they want”. After typing their question into the text field, the NPC reacted either friendly or aggressively and revealed the searched floor number. After that, players had to move to the corresponding elevator and hit the spacebar to accept their decision. Finally, we asked participants to rate the emotion of the NPC on a scale from 0 (= “very friendly”) to 100 (= “very angry”). Per side (left, right), we had 5 positive NPCs interactions and 5 negative interactions resulting in 20 trials (2 sides x 2 emotions x 5 repetitions). Every trial had one individual team name and no team name was repeated. The gaming task was implemented using Unity Engine [120] combined with the asset bundle “Advanced People Pack 2” [72] and deployed using the Bride of Frankenstein framework [58]. Figure 3 visualizes the steps of the first trial.

3.3 Participants and Procedure

We recruited 410 participants on Amazon Mechanical (MTurk) [2] and Prolific [97]. For this study, we recruited participants who indicated that they live in Canada or the United States of America and have an interest in digital gaming. While prior work shows the potential and benefits of these platforms there are several shortcomings, which may have affected the results. As prior work outlines, there are several potential threats to the data quality, such as the lack of proper security tools, which facilitates the risk of fraudulent behaviour within the studies (e.g., using a VPN connection to overcome country restrictions) [34]. Additionally, prior work emphasize that MTurk and Prolific are suffer from biases, which may limit the generalizability of results within the context of mental health and personality traits [24, 52, 124]. We excluded participants who did not finish the experiment, e.g., due to technical difficulties or incomplete data collection, or showed negligent behaviour, such as rushing through the questionnaires and selecting random answers ($n = 25$). We identified such negligent behaviour by analyzing how much time participants spent on responding to one of the scales that we used. After applying this filter, we had complete data for 385 participants (218 women, 157 men, 9 non-binary, 1 preferred to not answer) aged 18 – 77 ($M = 28.740$, $SD = 10.075$). All participants received \$9 compensation for participating in this study,

which took approximately 45 minutes to complete. Participants were told a cover story that the goal of this study is to analyze the effects of network latency on the game experience to justify why we asked them to repeat a movement task 20 times as well as to reduce the risk that they behaved differently as a result of knowing the real goal of the study. After that, the task started by asking the player to create their own avatar in the previously described character editor. After the 20 trials were recorded, we assessed the participants’ trait psychopathy using the Triarchic Psychopathy measure (TriPM) [92], and demographic information. Finally, we debriefed participants about the goal of the study and provided additional support resources and a link to pictures of baby animals to reduce potential negative effects on participants. This procedure was approved by the ethics board of the University of Saskatchewan. Table 1 summarizes the characteristics of the sample.

3.4 In-game Measurements

We focus on the following aspects of in-game social behaviour to better understand how trait psychopathy affects gaming behaviours:

3.4.1 Perceived Emotion of the NPC. After each trial, we asked participants to rate the emotion of the NPC who was present in the trial on a scale ranging from 0 (= “very friendly”) to 100 (= “very aggressive”). This measurement was adapted from prior work [31, 32], in which users rated the severity of perceived and expected social stress of a social interaction in a gaming task on a scale from 0 (not stressful) up to 100 (very stressful). However, as we were only interested in the perceived anger (vs friendliness) of the NPC, we focused only on this measurement and asked participants to rate emotions on this continuum.

3.4.2 Communication Characteristics. We were curious whether trait biases also manifest in the communication of participants. Therefore, we recorded the participants’ questions they posed to the NPC, in which they asked for the floors, and analyzed the psycholinguistic features using the LIWC-2015 tool, which analyses text using a bag-of-words approach [93]. We focused on whether participants were social toward the NPC and thus used the social subcategory, which includes all non-first-person pronouns and verbs related to human interaction [93]. Further, we analyzed how many swear words were used, which has been argued as an indicator of online social disinhibition and is related to toxic interactions [25].

3.4.3 Movement Behaviour around the NPC. Based on prior work, we focus on two aspects of in-game behaviour: The interpersonal



Figure 2: The two NPC conditions: Neutral (left) or Angry (right) showing either a friendly or threatening gesture and facial expression

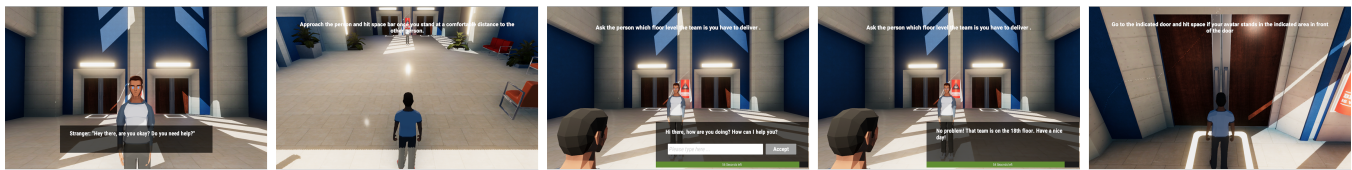


Figure 3: Task steps, from left to right: (1) instructions and exposure to the emotion, (2) approach to the NPC, (3) interaction with the NPC, (4) answer of the NPC, (5) approach the destination.

distance between the player and the NPC as well as the movement behaviour around the NPC:

Interpersonal Distance (IPD). As previously introduced, the interpersonal distance (IPD) may be influenced by personality traits, including psychopathic traits, in the context of virtual reality simulations [86, 128, 129]. Therefore, we were curious if these effects manifest within the gaming context. We included this aspect into the task by asking participants to walk towards the NPC and press the spacebar once they were standing at a comfortable distance to start a social interaction with the NPC.

Movement Features. After the conversation with the NPC ended, we started to record the position of the player's avatar with a frequency of 20 Hz. We focused on the effects of psychopathic traits on the skew and kurtosis of the distribution of the distance between the player and the NPC across the recorded samples in a trial. Prior work in the context of social anxiety suggests that personality traits might manifest in these behavioural indicators: Socially anxious participants walked farther and with a more consistent path around an NPC, resulting in higher skew and kurtosis respectively [29].

3.5 Expected Behaviour

Based on the literature about trait psychopathy and social behaviour, we expect the following:

3.5.1 Perceived Emotion of the NPC. We expect individuals with higher levels of psychopathic traits to rate the emotion of the NPC as less intense due to the previously introduced cognitive bias.

3.5.2 Communication Characteristics: We expect that participants will use fewer swear words when confronted with a neutral NPC and may use more when confronted with an angry NPC, and that this relationship might be amplified for those higher in trait psychopathy. We based this assumption on the previously-introduced potentially manipulative aspect of psychopathy. However, we expect that individuals with elevated psychopathic traits will use fewer social words, as they are more focused on themselves and their own goals rather their social environment [7].

3.5.3 Movement Behaviour around the NPC. Prior work suggests that participants with higher levels of psychopathic traits may show a lower personal distance to the NPC [126] and may be regulated by the emotion of the NPC as well [67, 128]. Based on this prior work, we expect similar results for the movement path around the NPC: that elevated psychopathic traits will result in lower interpersonal distance. Regarding NPC emotion, participants may keep a larger distance around the neutral NPCs and acknowledge the personal space of the NPC. On the other hand, an angry NPC may cause them to walk closer towards them and ignore social norms in-game. Prior work also shows that individuals with psychopathic traits are more goal focused, which causes them to ignore other (social) clues around them, which could attenuate the influence of the NPC's emotion, due to these participants focusing on finishing the task [45]. These would suggest that higher levels of psychopathic traits would be associated with lower skew (closer path to the NPC) and lower kurtosis (a more consistent path).

Variable	Categories	n	%	M	SD	Min	Max
Age		385		28.740	10.075	18	77
Gender	Woman	218	56.62 %				
	Male	157	40.77 %				
	Non-Binary	9	2.03 %				
	Prefer Not To Answer	1	0.25 %				
Income Per Year	Less than 10.000 USD	23	5.97 %				
	Between 10.000 USD - 25.000 USD	57	14.80 %				
	Between 25.001 USD - 45.000 USD	66	17.14 %				
	Between 45.001 USD - 65.000 USD	62	16.10 %				
	Between 60.001 USD - 85.000 USD	56	14.54 %				
	Between 85.001 USD - 100.000 USD	31	8.05 %				
	Between 100.000 USD - 150.000 USD	50	12.98 %				
	More than 150.00 USD	22	5.71%				
	Prefer Not To Answer	18	4.67%				
	Marital Status	Single	247	64.15 %			
Married or Domestic Relationship		126	32.72 %				
Divorced		11	2.85 %				
Widowed		1	0.25 %				
Ethnicity	American Indian or Alaskan Native	1	0.25 %				
	Asian	38	9.87 %				
	Black or Afro American	19	4.93 %				
	Hispanic/Latino	26	6.75 %				
	Native Hawaiian or Other Pacific Islander	1	0.25 %				
	Two or more categories	16	4.15 %				
	White	282	73.24 %				
	Prefer Not To Answer	2	0.51 %				
TriPM Boldness Score		385		25.145	9.929	0	53
TriPM Meanness Score		385		10.078	7.939	0	46
TriPM Disinhibition Score		385		15.322	8.753	0	48
PIS Similarity Identification		385		2.997	0.636	0	4
PIS Embodied Identification		385		2.339	0.886	0	4
PIS Wishful Identification		385		1.964	0.847	0	4

Table 1: Summary of the demographic information, TriPM, and PIS data.

3.6 Questionnaire-based Measurements

3.6.1 Measurements of Boldness, Meanness and Disinhibition: We used the Triarchic Psychopathy measure (TriPM) to measure the three aspects of psychopathy: boldness, meanness, and disinhibition [92]. The TRIPM consists of 58 items, split into three subcategories of meanness (19 items), disinhibition (20 items), and boldness (19 items), and can be used in combination as measurement for certain personality traits, such as lack of empathy or cold-heartedness [91]. Participants had to answer how much they agree with each item on a 4-point Likert scale (0 = "False"; 3 = "True") and responses are then summed (higher=bolder). Meanness is associated with cruel, callous, predatory, and excitement-seeking behavior. Disinhibition is related to irresponsible, impulsive, oppositional, but also potential hostile behavior. The boldness sub-scale, related to dominance and low anxiousness [91] in the triarchic model, seems to be most relevant in distinguishing between antisocial personality disorder (ASPD) and psychopathy [123]. Prior work suggests that the TriPM seems to be unaffected by gender [75]. The scores for boldness ranged from 0 to 53 ($M = 25.145$; $SD = 9.929$), meanness ranged

from 0 to 46 ($M = 10.078$; $SD = 7.939$), and disinhibition ranged from 0 to 48 ($M = 15.322$; $SD = 8.753$).

3.6.2 Avatar Identification: After the customization, we asked participants to fill out the avatar-related subscales of the Player Identification Scale (PIS) [122]. With these subscales, participants had to rate their agreement to different statements about their relationship with their avatar, such as "My character is like me in many ways." on 5-point Likert scales from 0 (= "strongly disagree") to 4 (= "strongly agree").

3.6.3 Demographics: We recorded a variety of demographic factors including age, gender, income, marital status, and ethnicity.

3.7 Data Analysis

After removal of negligent participants as described earlier, we had per participant 20 trials, resulting in 7700 trials in our data. We discarded trials representing outliers in *IPD*, *Seconds Spent in Task*, *Minimum*, *Mean*, and *Maximum Distance* to the NPC, and *kurtosis* by applying a Tukey-filter to the measurements (1678 trials

were removed; 21.79%). After applying these filters, 6052 valid trials remained for the following data analysis.

Next, we created several linear mixed models, using REML and nloptwrap optimizer, to predict the behaviour measurements with each of the psychopathic traits and the emotion of the NPC (formula: Behaviour measurement Psychopathic trait measurement * Emotion of the NPC). To account for the hierarchical repeated-measures structure in our data, these models always included the participant, expressed through the participant ID, and the emotion of the NPC as random effects (formula: Emotion of the NPC | Participant). The emotion of the NPC was encoded as a contrast in the following way: 0 = Neutral Mood; 1 = Angry Mood. The analysis was done in R Studio Version 1.2.5033 using R 3.6.3 and the packages lmerTest and tidyverse. Per dependent variable we created a separate model.

4 RESULTS

4.1 Perceived Emotion of the NPC

We asked participants to rate the perceived emotion of the NPC on a scale from 0 (= "very friendly") to 100 (= "very aggressive"). We will refer to this rating as *emotion rating* in the following section. We found a significant positive relationship between boldness and the perceived emotion rating. Further, we found a significant positive relationship between NPC emotion and emotion rating. The interaction effect between boldness and NPC emotion on emotion rating was significant and negative. This suggests that individuals who score high on boldness tend to rate a neutral NPC as angrier and an angry NPC as less angry. We found the same pattern of results for meanness and disinhibition, except the main effect of disinhibition was not significant. Table 2 summarizes the results and Figure 4 visualizes these results.

4.2 Communication Characteristics

4.2.1 Swear words: We assessed how many swear words were used when communicating with the NPC. A higher value indicated a higher usage of curse words, which we will refer to as *swearing score*:

We found no significant relationship between boldness, meanness, or disinhibition, and the swearing score. However, for all three we found a significant positive relationship between NPC emotion and swearing score. This suggests that all participants used more swearwords when confronted with an angry NPC. Furthermore, we found one significant negative interaction effect between boldness and NPC emotion, which shows that the amount of swearing increases with trait boldness for the angry NPC, but not the neutral NPC. Table 3 summarizes these results and Figure 4 visualizes these results.

4.2.2 Social words: We analyzed how many social words participants used in their communication with the NPC. A higher value indicates that participants used pronouns that point to the NPC, such as "you" and more social words (e.g., "talk"). We will refer to this measurement as *social score*:

For boldness, meanness, and disinhibition, the trait was negatively associated with social score, suggesting that individuals with higher levels of psychopathic traits use fewer social words. NPC emotion had a significant negative relationships with social

scores, indicating that participants used more social words when communicating with neutral NPCs compared to angry NPCs. All interaction effects were non-significant. Table 4 summarizes these results and Figure 4 visualizes these results.

4.3 Movement Behaviour around the NPC

In the following section, we will discuss the results of the three movement behaviour measurements: The interpersonal distance (IPD) and the shape of the movement trajectory when passing the NPC, expressed by the skew and kurtosis of the movement path.

4.3.1 Interpersonal Distance: We found a significant negative relationship between boldness and IPD. Further, we found a significant positive relationship between NPC emotion and IPD, but no interaction effect. These results suggest that bold individuals stopped closer to the NPC. Although they tended to stop farther from angry NPCs, people higher in trait boldness stopped closer to both angry and neutral NPCs. We found no significant relationship between meanness and IPD. However, we found a significant positive relationship between NPC emotion and IPD, showing the same result as with boldness. Further, we found a significant negative interaction effect between meanness, NPC emotion, and IPD, suggesting that individuals higher in meanness stopped closer to angry NPCs, but meanness did not affect IPD to neutral NPCs. We also found a significant positive relationship between disinhibition and IPD and a significant positive relationship between NPC emotion and IPD, showing the same result as for boldness and meanness. However, we found no interaction effect between disinhibition, NPC emotion, and IPD, which together suggests that individuals higher in trait disinhibition tend to stand closer to NPCs, regardless of their emotion. Table 5 summarizes the results.

4.3.2 Skew and Kurtosis: Besides the interpersonal distance, we also analyzed whether psychopathic traits affect the movement behaviour around the NPC, which we assessed with the skew and kurtosis of the distribution of the distances to the NPC:

We found a significant negative relationship between boldness and skew. However, we found no significant relationship between NPC emotion and skew as well as no interaction effect. Similar effects were found for meanness, showing that players lower in trait meanness and boldness tended to give the NPC a wider berth. We found no significant effect for disinhibition and skew.

We found a significant negative relationship between boldness and kurtosis. However, we found no significant relationship between NPC emotion and kurtosis as well as no interaction effect. Similar effects were found for meanness, showing that players higher in trait meanness and boldness tended to take a more consistent movement path around the NPC. We found no significant effect for disinhibition and kurtosis.

Together, the movement path results suggest that individuals scoring high on boldness and meanness ignore the personal space of the NPC and walk closer around it, suggesting a more straight to the goal movement. Table 6 shows the results of the skew and kurtosis of the movement path around the NPC. Figure 4 visualizes the results of the previously discussed models.

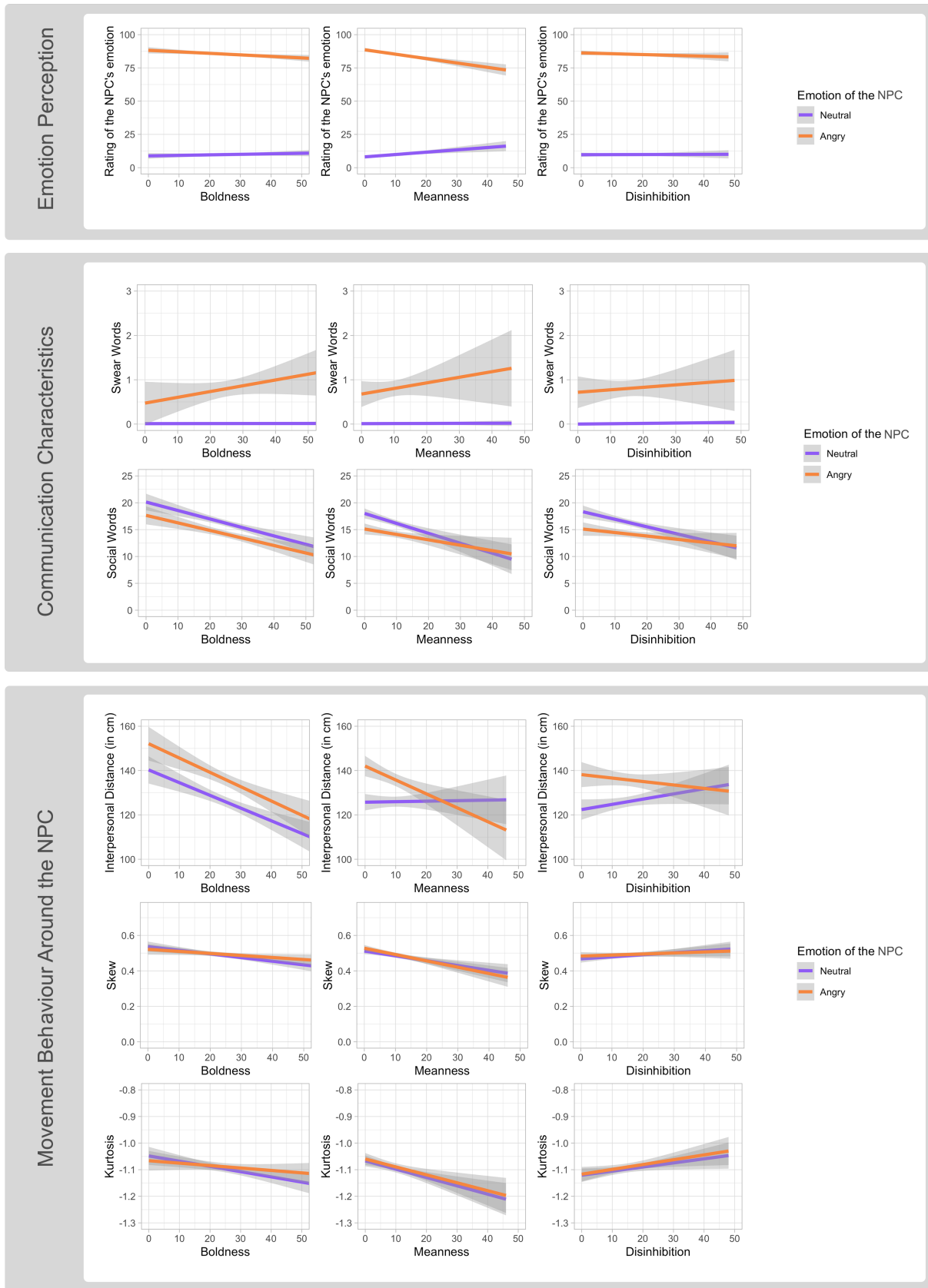


Figure 4: Relationship between psychopathic traits and emotion perception, communication characteristics, and movement behaviour.

Rating of the Perceived Emotion of the NPC		beta	95 % CI	t	p	std. beta	95 % CI
Boldness	Boldness	0.25	0.14; 0.35	4.71	<0.001	0.06	0.03; 0.08
	NPC Emotion	89.71	84.36; 95.05	32.90	<0.001	1.70	1.62; 1.78
	Boldness : NPC Emotion	-0.58	-0.75; -0.41	-6.81	<0.001	-0.13	-0.17; -0.09
Meanness	Meanness	0.37	0.24; 0.51	5.34	<0.001	0.06	0.04; 0.09
	NPC Emotion	85.34	81.33; 89.34	41.76	<0.001	1.70	1.63; 1.78
	Meanness : NPC Emotion	-1.02	-1.25; -0.79	-8.73	<0.001	-0.18	-0.21; -0.14
Disinhibition	Disinhibition	0.21	-0.00541; 0.24	1.87	0.061	0.02	-0.00106; 0.05
	NPC Emotion	81.54	76.96 ; 86.12	34.90	<0.001	1.70	1.63; 1.78
	Disinhibition : NPC Emotion	-0.41	-0.62 ; -0.20	-3.88	<0.001	-0.08	-0.12 ; -0.04

Table 2: Summary of the models for the relationship between the perceived emotion rating and boldness, meanness, and disinhibition; Significant results are highlighted.

Communication Characteristics: Swearing		beta	95 % CI	t	p	std. beta	95 % CI
Boldness	Boldness	0.0000679	-0.01, 0.01	0.01	0.990	0.000201	-0.03, 0.03
	NPC Emotion	1.38	0.80, 1.96	4.66	<0.001	0.23	0.15, 0.30
	Boldness : NPC Emotion	-0.02	-0.05, 0.00	-2.36	0.018	-0.07	-0.13, -0.01
Meanness	Meanness	0.000227	-0.01, 0.01	0.03	0.975	0.000516	-0.03, 0.03
	NPC Emotion	0.84	0.46, 1.22	4.38	<0.001	0.23	0.15, 0.30
	Meanness : NPC Emotion	-0.00847	-0.04, 0.02	-0.61	0.545	-0.02	-0.08, 0.04
Disinhibition	Disinhibition	0.000760	-0.01, 0.01	0.12	0.904	0.00196	-0.03, 0.03
	NPC Emotion	0.61	0.15, 1.07	2.62	0.009	0.23	0.15, 0.30
	Disinhibition : NPC Emotion	0.00942	-0.01, 0.03	0.76	0.449	0.02	-0.04, 0.09

Table 3: Summary of the models for the relationship between swearing score and boldness, meanness, and disinhibition; Significant results are highlighted.

Communication Characteristics: Social		beta	95 % CI	t	p	std. beta	95 % CI
Boldness	Boldness	-0.16	-0.23, -0.09	-4.46	<0.001	-0.09	-0.14, -0.05
	NPC Emotion	-2.50	-4.52, -0.47	-2.42	0.016	-0.11	-0.16, -0.06
	Boldness : NPC Emotion	0.03	-0.05, 0.10	0.67	0.500	0.02	-0.013, 0.06
Meanness	Meanness	-0.20	-0.30, -0.11	4.21	<0.001	-0.09	-0.14, -0.05
	NPC Emotion	-2.48	-3.72, -1.24	-3.91	<0.001	-0.11	-0.16, -0.06
	Meanness : NPC Emotion	0.06	-0.04, 0.16	1.25	0.210	0.03	-0.02, 0.07
Disinhibition	Disinhibition	-0.20	-0.28, -0.12	-4.63	<0.001	-0.10	-0.15, -0.06
	NPC Emotion	-2.66	-4.19, -1.14	-3.42	<0.001	-0.11	-0.16, -0.07
	Disinhibition : NPC Emotion	0.05	-0.03, 0.14	1.17	0.242	0.03	-0.02, 0.07

Table 4: Summary of the models for the relationship between social score and boldness, meanness, and disinhibition; Significant results are highlighted.

Movement Behaviour: IPD		beta	95 % CI	t	p	std. beta	95 % CI
Boldness	Boldness	-0.69	-0.97 ; -0.42	-4.96	<0.001	-0.10	-0.14; -0.06
	NPC Emotion	17.10	7.85; 26.36	3.62	<0.001	0.18	0.12; 0.24
	Boldness : NPC Emotion	-0.17	-0.51 ; 0.16	-1.01	0.312	-0.02	-0.07; 0.02
Meanness	Meanness	0.22	-0.15 ; 0.59	1.15	0.252	0.02	-0.02 0.06
	NPC Emotion	19.81	13.94 ; 25.69	6.61	0.001	0.18	0.12; 0.24
	Meanness : NPC Emotion	-0.72	-1.16 ; -0.28	-3.19	0.001	-0.08	-0.12; -0.03
Disinhibition	Disinhibition	0.34	114.57 ; 130.28	30.54	0.045	0.04	0.000987 ; 0.08
	NPC Emotion	18.08	0.01 ; 0.68	2.01	<0.001	0.18	0.12; 0.24
	Disinhibition : NPC Emotion	-0.35	10.86 ; 25.31	4.9	0.082	-0.04	-0.09; 0.00540

Table 5: Summary of the models for the relationship between IPD and meanness, boldness, and disinhibition; Significant results are highlighted.

Movement Behaviour: Skew and Kurtosis		beta	95% CI	t	p	Std. beta	95% CI
Skew	Boldness	-0.00233	-0.00362; -0.00103	-3.52	< .001	-0.08	-0.12; -0.03
	NPC Emotion	-0.00481	-0.05; 0.04	-0.23	0.821	0.04	-0.02; 0.09
	Boldness : NPC Emotion	0.000631	-0.000904 ; 0.00217	0.81	0.421	0.02	-0.03; 0.07
	Meanness	-0.00348	-0.00519 ; -0.00177	-3.98	< .001	-0.09	-0.13; -0.04
	NPC Emotion	0.02	-0.00294 ; 0.05	1.73	0.083	0.04	-0.02 ; 0.09
	Meanness : NPC Emotion	-0.00115	-0.00316; 0.000856	-1.12	0.261	-0.03	-0.08; 0.02
	Disinhibition	-0.000219	-0.00176; 0.00132	-0.28	0.780	-0.00628	-0.05, 0.04
	NPC Emotion	0.02	-0.01; 0.05	1.26	0.208	0.04	-0.02, 0.09
	Disinhibition : NPC Emotion	-0.000608	-0.00238;0.00116	-0.67	0.5	-0.02	-0.07, 0.03
Kurtosis	Boldness	-0.00217	-0.00374 ; -0.000598	-2.71	0.07	-0.06	-0.10 ; -0.02
	NPC Emotion	-0.00401	-0.05 ; 0.04	-0.16	0.871	0.03	-0.02 ; 0.08
	Boldness : NPC in Angry	0.000633	0.00115 ; 0.00242	0.69	0.487	0.02	-0.03; 0.07
	Meanness	-0.00384	-0.00591; -0.00177	-3.63	< 0.001	-0.08	-0.12 ; -0.04
	NPC Emotion	0.02	-0.01 ; 0.04	1.01	0.314	0.03	-0.02 ; 0.08
	Meanness : NPC Emotion	-0.000318	-0.00266; 0.00202	-0.27	0.790	-0.00663	-0.06 ; 0.04
	Disinhibition	-0.0000353	-0.00190; 0.00183	-0.04	0.970	-0.000836	-0.04 ; 0.04
	NPC Emotion	0.00851	-0.03; 0.04	0.46	0.645	0.03	-0.02 ; 0.08
	Disinhibition : NPC Emotion	0.000203	-0.00185 ; 0.00226	0.19	0.847	0.00481	-0.04 ; 0.05

Table 6: Summary of the models for the relationship between skew and kurtosis with meanness, boldness, and disinhibition; Significant results are highlighted.

5 DISCUSSION

5.1 Summary of the Results

Our results revealed how personality traits related to psychopathy may manifest in-game:

5.1.1 Boldness: We show that individuals scoring higher on *boldness* rate the emotion of the NPC less intense, shown by a decreased aggressive emotion rating for an angry NPC and an increased aggressive emotion rating for neutral NPC. Further, we show that bold individuals use more swear words only when confronted with an Angry NPC, but a decreased use of social words when interacting with both NPCs. The IPD shows that the NPC's emotion had no significant effect, but that regardless of NPC emotion, bolder individuals stopped closer to the NPC. Similarly, the skew and kurtosis were not significantly affected by the NPC's emotion, but in either case, bolder individuals tended to walk closer around the NPC and more directly towards the goal behind the NPC.

5.1.2 Meanness: Participant scoring higher on *meanness* showed a less intense perception of the NPC's emotion, resulting in a lower emotion rating for angry NPCs and higher ratings for neutral NPCs. The usage of swear words was influenced only by NPC emotion, not meanness (i.e., higher when interacting with an angry NPC); however, the use of social words decreased for individuals scoring higher on meanness. The IPD showed no direct relationship between meanness and IPD, but the interaction with NPC emotion showed the people scoring higher on meanness stopped closer to angry NPCs (with no effect on neutral NPCs). Further, skew and kurtosis showed that individuals scoring higher on meanness walk closer around the NPC and more directly toward their goal (expressed by a reduced skew and kurtosis), regardless of NPC emotion.

5.1.3 Disinhibition: Finally, we found no direct relationship between individuals scoring high on *disinhibition* and the emotion rating. Yet the main effect of NPCs emotion as well as the interaction effect between disinhibition and NPC emotion suggest that more disinhibited people rated angry NPCs less angry, but neutral NPCs still very friendly. Although the main effect of NPC on swearing showed that players used more swear words with angry NPCs, there we found no evidence that swearing was influenced by disinhibition. Like the other traits, players higher in disinhibition also used fewer social words, regardless of the NPC emotion. Similarly, the relationship between disinhibition and IPD showed that more disinhibited participants tended to stand farther away from the NPC, and in general stood farther from angry NPCs, but that disinhibition and NPC emotion did not interact to influence IPD. Finally, we found no significant relationship between disinhibition and skew or kurtosis, showing no evidence of a relationship between trait disinhibition and the movement pattern around the NPC.

5.2 Explanation of Findings

Our results lend support to the proposition that traits of psychopathy affect social gaming behavior and that we may be able to explain in-game behavior in terms of personality theory. On one side, we see that some psychopathy traits share similar expressions in-game as they are known to do in the physical world, such as the perception of the NPC's emotion, the increased swearing, and the decreased usage of social words. Prior work about psychopathy as a trait emphasizes a potential deficit in the ability to perceive and experience affect [33]; our results align with these findings, as all three psychopathic traits lead players to rate the emotion of angry NPCs as less angry and the emotion of friendly NPCs as less friendly. Similarly, prior work [117] shows that individuals

with psychopathic traits are more likely to use angry language. Our findings agree with these results only partially as only angry NPCs elicited bolder participants to use more swear words in their communication. This effect may be explained by the normalization effect [9], as players only started to use more swear words once they experienced insults *from* the NPC and therefore began to normalize swearing within this gaming context. However, the reduced social word usage was shared by all three traits. Here, the overarching psychopathy trait may explain these results, as prior work provides evidence for a relationship between psychopathy and egocentric characteristics [103], which in our case expresses in fewer socially-oriented words in general.

The interpersonal distance findings were more nuanced in terms of how the different aspects of psychopathic traits were expressed in-game. According to Patrick et al. [92], *boldness* reflects social dominance and fearless resiliency as well as reduced stress reactivity [70]. These typical aspects of the boldness trait are shown to manifest within our gaming context, especially within interpersonal distance: the emotion of the NPC did not significantly affect the IPD and participants with a high boldness score stand closer to the NPC. On the other hand, we found a different IPD behaviour for *meanness*, which is characterized by aggressive resource seeking without concern for others, which includes aspects like hostility and exploitativeness [92]. Our results align with these descriptions and similar results about the expression of meanness in other contexts [5, 19]: As the IPD shows, participants scoring high on meanness breach the personal space of angry NPCs. Finally, *disinhibition* reflects difficulties with impulse control, poor planning, and limitations in delaying gratification [92]. However, our results suggest that disinhibition was not significantly associated with anti-social behaviours, as the main effect between disinhibition and IPD was small and positive. In the context of psychopathy, prior work suggests that disinhibition is an essential part and needs to be combined with either boldness or meanness to fully unfold into psychopathy [123]; that our results for each trait's influence on IPD were unique does reinforce the potential triarchic structure of psychopathy [91].

The significant findings for skew and kurtosis related to meanness and boldness suggest a more focused movement towards the final destination (kurtosis), while also breaching the personal space of the NPC (skew). This behaviour may be explained by a lack of avoidance motivation when encountering threat [128, 128] and a tendency to ignore social norms while only focusing on how to be most efficient in finishing the task at hand [88] in general psychopathy. These tendencies reflect a bias among trait psychopathy to not integrate peripheral information of social cues into one's own behavior when engaging in goal-directed behavior, as proposed by the response-modulation hypothesis of psychopathy [74].

5.3 Implications for Design

Our results show, that the psychopathic traits meanness, boldness and disinhibition may manifest within games, which might influence the gaming experience. Game designers try to evoke various emotions in the player, depending on genre, design or a certain

topic; however, games can also be designed to avoid certain emotions, such as frustration, one of the core challenges of developing a great experience.

We show that psychopathic traits can bias the perception of emotions: individuals with higher levels of psychopathic traits rated the emotion of the NPC less intense, which may help explain how the expression of emotion in-game can be misunderstood. Many games offer ways to express emotions in-game to enhance the social interaction; however, some players may have bias in how they interpret these emotions, resulting in a negative or harmful reaction, like aggressive responses. Similarly to how feeling socially excluded increases the interpretation of neutral information as more hostile in gaming contexts [13], trait psychopathy might show a similar pattern in which neutral interactions are perceived as more aggressive. Further, as angry interactions were actually perceived as less aggressive, trait psychopathy may contribute to the normalizing of toxic interactions within gaming contexts [9]. Game designers need to provide tools that help presented emotions be interpreted correctly by players, even if emotional interpretation biases are present. However, even if such tools were provided, in-game behaviour could be misunderstood and elicit anti-social behaviour, e.g., players might not follow suggestions in-game because they are not familiar with the game rules, which can be misunderstood as an anti-social behaviour [39].

Prior work suggests that the normalization of toxicity in games creates a vicious cycle [9]. Players who engage in but also experience toxic behaviour are more likely to normalize this experience and start to engage in more toxic interaction in-game [62]. Our results show that players with psychopathic traits also used more swear words and less social words, especially when confronted with an angry NPC. This suggests that game designers may need to increase the awareness of rising toxicity in-game to break the cycle of toxic behaviour in-game. However, game designers need to be cautious when analyzing the communication in-game, as other factors, such the arousal induced by the game, may increase the probability to use rude language as a way to regulate the experienced stress [111, 112]. Our findings suggest several in-game behaviours that are consistently associated with higher levels of psychopathic traits, across boldness, meanness, and disinhibition (e.g., usage of swear words or social words). Using them as a way to detect "anti-social players" would not be helpful due to the large overlap and the blurred lines between traits and with other sources that elicit similar behaviours. For example, in-game situations, high arousal due to stress or bad mood as well as other factors, may cause individuals to use swear words as a coping mechanism. In line with this, previously failed attempts to reduce toxic behaviour by simple excluding toxic players showed little effect on the perceived toxicity in-game [76]. Moreover, designers need to be aware that many aspects of the game, but also aspects of the player and their personality traits, can lead to anti-social behaviour in games.

5.4 Ethical Concerns About Detecting Personality Traits

Measuring and assessing aspects of people using technology, including their personality traits, has become more prevalent as sensors enable us to easily capture data on people's habits and behaviours,

e.g., [10, 29, 43, 61, 80, 81, 104] and has inspired an ongoing discussion about the ethics of such approaches [81]. Designers and researchers must be aware of potentially problematic aspects of these practices, including inferring identity, the breach of privacy, and how these practices may affect the person and their social environment. For example, prior work proposed ways how to detect psychopathy using gaze data and artificial intelligence [10]; however, as previously discussed, psychopathic traits may not be socially welcomed and even feared by others. As a result, individuals who are sub-forensic (i.e., have elevated psychopathic traits that are not necessarily problematic) may experience higher scrutiny by others due to the stigma and pop-culture stereotypes of psychopathy, when automated detection of these traits is applied without careful ethical considerations [1, 81]. As previously discussed, game designers should not exclude players due to *any personality trait*, as it has been shown to be not an effective way to solve the manifestation of anti-social behaviour in games. Moreover, we emphasize that game designers should seek novel ways to include and satisfy *all players* to create a more diverse community by assisting players with different traits to feel welcome in their communities, using in-game rules and tools to promote healthy social interactions among all players.

5.5 Limitations and Future Research

There are several limitations to the results of this study, which can be addressed by future work. First, our evaluation is based on an abstract social interaction in comparison to those prevalent in actual digital games. Future work could benefit from replicating the results in a more elaborated game environment, with a more realistic task, and richer social interactions with an NPC. Further, extending our findings to social interactions with other players would provide additional knowledge around how trait boldness, meanness, and disinhibition express in social games. Second, our character editor did not include a non-binary option for players, due to limitations of our underlying technical framework. We emphasize that future work should include non-binary options for players to ensure that all players can express themselves fully through character creators. Third, in the task we only focused on two emotions, friendly and angry, which were emphasized multiple times during each trial. Future work should focus on more subtle social clues, as emotion perception and interpretation bias is elevated for more subtle and complex facial expressions [51]. Further, we suggest that researchers may investigate the relationship between psychopathic traits and in-game roles and preferences, similar to what has been done for other personality traits (e.g., [95, 96]) to maximize the enjoyment of role based games. Fourth, the effects of using online research platforms such as Amazon MTurk or Prolific. While these platforms allow researchers to reach out to a large user group, there are rising concerns about the data quality of these platforms [34, 52]. Prior work points out several threats to the data quality recorded on these platforms and some recent incidents [73] emphasize the vulnerability to trends and potential harm to the data quality. Therefore, future research may adapt the presented research and try to reproduce these findings in other in-person experiments to protect the data quality against potential fraudulent behaviour. Fifth, the role of the NPC. Although we did not explicitly

introduce the NPC as the representation of another player, some participants may have perceived it as such. Therefore, they may have experienced elevated social presence [8], which may have caused them to behave differently. Future research may explore further the role of social presence and compare these findings about the interaction with a NPC with player's behaviour when interacting with other players' representations. Furthermore, we only used male NPCs in this experiment. However, prior work shows that the gender of the NPC may affect the way players interact with it and how threatening they perceive it [100]. Future work should explore more diverse gender and ethnicity representations in this experiment to better understand the role of gender and ethnic background on the social interaction in-game.

6 CONCLUSION

Social interactions within gaming have become an essential part of how we connect to others, both inside and outside of a game. These interactions provide a variety of benefits to players; however, when social interactions involve insults, taunts, trolling, or bullying, they cause serious harm to the wellbeing of players and gaming communities. In this paper, we considered how individual personality traits affect social behaviours in games. Specifically, we assessed participants' trait-level boldness, meanness, and disinhibition—which together comprise trait psychopathy—and asked them to engage in a series of social interactions with an NPC (who displayed either angry or neutral emotion) in a gaming task. Our findings demonstrate that the three traits significantly influence social behaviours, including the interpretation of NPC emotion, verbal responses to the NPC, stopping distance to initiate interaction with the NPC, and movement behaviours around the NPC.

Mounting evidence shows that players carry their personalities, motives, social habits, biases, and interaction styles with them into their interactions within digital games—whether these individual traits yield benefit or harm to others. Our findings provide new insights into how trait psychopathy manifests in social behaviours within digital games, expressed in our study through player perceptions, use of language in communicating with the NPC, and violation of the NPC's personal space.

To ensure that the myriad benefits of social gaming are accessible to all players, researchers and developers must continue to develop gaming cultures, norms, and tools that promote harm reduction. A first step in preventing harm is to understand how—and for whom—harmful social interactions unfold. Our work adds to this understanding, with the hope of leading toward safer gaming spaces for all players.

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