Bleed in Dungeons & Dragons:
A Study on the Impact of Personality Design and Character Similarity

Abstract: Recently, *Dungeons & Dragons* (*D&D*) has surged in popularity. Particularly during COVID-19, more people started playing *D&D*, which has been shown to have a positive effect on the players' wellbeing, underscoring the potential mental health benefits of the game. These effects of role-playing on the players' real-life mental state can be explained by emotions, behavior and beliefs *bleeding* from the player into their character and vice versa.

While existing research has explored how physical customization possibilities of game characters can affect players or strengthen the bond between players and their characters, little attention has been paid to how different character personality designs affect the player. Moreover, there is a notable lack of research examining how bleed develops over an extended period of play. This study addresses these gaps by developing and testing a conceptual model for bleed and examining how different designs for *D&D* characters (similar, dissimilar, idealized self in terms of personality) affect the player over an extended period through a qualitative, exploratory experiment. Novel measures for bleed were developed and tested for this purpose.

Furthermore, a Myers-Briggs-based, gamified personality test was used as a simplified way of operationalizing similarity between a player and their character. Findings indicate that playing a character similar in personality to the player fosters greater bleed-in than bleed-out, while a character representing desired traits evokes both bleed-in and bleed-out. Notably, playing a dissimilar character induces more bleed-out than playing a similar character. This study provides further insights into the complex nature of bleed and paves the way for future research, with the aim of discovering how RPGs like *D&D* and character creation can be leveraged to impact one's self-development.

Keywords: role-playing games, *Dungeons & Dragons*, bleed, self-development, personality design

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1. INTRODUCTION

The relationship between players and their characters is essential to the experience of role-playing games (RPGs), with characters serving as the medium through which players extend their presence and agency into the game (Banks et al. 2019; Bowman et al. 2016; Dimas et al. 2011). Prior research has predominantly examined the impact of physical character customization on players' self-concept, body ownership, and presence (Waltemate et al. 2018; Yee & Bailenson 2007). However, little is known about how a character's personality design and customization options affect the player. This study aims to fill that gap by focusing on a RPG with extensive personality customization options: *Dungeons & Dragons* (*D&D*).

Originally introduced as a tabletop role-playing game (TTRPG) in 1974, *D&D* has sustained its popularity over the years (Adams 2013). In this game, players navigate their self-made characters through adventures crafted by another player who serves as the "Dungeon Master" (DM). Through collaborative sto-

rytelling, players are both audience and author, significantly influencing and affecting the narrative. Character design in *D&D* offers a wide range of customization options, from arbitrary choices like clothing and hair color to impactful decisions affecting the game (such as race and class) and narrative (such as ethical beliefs and personality).

In *D&D*, through the imaginary and active nature of the game, the player actively uses their cognitive capacity to immerse themselves in the game and into the character. Through acting, the player gets to pretend they are the character, resulting in characters posing as a medium to experience events and emotions (N.D. Bowman et al. 2016). Because of the active use of a player's cognitive capacities and the constant switching between the real world and fictional world in a process of "metareflection" (Levin 2020), some aspects inevitably remain rooted in real-life experiences, blurring the lines between player and character.

How players are affected by the experiences of their characters (e.g., emotions, behavior, beliefs) and vice versa is called bleed (Hugaas 2024; S. L. Bowman 2022; Vi Åker Jeep, n.d.). Based on the notion of bleed, a character can serve as an explorative medium, allowing players to express and experiment with different aspects of their identity. Identity is considered a multifaceted construct, where different aspects of a person's identity become dominant in various social settings (Hugaas 2024). This exploration of identity could lay the groundwork for the positive therapeutic outcomes of playing *D&D* that have been observed (e.g., S. L. Bowman 2012; Yuliawati et al. 2024), with different character designs (i.e., more or less similar to the player) enabling the player to explore various versions of themselves (S. L. Bowman 2010; Kapitány et al. 2022; Kilmer et al. 2023).

Previous research has explored bleed primarily through qualitative methods, revealing insights into how players perceive and experience this phenomenon (e.g., Walsh & Linehan 2024; S.L. Bowman 2013). There is a notable lack of research examining how bleed develops over an extended period of play, and how much time one would have to spend with a character for bleed effects to occur. Each player's unique engagement with their character results in diverse player-character relationships, according to their motivations and immersion modes (S.L. Bowman & Schrier 2018). This dynamic interplay matures as the character undergoes development, and players invest more time in character portrayal.

The aim of this study is twofold: (1) to study the impact of different character designs, in terms of similarity between player and character, on bleed effects, and (2) to provide an overview of how and through which mechanisms bleed develops after an extended period of play. This is done using a mixed research design, where participants reflect on their experiences after several months of playing a newly created character in *D&D*, combining qualitative and quantitative methods to address the following research question:

1. How does bleed develop between player and character in an online setting of Dungeons & Dragons over an extended period of time, and how does a character's degree of similarity to the player affect this development?

2. BACKGROUND

2.1 Dungeons & Dragons in an online setting

Dungeons & Dragons (*D&D*), originally intended for in-person tabletop play, has recently also transitioned to online platforms (Hedge 2021). These web-based adaptations offer a myriad of playstyles, encompassing text-based, audio-only, and audiovisual formats, each offering different experiences. The frequency and composition of gameplay groups, whether consistent or ever-changing, further contribute to the versatility of online *D&D*.

This research focuses on the online *D&D* format, often referred to as "West Marches." Distinguished from traditional *D&D* campaigns, West Marches embodies a player-driven, community-based approach

(Lumpkin 2019). In this format, players have the option to assume the roles of both players and DMs, resulting in a lack of predefined player groups and overarching narratives. Frequent game sessions, typically self-contained, are woven into a shared game world within the online community. West Marches exemplifies sandbox-style gameplay, affording players the agency to select interactions and storylines freely.

Another difference from traditional offline *D&D* formats stems from the additional opportunities for immersion. Text-based channels are made to represent various in-game locations (e.g., forests or taverns), facilitating role-play between players. Unlike traditional sessions that require planning and organization, text-based role-play can be initiated spontaneously with any two (or more) willing players. This accessibility provides players with a continuous avenue to immerse themselves in the story world and their characters.

2.2 Character design in Dungeons & Dragons

One of the unique aspects of engaging in RPGs such as *D&D* is the ability for the player to shape their character in appearance as well as personality and underlying values. Sarah Lynne Bowman (2010; Chapter 7) identifies different types of relationships between the player's own identity and their character: (1) a Doppelganger that is very strongly related to their sense of self; (2) the Devoid Self that can be seen as a version of themselves that is lacking something they do possess in real life; (3) the Augmented Self as a version of themselves with an added quality (e.g., superpower); (4) the Fragmented Self that has a part of themselves accentuated or exaggerated; (5) the Repressed Self that represents one's inner child and desire to be carefree; (6) the Idealized Self with traits that a player wishes to have; (7) the Oppositional Self as the inverse of the player's personality; (8) the Experimental Self as a way for the player to challenge themselves with difficult-to-role-play characters; and (9) the Taboo Self where the character is used to open the floor to discuss topics or concepts that are considered taboo in real life.

We postulate that these different relationships between a player and their character result in different experiences and reflections while role-playing the character archetypes. To explore these player-character relationships and their effects in the current study, we have invited players to design characters that are likely to result in different relationships. We expect that characters that closely resemble personality characteristics of the player result in Doppelganger-type relationships; characters that are very different from the player, in Oppositional Self-type relationships; and characters that possess personality traits that the player would like to have in addition to the personality traits they do have, in Idealized Self-type relationships.

Although participants in our study are instructed to create a character following specific traits, Sarah Lynne Bowman (2010; Chapter 7) indicates that it takes time for the character and its relationship with the player to develop. After the initial creation, or *Genesis* of the character, the *Development* stage comprises the player putting further thought into the character. This is followed by the *Interaction* of the character with the fictional world and other characters, where concrete decisions need to be made on behalf of the character, which exposes further character traits. Finally, after some time spent role-playing the character, there is a sense of *Realization* where the player has developed an in-depth understanding of the character. Because these later stages of player-character relationship formation are likely to play a substantial part in the effects that this relationship ends up having on the player, it is important to include the different stages when studying these effects, for example by conducting a follow-up session after players have had a chance to develop their characters in naturalistic gameplay.

2.3 Immersion

Narratives can take us on an emotional journey where we experience emotions with and for a character (Slater et al. 2014). This can manifest in behaviors such as laughing out loud or crying when engaging with media. Through words and images, we feel the agony and share the joy of whoever's viewpoint we are taking on.

Previous academic endeavors concerning traditional narratives explain that stories take us out of our everyday lives and "transport" us into a fictional world. Immersion is a fundamental aspect of transportation where the person taking in the narrative mentally leaves behind the real world in favor of the fictional one (Irimiás et al. 2021). In her book *Hamlet on the Holodeck*, Murray describes immersion as follows:

> Immersion is a metaphorical term derived from the physical experience of being submerged in water. We seek the same feeling from a psychologically immersive experience that we do from a plunge in the ocean or swimming pool: the sensation of being surrounded by a completely other reality, as different as water is from air, that takes over all of our attention, our whole perceptual apparatus. (1997, p. 98)

This perspective primarily stems from studies on traditional media. Immersion into RPGs differs in certain ways, mainly in the sense that this involves an active, performative way of transitioning from one's own identity into another (Bowman 2012). The transitioning into and out of the imaginary mindset of the character has respectively been called en-roling and de-roling (Burrell 2023; Gualeni & Vella 2020). While most theories see the transfer as instantaneous, Gualeni and Vella (2020) note that this is a complex process. Players, in the example of *D&D*, need to meet a threshold of basic knowledge of the game, such as how to navigate their character sheet or that the embodiment of their character takes place through linguistic means, as a prerequisite to en-roling in their character. Additionally, the role-playing capacities of the group and storytelling capacities of the DM play a big part in creating the shared fictional environment that allows for a player to stay en-roled into character.

Bowman and Standiford (2016) identify six distinct categories of immersion in role-playing games: activity, game, environment, narrative, character, and community immersion. Activity immersion relates to the physical and performance aspects of role-playing, such as speaking in character, using gestures, or participating in live-action components. Game immersion refers to the willingness to strive towards the game's intended goal, where players engage with rules, strategies, and problem-solving elements. Environment immersion refers to the spatial aspects of the setting, where players feel present within the imagined environment. Narrative immersion occurs when players become engrossed in the story, which is especially prevalent in RPGs due to the first-person perspective. Character immersion involves the player's identification with and embodiment of their character, experiencing emotions and thoughts from their character's perspective. Lastly, community immersion emerges through interactions with the other players at the table, where immersion is created through shared experiences and (the creation of) social bonds. In this research, the focus will mainly be on character immersion, supported by the other forms of immersion. Immersion will be taken as a first prerequisite for building emotional involvement with a fictional character since it is a first step toward getting involved in the overall narrative and the fictional world.

As players en-role into character and enter the fictional world, it is important to note that they maintain their primary identity[1] in the real world (Bowman 2010, Chapter 6; Bowman & Lieberoth 2018). However, role-playing does offer the opportunity to explore and understand the intricacies of the inner self that comprises not only the primary identity but also the various roles that a person fulfills (Hugaas 2024; S.L. Bowman 2010; Kapitány et al. 2022). If a player is strongly immersed in the fictional world, they are likely to temporarily replace their emotions with those of their character, causing an identity shift (S.L. Bowman & Lieberoth 2018). To a certain extent, the player can control the degree to which this identity shift happens by either maintaining or letting go of a boundary between their character and themselves. This is also referred to

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[1] What exactly is meant by someone's primary identity or primary self does not appear to be addressed in literature. We assume it refers to one's identity, personality or sense of self before engaging in role-playing, including those aspects that the person believes uniquely define them.

as "having an alibi," controlling the extent to which the player places responsibility for a character's actions on the character or themselves (S.L. Bowman & Lieberoth 2018; Deterding 2017). Maintaining a stronger alibi means that players psychologically distance themselves more from their character's actions. At the same time, the alibi serves as a social contract among players, providing the permission and mutual understanding needed to portray morally ambiguous or socially transgressive behavior within the safe boundaries of the game (S.L. Bowman 2010; Hugaas 2024).

It is expected that designing a character that is more similar to the player reduces the boundary between player and character (S.L. Bowman & Lieberoth 2018). At the same time, having a stronger alibi enables the player to fully engage with the character and explore the character's identity in a safe environment (Hugaas 2024), which may make an alibi more suitable for certain character types such as the Taboo Self (cf. S.L. Bowman 2010).

2.4 Self-presence

To formalize this concept of a distance or boundary between a player and their character, and thus the degree to which the player experiences events and emotions from their character as if they are occurring to themselves, we propose to draw inspiration from the field of digital, immersive game experiences with the concept of self-presence. In the context of *D&D*, where the player is not just passively watching a narrative with fixed characters, but instead creates a character and actively participates, it can be argued that players of this game are encouraged to insert themselves into the game environment and become present in the story-world (Christy & Fox 2016).

Self-presence refers to the physiological state in which the character is experienced as the actual self in the perception of the body, physiological states, emotional states, and identity (Biocca 1997; Lee 2004; Ratan 2012). The element of active participation in *D&D* where players create a character that takes on an active role in pursuing narrative progression has led scholars to believe that the high level of interactivity results in a more monadic experience (seeing the character as the self) in which character role-taking is stronger than in passive media consumption, leading to self-presence (Klimmt et al. 2009; Peng et al. 2010), especially if there is little to no boundary between the player and their character (de Wit 2021). This boundary between reality and fiction is also referred to as aesthetic distance, a term that is used to explain the potential transformative effects of live-action role-playing (Levin 2020), where experiencing more (self-)presence results in a smaller aesthetic distance (de Wit 2021).

As with character immersion, in self-presence it has also been established that players never fully let go of their primary identity in favor of the character's identity, but that there is a temporary change in self-perception and social identity due to a strong degree of identifying with the character (Biocca 1997; Downs et al. 2019; Klimmt et al. 2009; Tamborini & Skalski 2006). Self-presence is said to be stronger if there is a close mapping of a character's mental models in terms of body image and identity to the player's (Tamborini & Skalski 2006). In *D&D*, the player is using their own body and voice to portray the character, which may provide a solid basis for strong degrees of physical self-presence, and subsequently other forms of self-presence to occur, especially if the personality or identity of the character is also similar to that of the player (Ratan 2012). The sense of self-presence can lead to transformative effects where the player's self-image and identity are affected even after the play session concludes (Tamborini & Skalski 2006). In other words, a strong degree of self-presence can set the stage for bleed effects to occur.

2.5 Bleed

While traditionally it was assumed that people recognize fictional characters as being fictional and thereby unable to affect one's primary identity, it has been shown that this 'cognitive quarantine' is indeed permeable (Holmes et al. 2024). This cognitive permeation, also known as "bleed" in live-action and tabletop role-playing

games (Boss 2007), can occur whenever a person immerses themselves into a fictional character and aspects of the self spill over from the player into the character or vice versa (Vi Åker Jeep, n.d.). These aspects include emotions, thoughts, behavior, relationship dynamics, physical states, ideologies, and personality traits, among others (Bowman 2022). It is important to note that bleed is a neutral occurrence, devoid of inherent positivity or negativity (Bowman 2022). Bleed distinguishes itself from immersion and self-presence in that it relates the character's identity to the player's primary identity, instead of the player temporarily replacing their own primary identity with the character's.

Several mechanisms have been identified that could potentially help explain how bleed takes shape. For example, a strong degree of immersion causing an identity shift could set the stage for elements of the temporary adoption of another identity to remain as long-term changes to one's primary identity (Bowman & Lieberoth 2018). A similar concept is identity fusion, where, in the case of a strong fusion, the character's and player's identity feel as one, again showing potential for bleed (or cognitive permeation) to occur when strong emotional experiences are shared between player and character (Holmes et al. 2024). While being immersed or engaged in role-play, meta-reflection, and metacognitive processes, where players fluently switch between perceiving fiction, reality, and the integration of both, likely facilitates bleed (Holmes et al. 2024; Levin 2020). Perhaps slightly less applicable to tabletop role-playing, in live-action role-playing the physical embodiment and enactment of the player's character is identified as a strong mechanism that blurs the boundary between a player and their character, making it more likely for bleed to occur (cf. embodied cognition; Lankoski & Järvelä 2012; Leonard & Thurman 2018).

Bleed can be experienced in two ways: bleed-in and bleed-out. When experiencing bleed-in, a player (subconsciously) starts spilling aspects of themselves into the character. If this happens consciously, it could also be likened to the concept of *steering* as seen in live-action role-playing (Montola et al. 2015). Bleed-out is when aspects of the character spill back into the player's primary identity. The main difference between bleed and the identity shift that was previously mentioned in the context of immersion and self-presence, is that while identity shift is a temporary replacement of the player's emotions and experiences with that of the character alongside the player's primary identity, bleed is a transformative experience resulting from this identity shift that changes the player's primary identity in some way (Hugaas 2024). It can thus be seen as a way to (re)form one's identity, a phenomenon that people tend to engage in through various means, including role-playing. However, there appears to be a bleed perception threshold under which people are not consciously aware that they are experiencing bleed, even though their identity may be reflected upon and altered anyway (Hugaas 2024).

Regardless of the direction of bleed, there are several types. S.L. Bowman (2022) proposed the following taxonomy of bleed, based on previous research: emotional bleed (Montola 2010), procedural bleed (Hugaas 2019), memetic bleed (Hugaas 2019), romantic bleed (Bowman & Hugaas 2021; Harder 2018), ego bleed (Beltrán 2013), identity bleed (Hugaas 2024), emancipatory bleed (Kemper 2017; 2020), and design bleed (Toft & Harrer 2020). Within this taxonomy, the breadth and level of abstraction differ between categories. For example, emotional bleed contains any emotional state, while romantic bleed includes feelings of romantic and/or sexual attraction, which is very niche when compared to emotional states as a whole. After reviewing the categories and existing literature, we propose four, more evenly distributed categories: emotional, social, cognitive, and behavioral bleed. The two directions of bleed and the types of bleed were used in creating the measurement instrument for bleed that was applied in the current study. The bleed categories used in this study bear close similarities to the constructs introduced by Hugaas (2024) as well as those in the measurement of cognitive permeation proposed by Holmes et al. (2024). While our framework aligns with aspects of Hugaas' work, it differs in that we focus on observable manifestations of bleed rather than the underlying psychological mechanisms. Hugaas (2024) distinguishes between "components" (experiential elements of bleed) and "constructs" (analytical categories), whereas our categories are designed as functional groupings for measurement purposes. The different yet conceptually related labels between these taxonomies are compared in Table 1.

Table 1: Comparison of the taxonomy of bleed categories in the current research, the definition by Hugaas (2024), and the measurement of cognitive permeation by Holmes et al. (2024).

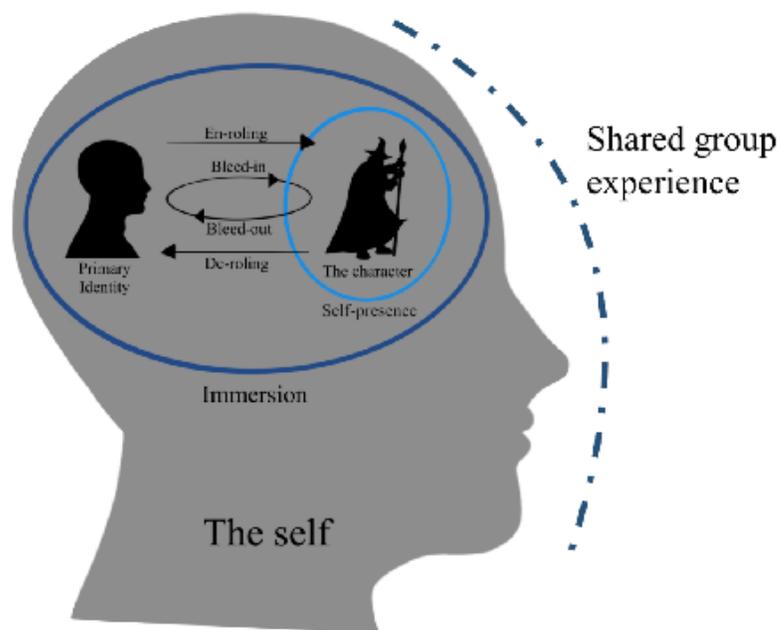| This study	Hugaas (2024)	Holmes et al. (2024)
Emotional	Emotional	Emotion
Societal	Relationship	Social
Cognitive	Memetic, ego, identity	Cognition
Behavioral	Procedural	Skills

Figure 1: A visual representation of the self experiencing bleed

Combining the literature, a visual representation of bleed was developed, which can be found in Figure 1. Since, in the context of this study, the player is the designer of the character, the entire process happens within the boundaries of the self, as well as being influenced by the shared group experience when playing the game. Within this model, immersion (into the game world and into the narrative) is seen as the first state that needs to be reached to fully experience both self-presence and, subsequently, bleed. As such, we propose the first hypothesis:

> **Hypothesis 1:** A higher degree of experienced immersion leads to a higher degree of self-presence.

Self-presence can be experienced when the player is immersed in the narrative and present in the environment depicted by the DM, and is reached when the player is en-roled into the character, where it feels like they *are*

the character, and is thus seen as a second prerequisite of bleed. Given the character-dependent nature of this phenomenon, this is suspected to be a strong factor in bleed. Thus, we propose the following hypothesis:

> **Hypothesis 2:** A higher degree of experienced immersion leads to stronger reported bleed, and this effect is mediated by self-presence.

The degree to which bleed-in and bleed-out are experienced may differ depending on how similar a character is to the player. S.L. Bowman and Lieberoth (2018), for example, state that the boundary between a player and their character is likely to be smaller if the character and player are similar. In self-presence research, a similar phenomenon is suggested where the player and character share similarities either in appearance or identity (Tamborini & Skalski 2006). We further expect that it will be more difficult to portray a character that is dissimilar to the player, as their behavior and responses to events that happen in the fictional world are new to them. As such, bleed-in hypothetically should be more pronounced when the character and player are similar. At the same time, when the player and their character are dissimilar, there may be more room for bleed-out to occur, as the player has ample room to explore an identity different from their own, and to merge parts of this identity with their own.

In between these two extremes of similar and dissimilar characters, we expect characters that belong to the Idealized Self type (cf. S.L. Bowman 2010) to be similar to the player in some respects while being dissimilar in others, resulting in equal parts bleed-in and bleed-out. These character types are expected to stimulate wishful identification, a psychological process where a person aspires to emulate (fictional) characters sharing traits they possess while embodying qualities they desire (Hoffner & Buchanan 2005). Based on these different character type designs, we propose the following hypotheses:

> **Hypothesis 3a:** Characters that are similar to the player result in a stronger bleed-in effect and weaker bleed-out effect.

> **Hypothesis 3b:** Characters that embody a player's wishful identification result in equally strong bleed-in and bleed-out effects.

> **Hypothesis 3c:** Characters that are dissimilar to the player result in a stronger bleed-out effect and weaker bleed-in effect.

3. METHOD

3.1 Participants

The study was approved by the research ethics and data management committee of the researchers' university. A G*Power (version 3.1) analysis indicates a desired sample size of 41 for the paired samples t-tests used to compare bleed-in and bleed-out effects within participants (H3) for detecting a medium-sized effect (0.40) at a power (1- β) of 0.80 and significance level of α = .05. For the mediation analyses (H1, H2, exploratory analyses) G*Power does not provide a desired sample size, but literature indicates a minimum sample of 71 participants for medium-sized α and β paths (.39) with bias-corrected bootstrapping (Fritz & MacKinnon 2007). Due to the difficulty of reaching a large group of active *D&D* players willing to invest in creating a new character for the purposes of this research and spending time playing this character, we did not manage to meet this desired minimum sample size. As such, especially the mediation analyses need to be interpreted with some caution. A total of 42 volunteers from 11 different countries were recruited from four Discord servers and through Reddit, adhering to West Marches' rules for gameplay.

Participants had no previous knowledge about the experiment objectives. Of the three conditions, 18 participants played a character similar to themselves, 13 participants a character of the Idealized Self type, and 11 participants a dissimilar character. Of the 42 participants included in the sample, 64 percent were male (n = 27), 26 percent were female (n =11), five percent were non-binary (n = 2), and five percent did not want to disclose their gender (n = 2). The largest group indicated to be between 25-34 years old (n = 28), with ages ranging from 18 to 44 years old. Looking at nationalities, 38 percent (n = 16) of the participants were from the United States, and 29 percent (n = 12) were from the Netherlands. Other countries include the United Kingdom (n = 4), Denmark (n = 2), Malaysia (n = 2), Belgium (n = 1), Brazil (n = 1), Ecuador (n = 1), Indonesia (n = 1), Kuwait (n = 1) and Poland (n = 1). Sixty percent of the sample (n = 25) had a degree in higher professional education or above. Half the participants (n = 21) had at least four years of experience playing *D&D*, while the other half had less than four years of experience. Most participants (n = 11) indicated playing *D&D* around 5-10 hours a week.

3.2 Materials and Measures

Two questionnaires were administered through Qualtrics. The first, before the experiment, included demographic questions, *D&D* experience, and the 16personalities.com personality test as a basis for character creation. The second questionnaire, administered after three months, measured immersion, self-presence, and bleed. Both questionnaires can be found in the appendix.

Character creation was done using the Myers-Briggs-based, gamified 16personalities.com personality test. The test was used to offer suggestions for the character's personality strengths and weaknesses. According to critics, Myers-Briggs is unlikely to be a valid measure of personality and is largely refuted by scholars. Reasons for this refusal include, but are not limited to, the lack of consistency that stems from having people self-verify the results, and how the test is widely used to explain people's behavior, rather than describe it (e.g., Stein & Swan 2019; Weddle 2015). Nevertheless, while the test is not a tool for predicting performance or outcomes, it is helpful to users as a guideline for increased self-awareness and understanding (Stein & Swan 2019). In this study, the main purpose of the gamified personality test is to offer suggestions of characteristics to participants to stimulate the creative process of character creation. Although personality and identity are different, we decided to use these archetypal personality types to give participants structure in shaping their characters' behavior while engaging in role-playing. In other words, it was a vastly simplified way of operationalizing similarity between player and character for this study.

Immersion was assessed using the Immersive Experience Questionnaire (IEQ) combined with the Understanding Media Enjoyment Questionnaire from Green and Brock (2000). Because to our knowledge, there is no scale that focuses on measuring immersion in the context of analog role-playing games, these more general scales were adapted for this study. While the IEQ contains items that capture character immersion, the Understanding Media Enjoyment Questionnaire adds four of the six types of immersion described by Bowman and Standiford (2016): activity, game, environment, and narrative immersion. The sixth type, community immersion, does not seem to be covered by existing scales. Both questionnaires measure the subjective experience of being immersed in a game/narrative by letting participants report their feelings on a 7-point Likert scale, ranging from "not at all" to "a lot". An assessment of the internal consistency of the measure of immersion, consisting of 21 items, showed Cronbach's Alpha being α = .87.

Self-presence was measured using the Self-Presence Questionnaire (SPQ), adapted for *D&D* (Ratan 2012). The SPQ measures the subjective experience of feeling self-presence in a virtual environment on a 5-point Likert scale, ranging from "not at all" to "absolutely."

Bleed was assessed through a questionnaire developed specifically for this study, covering bleed-in and bleed-out across four categories: social settings, emotional capacity, cognitive capacity, and player behavior. The questionnaire measures both bleeding into a character and bleeding out of a character. It has been designed in the context of this study because, to the researchers' knowledge, no measurement instrument for bleed existed at the time this study was conducted. Later, we discovered the measurement of cognitive permeation, a similar construct to bleed (Holmes et al. 2024). Comparing the two measurement scales, they share a strong resemblance, where both contain items describing permeation or bleed from character to player, and from player to character, across four categories that are similar between the two scales (as shown in Table 1).

Our newly designed questionnaire has been evaluated by three experienced *D&D* players from the researcher's network. The measures of bleed were split into bleed-in and bleed-out, and on a sub-level split into the four above-mentioned categories of bleed: emotional (e.g., "After the session the emotions I felt during the game often lingered"), social (e.g., "I started disliking a player more because of the dislikable character they play"), cognitive (e.g., "Playing my character has helped me feel more comfortable with myself"), and behavioral (e.g., "When I act out what I say I am doing (for example through hand movements), I notice I connect more with my character"). An assessment of the internal consistency of the measure of self-presence, consisting of 15 items, showed Cronbach's Alpha being $\alpha = .84$. The adjusted questions, including the reasoning for the adjusted or omitted questions, can be found in the appendix.

Open-ended questions were included because of the novelty of the bleed scale. These explored the player's experience and were included to serve as further information as to why bleed was or was not happening.

3.3 Procedure

Participants provided informed consent and completed a demographic questionnaire. They were randomly assigned to one of three character personality conditions: close to their own personality (similar), close to their ideal personality, or opposite to their own personality (dissimilar). A personality test on 16personalities. com provided a baseline for character creation. Participants were instructed to play their characters as desired for three months, going through (parts of) the other stages of the evolution of role-playing characters—development of the character, interaction between the character and the game world, and optionally reaching the stage of full character realization (S.L. Bowman 2010; Chapter 7)—while tracking their in-character time. After this period of time, participants were given a survey measuring the amount of immersion, self-presence, and bleed they experienced over the whole period in which they played.

3.4 Analysis

Internal consistency was assessed using Cronbach's Alpha, and a factor analysis was conducted to validate the bleed scale. Answers to the open-ended questions provided qualitative data for further explanation. An assessment of the internal consistency of the measure of character-bleed, consisting of 18 items, showed Cronbach's Alpha being $\alpha = .89$. Next, looking closely at the validity of the scale of bleed, a split was made between bleed-in and bleed-out. For the scale for bleed-in, Cronbach's Alpha is $\alpha = .66$. For the scale for bleed-out, Cronbach's Alpha is $\alpha = .88$. The factor analysis was conducted on the bleed scale using Varimax rotation due to the differences in bleed types and subtypes. The analysis revealed four factors with eigenvalues above 1, explaining 65.12 percent of the variance in bleed. These factors did not align with the predetermined structure, combining bleed-in and bleed-out statements. To account for this, a subsequent analysis focusing on one retained factor showed that nine items intended to measure bleed-out clustered well together, explaining 51.47 percent of the variance with an eigenvalue of 4.63. Consequently, the original plan to analyze bleed as a single construct was revised to distinguish between bleed-in and bleed-out.

4. RESULTS

4.1 Immersion, self-presence, and bleed

Following the preregistration,[2] the study began by investigating whether the relationship between immersion and bleed could be elucidated by the concept of self-presence, as stipulated in Hypotheses 1 (H1) and 2 (H2). Two mediation analyses were conducted, focusing on bleed-in and bleed-out as separate outcome variables. All assumptions for the mediation analyses (independence of errors, multicollinearity, heteroscedasticity, normality, outliers) were checked and met. The means and standard deviations can be found in Table 2 below.

Table 2: Means and Standard Deviations of the Variables measured on a scale of 1-5.

Sub-scale	M	SD
Immersion	3.71	.59
Self-presence	3.66	.68
Bleed	3.11	.74
Bleed-in	3.19	.65
Bleed-out	3.09	.89

4.2 Mediation analysis with immersion, self-presence, and bleed-in

The model with immersion and self-presence to predict bleed-in is an improvement over the null model (R^2= .17, F [1, 40] = 8.30, p= .01), with the model predicting 17.2 percent of the variance in bleed-in. The model also showed a significant effect of immersion on self-presence (b= .58, SE= .16, p< .001), indicating that a higher immersion score led to higher scores on self-presence. This leads to the acceptance of the first hypothesis that a higher degree of experienced immersion leads to a higher degree of self-presence. Furthermore, results showed there was no significant direct effect of immersion on bleed-in (b= .37, SE= .20, p= .07), nor a significant effect of self-presence on bleed-in (b= .23, SE= .18, p= .20). Nevertheless, a significant total effect emerged (b= .51, SE= .18, p= .01), indicating that the relationship between immersion and bleed-in is mediated by self-presence. The conceptual model can be found in Figure 2 below.

A second model was run where the time participants spent playing their characters was added as a covariate. The second model was a slight improvement over the first model (R^2= .18, F [2, 39] = 4.16, p= .02), with the model predicting 17.6 percent of the variance in bleed-in. However, the model shows no significant effect of hours participants spent in character on bleed-in (b= -.01, SE= .03, p= .67).

_____

[2] Click here to see the preregistration form.

Indirect effect: b=.13, 95% CI[-.03, .44]

Self-Presence

b=.58, p<.001

b=.23, p=.20

Immersion

Character bleed-in

Direct effect: b=.37, p=.07

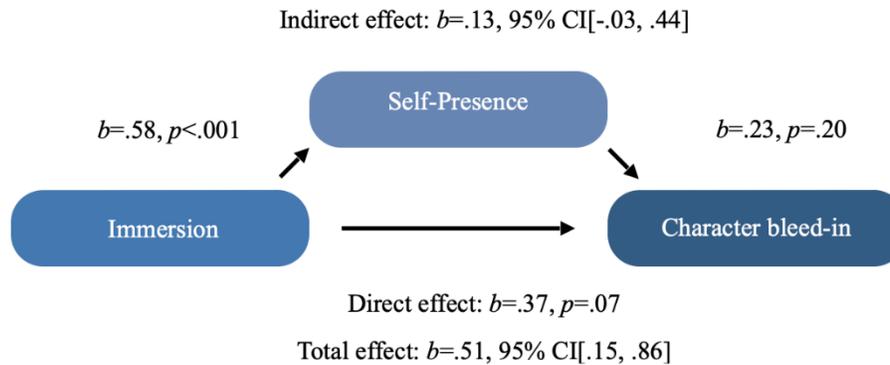Total effect: b=.51, 95% CI[.15, .86]

Figure 2: Conceptual model of Bleed-in with Immersion and Self-presence

4.3 Mediation analysis with immersion, self-presence, and bleed-out

The model with immersion and self-presence to predict bleed-out is an improvement over the null model (R^2 = .41, F[1, 40]=28.05, p<.001), with the model predicting 41.2 percent of the variance in bleed-out. Results showed there was a significant direct effect of immersion on bleed-out (b=.84, SE=.23, p<.001). There was no significant effect of self-presence on bleed-out (b=.40, SE=.20, p=.052). However, there was an indirect effect of the model (b=.23, SE=.15, 95% BCa CI [.03, .61]) and a total effect of immersion on bleed-out (b=1.07, SE=.20, p<.001), meaning that despite self-presence not directly explaining bleed-out, the relationship of immersion on bleed-out is significantly explained by the mediator of self-presence. The conceptual model can be found in Figure 3 below.
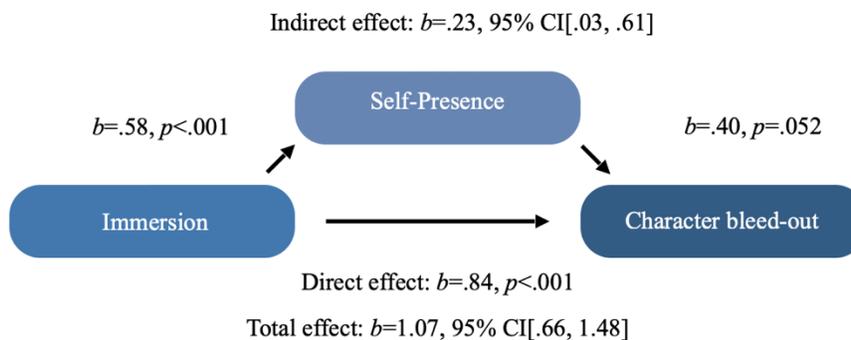
Indirect effect: b=.23, 95% CI[.03, .61]

Self-Presence

b=.58, p<.001

b=.40, p=.052

Immersion

Character bleed-out

Direct effect: b=.84, p<.001

Total effect: b=1.07, 95% CI[.66, 1.48]

Figure 3: Conceptual model of Bleed-out with Immersion and Self-presence

Given that in both models there is a total effect of immersion on bleed, which is mediated by self-presence, this leads to the acceptance of the second hypothesis that a higher degree of experienced immersion leads to stronger reported bleed, and this effect is mediated by self-presence.

A second model was run where the time participants spent playing their characters was added as a co-variate. The second model was a slight improvement over the first model (R^2=.42, F[2, 39] = 14.24, p<.001), with the model predicting 42.2 percent of the variance in bleed-out. However, the model shows no significant effect of hours participants spent in character on bleed-out (b= -.02, SE = .03, p= .42). Because the number of hours participants spent in character is neither a significant contribution to bleed-in or bleed-out, it can be concluded that the extended period of time does not play a role in the development of bleed.

4.4 Character types and bleed

The subsequent analysis aimed to explore the influence of character types on bleed, as postulated in Hypothesis 3. Table 3 below illustrates the means and standard deviations per character type.

Table 3: Means and Standard Deviations of the Variables measured.

Sub-scale		M	SD
Character similar to self	Bleed-in	3.07	.62
	Bleed-out	2.78	.83
Wishful identification	Bleed-in	3.31	.67
	Bleed-out	3.19	.86
Character dissimilar to self	Bleed-in	3.22	.71
	Bleed-out	3.49	.92

A paired samples t-test was conducted per condition to determine the effect of character types on bleed-in and bleed-out (H3). For characters similar to the player, a significant difference was observed between bleed-in (M= 3.07; SD= .62) and bleed-out (M= 2.78; SD= .83); [t (17) = 3.23, p= .01]. This finding suggests that characters that were designed to be similar to the player led to stronger bleed-in than bleed-out, which means Hypothesis 3a can be accepted.

For characters who portrayed a player's wishful identity, no significant difference was observed between bleed-in (M= 3.31; SD= .67) and bleed-out (M= 3.19; SD= .86); [t(12) = .91, p= .38], affirming hypothesis H3b.

For characters that were designed to be dissimilar to the player, no significant difference emerged for bleed-in (M= 3.22; SD= .71) and bleed-out (M= 3.49; SD= .92); [t(10) = -1.31, p= .22]. which contradicts H3c. Thus, characters that were dissimilar to the player did not result in stronger bleed-out than bleed-in.

4.5 A unified model

To synthesize the findings and examine the complex interplay between character types, immersion, self-presence, and bleed, a unified model was constructed. This analysis tested the mediating roles of immersion and self-presence in the relationships between character types and bleed-in and bleed-out.

In the first serial mediation model, character type was the predictor variable for the outcome variable bleed-in, with immersion as the first mediator and self-presence as the second mediator. This model did not come out as an improvement over the null model (R^2= .01, F[1, 40]= .49, p= .49). The analysis shows a positive effect of immersion on self-presence when the effects of character types are controlled (b= .59, SE= .16, p<.001). Results also show that character types do not affect immersion (b= .07, SE= .10, p= .51) or self-presence (b= -.07, SE= .10, p= .51). In addition, neither character types (b= .07, SE= .11, p= .55), nor immersion (b= .35, SE= .21, p= .09), nor self-presence (b= .24, SE= .18, p= .18) affect bleed-in. Finally, there is no indirect effect (b= .02, SE= .05, 95% BCa CI [-.07, .14]) or total effect (b= .09, SE= .12, 95% BCa CI [-.16, .34]) either. The results can also be found visualized in Figure 4 below.

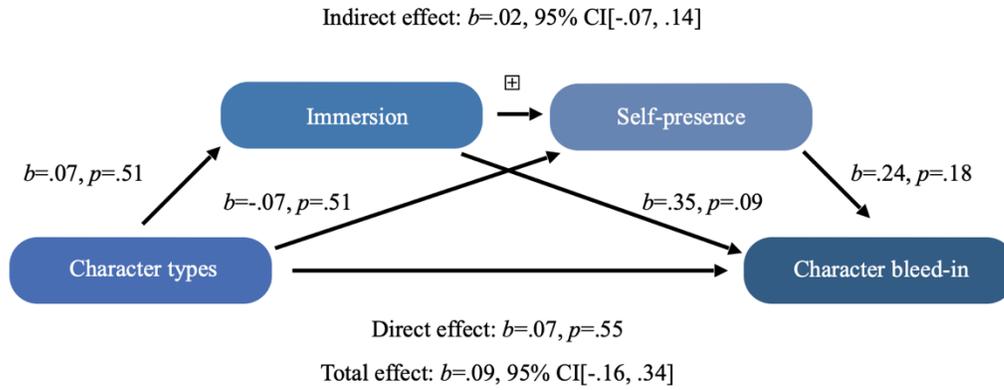Indirect effect: *b*=.02, 95% CI[-.07, .14]

Figure 4: Conceptual Model of Bleed-in with Character Types, Immersion, and Self-presence

In the second serial mediation analysis with bleed-out as the outcome variable, the model is an improvement over the null model (R^2= .11, F [1, 40]= 5.06, *p*= .01). Additionally, self-presence has a positive effect on bleed-out when the effects of character types and immersion are controlled (*b*= .45, *SE*= .18, *p*= .02) as does immersion on bleed-out when character types is controlled (*b*= .76, *SE* = .21, *p*= .001). In this case, an indirect effect was not observed (*b*= .04, *SE*= .10, 95% BCa CI [-.13, .25]), but the total effect of character types on bleed-out was significant (*b*= .36, *SE*= .16, *p*= .03), meaning that the combined influence of the direct effect of character types on bleed-out and the indirect effect flowing through the mediators of immersion and self-presence shows a significant total effect, next to the significant direct effect of character types on bleed-out. The results can also be found visualized in Figure 5 below.
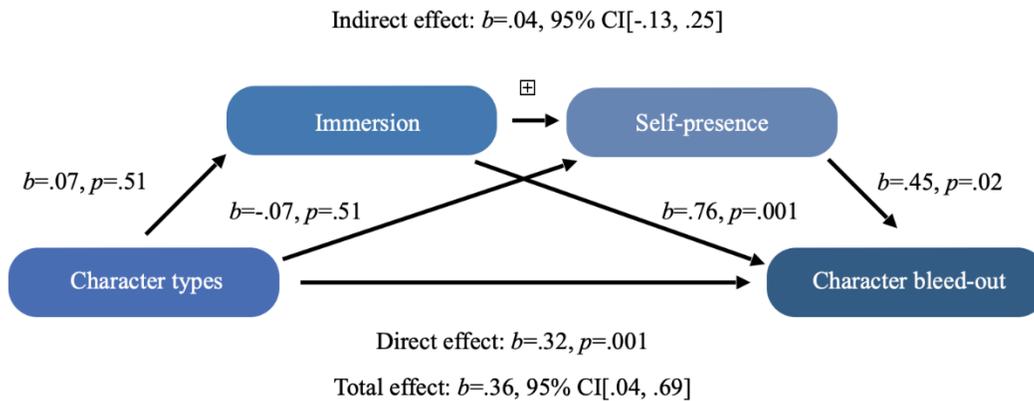
Indirect effect: *b*=.04, 95% CI[-.13, .25]

Figure 5: Conceptual model of Bleed-out with Character Types, Immersion, and Self-presence

5. DISCUSSION

This study investigated the interplay between immersion, self-presence, and bleed in the context of online *D&D* to further investigate how a character's design, in terms of similarity to the player, affects the player after spending time role-playing the character in a naturalistic setting. For this study, a new measurement for bleed was created.

5.1 Immersion, self-presence, and bleed

This study's results demonstrate several key findings. Firstly, a higher level of experienced immersion was found to be associated with a stronger sense of self-presence, confirming the first hypothesis. This aligns with prior research (e.g., Baños et al. 2004) and emphasizes the importance of immersion in fostering a player's sense of presence in the character within the game world. Moreover, this study revealed that higher levels of immersion were linked to stronger reported bleed. This effect was mediated by self-presence, supporting the second hypothesis. It suggests that while immersion draws the player into the game world, it is the internalization of the character's perspective (self-presence) that facilitates emotional spillover.

Furthermore, it was expected, as the bond between player and character develops , that the amount of experienced bleed would grow stronger over time (S.L. Bowman 2010; Giles 2002). However, this does not seem to be the case as shown by the insignificant influence time has on the mediation models' performance, indicating that bleed is more closely associated with the intensity of experiential engagement (immersion) and identification with the character's perspective (self-presence), rather than simply the duration of play. Looking at players' experiences of the game *World of Warcraft*, Banks et al. (2019) note that this is partially shaped by the attachment style of the player to the character.

Putting that notion in the light of this study, future research should further investigate this relationship to create more clarity on the role that player-character relations have on bleed and how this ties into the role of immersion and self-presence. While this study did not measure the bond players felt with their characters, the answers to the open questions already show an interesting incentive for this research. One participant noted: "I feel like my character is more of a friend than a part of myself, it was very unlike myself, so I see it more as a friend I had to act as rather than an extension of myself" (P29, dissimilar character). This example shows that player-character relationships, while heavily dependent on the player's preferred style of playing, can change according to the personality they create for their character, and can thus vary per character.

To answer the other half of the research question about how a character's design affects the development of bleed between players and characters, further analyses were conducted that are discussed below.

5.2 Character design – similar to the player

This study further delved into how a character's design affects bleed. The character design was operationalized as the personality of the character being either similar to, dissimilar to, or an idealized version of the player's, with the idea that players would then further shape the characters accordingly as they are confronted with situations in the fictional universe (cf. S.L. Bowman 2010). Participants who played characters similar to themselves experienced more bleed-in than bleed-out. This result suggests that players tend to project their own traits and emotions onto characters that closely mirror their own personalities, aligning with hypothesis 3a.

However, the actual extent of bleed-in may be underestimated, as some participants may not consciously recognize bleed-in, considering the close alignment of their own personality with their characters and the bleed perception threshold (Hugaas 2024). When a player's sense of self is closely aligned with the role they play, it might become harder for the player to perceive the experience of bleed. For example, one participant mentioned: "I found myself connecting to the character in a way that let me try to feel as if I had lived in the setting myself and taken the actions that my character did" (P20, similar to self), while later on saying "I could not name an example [of bleed-in] myself."

Regardless, when looking at the open-ended questions for additional insights, participants do report experiencing bleed-in. For example, one participant mentioned: "I do feel like my mood can bleed into the way I play more than anything. If I'm feeling down, I usually don't try to speak up as much during role-play" (P23, similar to self), illustrating how someone's emotions can bleed into the character. On the social level, another participant noted: "I felt the connection I had to other players. I felt my character interacted easier with players I knew and were comfortable with, whether it be a hostile interaction or a friendly one" (P29, similar to self). This continues to show that, while the results should be interpreted with care, participants playing a character similar to themselves report experiencing bleed-in.

Furthermore, participants reported that playing characters similar to themselves made them more self-aware, while also making them feel more vulnerable. For example, one participant said:

> Deliberately making a character with some of my own flaws and strengths didn't make me enjoy being the character any more than others I've played, but it did make some emotional moments resonate more. Like, "Oh, if he can do this thing in this situation, despite having the same flaw related to it that I do, maybe I can do it, too." (P17, similar to self)

Meanwhile another participant mentioned: "I felt very vulnerable and exposed playing this character" (P11, similar to self). This shows that while playing a character that is similar to the player might lead to new insights regarding how other people and participants themselves accept their flaws, participants generally did not enjoy it a lot because of how vulnerable it made them feel. This could perhaps be explained by the lack of an alibi (S.L. Bowman & Lieberoth 2018; Deterding 2017), thereby reducing the distance between a player and their character (Levin 2020).

5.3 Character design - wishful identification

For participants who created characters representing their ideal selves, it was observed that both bleed-in and bleed-out were experienced to a similar degree, corroborating hypothesis 3b. Looking at the open questions for further insights into this result, participants in this condition generally enjoyed the experience of playing a character similar to who they would like to be, while also being able to learn something about themselves. For example, one participant said "[I have experienced this as] positive. A bit of self-searching, taking a step back and realizing I could be myself a bit more at times" (P3, wishful identification), while another reported:

> My character definitely had me thinking about some of the ways I handle situations. While my initial intentions might have been to please the majority of others, I had to step back and think about how my character would handle it in not being a people pleaser. It made me more aware of my everyday situations and made me more confident to say "no" or to do what I needed and not what I thought someone else wanted. (P13, wishful identification)

These examples continue to illustrate how playing a character tied to one's ideal self can make one realize that they have the power to become who they want to be. Adding elements of yourself and someone you wish to be like into a character led to both bleed-in and bleed-out. These players enjoyed the experience and reported personal growth, indicating that wishful identification with a character led to self-reflection and empowerment. We postulate that this may be due to the combination of identifying with the character yet still being able to explore new aspects of one's role and identity in metareflection (Levin 2020).

5.4 Character design – dissimilar to the player

For those who played characters that were dissimilar to themselves, it was found that bleed-out was not significantly stronger than bleed-in. However, when accounting for immersion and self-presence, character types did have a notable effect on bleed-out, explaining 41.2% of the variance. This suggests that characters vastly different from the player can lead to stronger bleed-out as compared to characters that are more similar to the player.

Seeking an explanation for the found effect by looking at the open questions, participants in this condition mentioned they had a hard time connecting to their characters and that it often felt unnatural to play them. However, they often described the experience as a positive one, both giving insights into themselves and strengthening their acting skills. For example, one participant said: "I think this may have helped me a bit with my self-confidence. Even if I did not like the process" (P15, dissimilar to self). While another mentioned:

> [I have experienced this as] absolutely positive - it was an exciting challenge to undertake, to play someone as contrary to myself, and playing a build I find compelling and interesting. Even though [my character] and I have different personalities, and I found his aloof nature sometimes to be aggravating to myself, it built my social and role-playing skills significantly. (P33, dissimilar to self)

This illustrates that, despite participants mentioning they had a hard time connecting to their character, they experienced bleed-out. The difficulty participants found in connecting with their characters did not diminish the positive experiences they had. These descriptions of players' experiences seem to align not just with the Oppositional Self, but also have some of the elements of the Experimental Self as described by S.L. Bowman (2010), mainly in the level of role-playing challenges encountered by these players. Because it is harder to take on the role of the character, immersion and self-presence become more important. When looking at the serial mediation model for bleed-in, it appears that players generally did feel immersed and self-present, despite their reported difficulty getting into character. While research into *D&D* shows that players prefer to play characters reflecting their own personality (Park & Henley 2007), this study shows that the connection to a character in terms of similarity might not be necessary to gain new insights and learn new skills through bleed-out.

Previous research states that when a player plays a character that is similar to themselves, the alibi tends to be weaker, leading to more bleed (Bowman 2013; 2015; Brown et al. 2019). However, this study found that characters with a dissimilar personality from a player's personality can result in experiences of bleed-out. An explanation can be found in Leonard and Thurman's (2018) research, which found that there is limited room for self-regulation, distinguishing thoughts, feelings, and impulses when more cognitive effort is dedicated to taking on the perspective of the character. This could imply that the additional cognitive resources that are needed to portray a dissimilar character might reduce the amount of cognitive resources that are available for self-regulation, making bleed more likely. Furthermore, a stronger alibi could provide a safe space for exploration (Hugaas 2024).

An alternative explanation for the effects of dissimilar characters is that bleed is more easily perceived by the player when the character they play is vastly different from the player's primary identity, following Hugaas' (2024) conceptual model of the bleed perception threshold. The perceived difference between the player's primary identity and the identity of their character can play a role in the experience of bleed, with bigger differences being easier to recognize in a player's perception of bleed. Interestingly, in related work by Holmes et al. (2024), no significant correlation was found between cognitive permeation (akin to bleed) and a player's perceived similarity between their own personality and their character's. This appears to contradict our findings, however in Holmes et al. (2024) the character was not deliberately designed to be similar or dis-

similar to the player, and a general measure of cognitive permeation was used without distinguishing between permeation from the player to the character (bleed-in) and vice versa (bleed-out).

5.5 Limitations and directions for future research

With this study, we provide further insights into the mechanisms underlying bleed and the role of different character designs (in terms of their similarity to the player) on eliciting bleed. However, the study is subject to some limitations that warrant future research, mainly relating to the sample and the validity of the newly created bleed questionnaire.

The participants in this study were largely recruited from the same, although broad, game community without careful balancing regarding age, levels of education, or gender identity. Although analyses of the relationships between immersion, self-presence, and bleed are relatively well-powered as they include the entire sample, the number of participants in each condition is small. As such, the effects of different character types should be interpreted with caution, and there is a need for future research to study these differences in player-character similarity in a more systematic, large-scale manner. We believe that our initial findings, especially combined with the qualitative accounts of players' experiences with different character types, highlight the need for more research in this direction.

At the time of conducting the study, we could not find a way to quantify and measure bleed, and as a result, we created our own measurement instrument. Upon analysis of the newly created measurement for bleed, it turned out that the statements to measure bleed-out showed high validity and that the statements clustered well together. For this half of the measurement, the first attempt at developing a questionnaire to measure bleed was thus considered successful. The statements for bleed-in, however, had questionable validity and did not cluster well together. Important to note is that the measurement was created before Hugaas's (2024) conceptual model for bleed. It can be beneficial for further development of our scale to take this model into account to create a more balanced scale for future research.

In addition, when writing this paper, we discovered the related concept of cognitive permeation along with a questionnaire to measure this (Holmes et al. 2024). The authors of this questionnaire define a similar taxonomy of permeation or bleed types (cognition, emotion, skills, social), and they also distinguish between transfer from player to character and vice versa. Their initial factor analysis indicates that all items can be combined into one measure of permeation or bleed, as we were also originally intending to do. However, in a second study, the authors identify two factors, similar to our factor analysis: one that describes permeation from the character to the player (bleed-out) and one that describes permeation from the player to the character (bleed-in).

Due to the relatively small sample size, our factor analysis should be interpreted with caution, and a more thorough validation of our proposed questionnaire for measuring bleed is needed. However, with two factors, 18 variables, and relatively high factor loadings, the factor analysis should be reliable even with a small sample size (de Winter et al. 2009). In addition, the fact that a similar questionnaire emerged from Holmes et al. (2024) and their second analysis identified similar factors adds further confidence that we have made steps toward measuring bleed (or a similar construct). In future work we aim to join forces to provide one definite and validated measure of bleed or cognitive permeation.

Although we have let participants role-play their character for an extended period, it would be beneficial to carry out quantitative research with multiple moments of measurement to get a more intricate view of how the player-character relationship and bleed develop. The decision of a singular point of measurement was chosen in this research to keep ecological validity intact while lowering the bar for participation. However, as Hugaas (2024) has mentioned, the perception of bleed by the player can differ over time. A player can notice the experience of bleed during play, but then later report something different. It would be beneficial to implement a measurement during play, as well as a measurement later in time, to determine if the experiences

participants mentioned during the experiment linger after they stop playing the character. This will lead to a better understanding of the effectiveness and longevity of the effects of bleed. Furthermore, while we used a personality test to stimulate the creation of a character that shares a certain degree of similarity with the player, we did not follow up with a similarity measurement to see if the character indeed further developed along the same line as players started role-playing the character.

Lastly, bleed is a concept that has mostly been studied in terms of high-player-agency role-playing games like *D&D* and larp. Because the spillover of a character to a player could happen whenever there is a character present in whose point of view the player is immersed, it could be interesting to learn more about the role player agency has in experiencing bleed. By framing the concept in the gaming landscape, and potentially larger within the media landscape, this should help increase the understanding of the concept of bleed and its prerequisites in various contexts.

4. CONCLUSION

This study aimed to investigate how a character's personality design in *D&D* affects the player over an extended period of play. To do so, a new measurement instrument was developed, and an experiment was conducted using this measurement to see how people experience bleed and how their experience is affected by character design. Across the three types of character designs, these results were found: first, while participants playing a character similar to themselves reported feeling vulnerable, they still felt both drawn into the game world (immersion) and aligned with their character's perspective (self-presence), and experienced bleed. For participants within this condition, bleed-in was significantly more present than bleed-out.

Second, participants who created a character's personality by turning their weaknesses into strengths generally reported enjoying playing the character. They experienced immersion, self-presence, and bleed. The amount of bleed-in did not significantly differ from the amount of bleed-out. Third, participants playing a character whose personality was opposite to their own reported having a hard time connecting to their character in terms of role-play. There was no significant difference in the amount of bleed-in and bleed-out experienced. However, when running a model for bleed overall, including immersion and self-presence as mediators, it was found that the more dissimilar a character is from the player (measured in the three degrees of similar, wishful identification, and dissimilar), the higher the amount of bleed-out experienced. Immersion and self-presence levels were consistent across character types.

Furthermore, time spent role-playing the character did not seem to have a significant contribution to the development of bleed, whereas immersion and self-presence did, indicating that bleed is more dependent on immersion and self-presence than on duration. This suggests that experiencing bleed relies more on someone's willingness to immerse and identify with their character than spending a lot of time with the character.

This research contributes to the emerging research field of player-character dynamics in role-playing games by shedding light on how a character's personality design affects the player in the context of bleed. Furthermore, this research presents a first version of a measurement for bleed and provides insight into how this concept relates to immersion and self-presence.

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APPENDICES

Appendix A. Measurements of Questionnaire 1 (Intake and Character Creation)

1. What is your discord name? (this information will be used to connect the answers of this questionnaire to that of the answers on the one after the experiment)

2. For how many years have you played Dungeons & Dragons?
   - <1 year
   - 1-2 years
   - 2-3 years
   - 3-4 year
   - 4-5 years
   - 5-6 years
   - 6-7 years
   - 7-8 years
   - 8-9 years
   - 9-10 years
   - >10 years

3. How many hours a week do you roughly spend playing Dungeons & Dragons?
   - <5 hours
   - 5-10 hours
   - 10-15 hours
   - 15-20 hours

- 20-25 hours
- 25-30 hours
- 30-35 hours
- 35-40 hours
- 40-45 hours
- 45-50 hours
- >50 hours

4. If you had to choose, what aspect do you like best about Dungeons & Dragons?
- The roleplay
- The mechanics

5. How old are you? (please answer in a round number)
- Under 18
- 18-24
- 25-34
- 35-44
- 45-54
- 55-64
- 65-74
- 75 or older

6. What gender do you identify as?
- Male
- Female
- Non-binary/third gender
- Prefer not to say

7. What is your Nationality? (if you have multiple, select the one you associate with most)
- List with nationalities based on country

8. What is your highest completed educational level?
- Less than secondary school
- Secondary school
- Community College (mbo)
- Higher Professional Education (hbo)
- Academic Higher Education - Bachelor (wo)
- Academic Higher Education - Master (wo)
- PhD
- Doctorate
- Other
- Prefer not to say

Appendix B: Character creation instructions

Condition A: Close to self

For this experiment we want you to connect your character to your own personality. In order to do this, we will ask you to fill in the personality test provided on 16personalities.com. If you go to the website, you can take the test if you go to the top-right corner and click take the test.

Once you're done and have a personality type assigned, please go to strengths and weaknesses. For the character creation, please try and use some of these personality traits in the creation of your character. For example: if the test says you're curious, you could make a curious character. You don't need to use all but try to implement at least one strength and weakness.

Condition B: Wishful identification

For this experiment we want you to connect your character to your own personality. In order to do this, we will ask you to fill in the personality test provided on 16personalities.com. If you go to the website, you can take the test if you go to the top-right corner and click take the test.

Once you're done and have a personality type assigned, please go to strengths and weaknesses. For the character creation, please look at weaknesses and choose an attribute you wish you would see more of in yourself. When creating your character, try to implement this. For example: if you want to be more organized, try to make a character that is organized by nature. You don't need to use all given attributes, but try to implement at least one weakness turned into a strength.

Condition C: Far from self

For this experiment we want you to connect your character to your own personality. In order to do this, we will ask you to fill in the personality test provided on 16personalities.com. If you go to the website, you can take the test if you go to the top-right corner and click take the test.

Once you're done and have a personality type assigned, please look at the letters and turn them around according to the following table:

Table 4: Personality types

I	E
N	S
T	F
J	P
A	T

So, for example: if your personality test gives you INTJ-A, you turn it around to ESFP-T. Once you have your new personality type, go to the navigation column at the top of the page to personality types and navigate to your new personality type.

Once you're on the page, please go to strengths and weaknesses. For the character creation, please try and use some of these personality traits in the creation of your character. For example: if the strengths give curious as a strength, you could make a curious character. You don't need to use all but try to implement at least one strength and weakness.

Appendix C. Measurements of Questionnaire 2 (Reflecting on Experiences)

Table 5: Immersion scale

Modifications made to the original Immersive Experience Questionnaire (IEQ) to create the RPG IEQ (changes in bold). Questions marked with * are taken from Green and Brock (2000)		
Original quesion	Modified question	Reasoning
1. To what extent did the game hold your attention?	To what extent did the games overall hold your attention?	
2. To what extent did you feel you were focused on the game?	To what extent did you overall feel you were focused on the games?	
3. How much effort did you put into playing the game?	How much effort did you overall put into playing the game?	
4. Did you feel that you were trying your best?	*Left out*	Without a winning or losing objective, "doing your best" gets a different meaning
5. To what extent did you lose track of time?	*Unchanged*	
6. To what extent did you feel consciously aware of being in the real world whilst playing?	*Unchanged*	
7. To what extent did you forget about your everyday concerns?	*Unchanged*	
8. To what extent were you aware of yourself in your surroundings?	*Unchanged*	
9. To what extent did you notice events taking place around you?	*Unchanged*	
10. Did you feel the urge at any point to stop playing and see what was happening around you?	*Unchanged*	
11. To what extent did you feel that you were interacting with the game environment?	To what extent could you overall picture yourself in the scenes the DM sketched?*	
12. To what extent did you feel as though you were separated from your real-world environment?	*Unchanged*	

13. To what extent did you feel that the game was something you were experiencing, rather than something you were just doing?	*Unchanged*	
14. To what extent was your sense of being in the game environment stronger than your sense of being in the real world?	*Unchanged*	
15. At any point did you find yourself become so involved that you were unaware you were even using controls?	While playing the game, could you easily picture the events in it taking place?*	
16. To what extent did you feel as though you were moving through the game according to you own will?	To what extent did you find yourself thinking of ways the story could have turned out differently?*	
17. To what extent did you find the game challenging?	*Left out*	This is dependent on the session and not a guarantee for more immersion
18. Were there any times during the game in which you just wanted to give up?	Were there any times during the games in which you rather stopped playing?	
19. To what extent did you feel motivated while playing?	*Unchanged*	
20. To what extent did you find the game easy?	*Left out*	This is dependent on the session and not a guarantee for more immersion
21. To what extent did you feel like you were making progress towards the end of the game?	*Left out*	Sometimes games can go by where the characters don't leave a tavern. Progress is too vague a concept in Dungeons and Dragons
22. How well do you think you performed in the game?	*Left out*	Without a winning or losing objective, game performance gets a different meaning
23. To what extent did you feel emotionally attached to the game?	*Unchanged*	
24. To what extent were you interested in seeing how the game's events would progress?	*Unchanged*	

25. How much did you want to "win" the game?	*Left out*	There is no winning or losing objective
26. Were you in suspense about whether or not you would win or lose the game?	*Left out*	There is no winning or losing objective
27. At any point did you find yourself become so involved that you wanted to speak to the game directly?	*Left out*	This is a part of the game mechanics
28. To what extent did you enjoy the graphics and the imagery?	*Left out*	N/A
29. How much would you say you enjoyed playing the game?	*Unchanged*	
30. When interrupted, were you disappointed that the game was over?	When finished, were you overall disappointed that the session was over?	
31. Would you like to play the game again?	*Left out*	Players already play the game on a regular basis

Table 6: Self-presence scale

Modifications made to the original Self-Presence Questionnaire (SPQ) to create the Dungeons and Dragons Self Presence Questionnaire (changes in bold).		
Original quesion	Modified question	Reasoning
1. When using your avatar, do you feel physically close to the objects and other avatars in the game/virtual environment?	When playing your character, do you feel physically close to the objects and other characters in the game?	
2. When playing the game/using the virtual environment, how much do you feel like your avatar is an exten- sion of your body within the game/virtual environment?	*Left out*	More VR related
3. When something happens to your avatar's body, to what extent does it feel like it is happening to any part of your body?	When something happens to your character, to what extent do you emotionally experience that it is happening to you?	

4. When using your avatar, to what extent do you feel like your arm is elongated into the game/virtual envi- ronment through your avatar?	*Left out*	More VR related
5. When using your avatar, to what extent do you feel like you can reach into the game/virtual envi- ronment through your avatar?	When playing your character, to what extent do you feel like you are present in the game environment through your character?	
6. When playing the game/using the virtual environment, to what extent do you feel like your hand is inside of the game/virtual environ- ment?	*Left out*	More VR related
7. When playing the game/using the virtual environment, how much do you feel your avatar is a part of your body?	When playing the game, how much do you feel your charac- ter is a part of you?	
8. When happy events happen to your avatar, to what extent do you feel happy?	When happy events happen to your character, to what extent do you feel happy?	
9. When surprising events happen to your avatar, to what extent do you feel surprised?	When surprising events hap- pen to your character, to what extent do you feel surprised?	
10. When sad events happen to your avatar, to what extent do you feel sad?	When sad events happen to your character, to what extent do you feel sad?	
11. When upsetting events happen to your avatar, to what extent do you feel angry?	When upsetting events hap- pen to your character, to what extent do you feel angry?	
12. When arousing events happen to your avatar, to what extent do you feel aroused?	When arousing events happen to your character, to what extent do you feel aroused?	
13. How much effort did you put into making your avatar's sex clear to others?	How comfortable do you feel playing your character?	The original question is too similar to question 21, and there was still missing a general question about how comfortable the players feel
14. How much effort did you put into making your avatar's race clear to others?	*Left out*	Measuring too similar to question 17

15. How important is it for your profile to portray a specific identity for your avatar?	*Left out*	There are not always profiles in the game
16. How much do you care about the age of your avatar?	How much do you care about the age of your character?	1
17. How much do you care about the race of your avatar?	How much do you care about the race of your character?	
18. To what extent has the experience of using your avatar helped you learn more about your own identity?	*Left out*	Used in the bleed questions
19. To what extent have you customized your avatar to make it look the way it does?	To what extent are you comfortable role-playing the way your character acts?	Putting in questions for the aspects of both appearance and personality, where the original questionnaire had only appearance
20. To what extent does your avatar's appearance represent some aspect of your identity?	To what extent does your character's appearance represent some aspect of your identity?	
21. How much do you care about the sex of your avatar?	How much do you care about the sex of your character?	
22. How much effort did you put into making your avatar's age clear to others?	*Left out*	Measuring too similar to question 16
23. How much do you care about how your avatar looks?	How much do you care about how your character looks?	

Table 7: Bleed scale

Questionnaire for Bleed		
Question	Type of bleed	Subcategory
1. After the session the emotions I felt during the game often lingered	Bleed-out	Emotions
2. Playing my character has helped me feel more comfortable with myself	Bleed-out	Cognitive
3. I sometimes find it hard to separate what other players do and what their characters do	Bleed-in	Social dynamics

4.	I feel like I have to justify which actions are my own and which are my character's when my mood and my character's mood are similar	Bleed-in	Cognitive
5.	I am grateful when other players clarify which actions are their character's and which ones are theirs	Bleed-in	Social dynamics
6.	I started liking a player more because my character likes their character	Bleed-out	Social dynamics
7.	When I start a session with a troubled mindset, this often reflects into my character	Bleed-in	Emotions
8.	I started disliking a player more because of the dislikable character they play	Bleed-out	Social dynamics
9.	When I start a session with a happy mindset, this often gets reflected into my character	Bleed-in	Emotions
10.	My character often holds themselves in a similar way I do (e.g. reacting to problems, the way they hold their own in an argument, the way they walk)	Bleed-in	Behavioral
11.	When my character is troubled I myself notice that I am feeling more under the weather too	Bleed-out	Emotions
12.	When I like a player, my character is quick to like their characters too	Bleed-in	Social dynamics
13.	Playing my character helped me develop myself further in real life (in terms of skills such as confidence, leadership or reading social situations)	Bleed-out	Cognitive
14.	When I act out what I say I am doing (for example through hand movements), I notice I connect more with my character	Bleed-in	Behavior
15.	Playing my character has opened up my eyes in terms of seeing a concept differently	Bleed-out	Cognitive
16.	My characters tend to have the same stance on current political topics (such as LGBTQ rights and environmental issues) as I do	Bleed-in	Cognitive
17.	I notice the way I hold myself changes after playing my character	Bleed-out	Behavioral
18.	When my character is happy, I notice I myself am getting happier too	Bleed-out	Emotions

Maxime Scholte Albers is a lecturer at the University of Amsterdam in the Netherlands. She has a background in Communication Sciences and Media Studies, with a big interest in Psychology. Her research investigates how entertainment media impacts and shapes people's behavior, emotions, and identities, with her current research focusing on Dungeons & Dragons. Next to that, she has an (academically approved) coffee addiction and spends her evenings reading fantasy books.

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