

Avatar Identification and Psychological Ownership of Virtual Items: Key Drivers of Post-Purchase Intention in Online Games

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Received: 8 November 2024 | Revised: 8 February 2025 | Accepted: 17 February 2025

Abstract

Post-purchase behavioral intentions for virtual goods are a critical yet underexplored aspect of the customer journey, particularly in avatar-mediated environments like video games. Building on avatar identification and psychological ownership theories, this study investigates how the perception of key in-game elements—avatars and virtual items—influences consumer satisfaction, repurchase intention, and positive word-of-mouth. We collected and analyzed survey data from 439 online gamers using structural equation modeling. The findings reveal that avatar identification significantly boosts consumer satisfaction, repurchase intention, and word-of-mouth through the psychological ownership of virtual items. These results emphasize the importance of fostering strong associations between players, avatars, and virtual items to encourage post-purchase behaviors. For game developers, focusing on enhancing these associations can lead to increased player retention and revenue.

Keywords

In-Game Post-Purchase; Avatar Identification; Psychological Ownership; Customer Satisfaction; Repurchase Intention; Word-of-Mouth Intention



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Идентификация с аватаром и психологическое владение виртуальными предметами: ключевые факторы повторных покупок в онлайн-играх

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Рукопись получена: 8 ноября 2024 | Пересмотрена: 8 февраля 2025 | Принята: 17 февраля 2025

Аннотация

Поведенческие намерения пользователей после покупки виртуальных товаров являются важным, но малоизученным аспектом клиентского пути, особенно в средах, управляемых аватарами, таких как видеоигры. Опираясь на теории идентификации с аватаром и психологического владения, данное исследование анализирует, как восприятие ключевых игровых элементов (аватаров и виртуальных предметов) влияет на удовлетворенность потребителей, намерение совершить повторную покупку и позитивное сарафанное радио. Мы собрали и проанализировали данные опроса 439 онлайн-игроков с помощью структурного моделирования уравнений. Результаты показывают, что идентификация с аватаром значительно повышает удовлетворенность потребителей, намерение повторной покупки и сарафанный маркетинг через психологическое владение виртуальными предметами. Эти выводы подчеркивают важность формирования прочных связей между игроками, аватарами и виртуальными предметами для стимулирования повторных покупок. Для разработчиков игр усиление этих связей может способствовать увеличению удержания игроков и доходов.

Ключевые слова

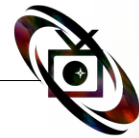
поведение после покупки в игре; идентификация с аватаром; психологическое владение; удовлетворенность потребителей; намерение повторной покупки; намерение рекомендовать



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Introduction

Video games have entertained nearly 3.38 billion players and generated 187.7 billion U.S. dollars in revenue as of 2023, underscoring their significance as a popular entertainment medium and a crucial segment of the global digital economy (Jessica, 2023). Since the business model that permits users to download and play the core functions of a game for free (i.e., “Free to Play”) has been widely embraced in the game industry, considerable industry and academia started to focus on understanding the psychological and behavioral dynamics of gamers’ in-game item consumption (Hamari et al., 2020; Hamari & Keronen, 2017; J. Lee et al., 2015). Researchers have identified various factors that positively influence in-game purchase intention, including individual gaming experiences (e.g., flow and presence; Animesh et al., 2011), intrinsic motivations (e.g., self-presentation desire, mood-regulation, and goal achievement; Bae et al., 2019; Kim et al., 2012; Shukla & Drennan, 2018), social factors (e.g., social identification and social networks; San-Martin et al., 2020; Shukla & Drennan, 2018), game affordances (e.g., interactivity, perceived ease of use, game balance, design aesthetic, and game novelty; Mäntymäki & Salo, 2013; Wang et al., 2022), and value perception (e.g., functional, hedonic, and social value; Davis et al., 2013; Hamari et al., 2020; Hsiao & Chen, 2016; Mäntymäki & Salo, 2013; Tan & Yang, 2022), to name a few.

Although these studies provide valuable insights into why players purchase in-game virtual items, some research emphasizes the greater importance of players’ subsequent behaviors in the post-purchase period (B. Kim, 2012; J. Lee et al., 2015). For instance, the repurchase behavior of existing customers contributes to the profitability of game companies and helps to establish customer loyalty (J. Lee et al., 2015). Positive word-of-mouth regarding purchased virtual items can enhance game companies’ competitiveness by attracting new buyers and retaining existing ones (B. Kim, 2012). However, in contrast to the rich academic attention on the purchase intention during the pre-purchase period, research on the post-purchase period remains relatively scarce (Hamari & Keronen, 2017; J. Lee et al., 2015; W.-T. Wang & Chang, 2014).

Post-purchase behaviors are shaped by how products are used after the purchase (Kuo et al., 2009; Westbrook, 1987). In the gaming world, players engage in various activities such as entertainment, problem-solving, socializing, self-presentation, environmental transformation, and usage of virtual items by manipulating characters that represent themselves, known as avatars (Choi & Kim, 2004; Suh et al., 2011). As a result, the usage and appraisal of virtual items often rely heavily on the presence of avatars, due to the avatar-mediated nature of video games (Nowak & Fox, 2018; Teng et al., 2023). For example, virtual equipment can level up avatar competency to fulfill achievements (Hamari & Keronen, 2017; Park & Lee, 2011), visual costumes personalize the avatar’s appearance facilitating better self-representation (Hamari & Keronen, 2017), and special effects (i.e., animated,



audio, and interactive effects) immerse players in a fantastic world that they could not experience in real life (Shelton, 2010). In this way, virtual item consumption creates a unique scenario where the buyer (the player's actual self) and the user (the player's virtual self or avatar) are distinct entities compared to physical shopping and other types of digital consumption (e.g., e-newspapers, digital music, streaming videos).

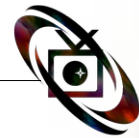
Players often purchase virtual items (e.g., skins, decorations, and equipment) for their favorite avatars, as these characters are seen as an extension of themselves in the game world (Animesh et al., 2011). They frequently describe their purchases with statements like, "I buy new clothes or equipment for my avatar," when showcasing their in-game digital collections on social media. At the same time, game publishers emphasize the "sense of acquisition" when promoting in-game items, encouraging players to display their digital collections to others. These language patterns from both players and publishers suggest that players' perceptions of avatars and virtual items are key to understanding their purchasing behaviors. Therefore, it is crucial to gain a deeper understanding of the connection between players and these two key in-game elements—avatars and virtual items—and the role these connections play in influencing in-game purchase behaviors.

Although several studies have explored the effects of player-avatar associations (i.e., avatar identification, Christoph et al., 2009; Teng, 2019, 2021) and player-item associations (i.e., psychological ownership Tan & Yang, 2022) on in-game purchases separately, the pathway of these associations concerning in-game purchases remains unclear, particularly regarding post-purchase behaviors. Focusing on three key aspects of post-purchase behaviors—customer satisfaction, repurchase intention, and positive word-of-mouth—we propose two research questions to guide our theoretical and empirical investigation:

RQ1. *What are the relationships between avatar identification and the three key aspects of post-purchase behaviors regarding in-game items?*

RQ2. *What role does psychological ownership play in the relationship between avatar identification and the three key aspects of post-purchase behaviors regarding in-game items?*

To answer the above two questions, avatar identification theory (Klimmt et al., 2009; Teng, 2019, 2021) and psychological ownership theory (Pierce et al., 2001; Tan & Yang, 2022) are adopted to understand players' perceptions of two in-game elements (i.e., avatars and items), and their influence on three key post-purchase behavioral intentions: consumer satisfaction, repurchase intention, and word-of-mouth intention (Kuo et al., 2009; Westbrook, 1987). We collected survey data from 439 gamers who had purchased in-game items, including avatar equipment and skins, within the six months preceding their survey responses. Of the 439 valid respondents, 275 (63%) reported frequently purchasing cosmetic items for their avatars, and 226 (51%) indicated regular purchases of avatar equipment. Structural



equation modeling was used to test the main effects, and bootstrapping was used to test the mediation effects.

Theoretically, this study contributes to current literature in four ways. First, this study adds valuable insights to the full corpus of knowledge on consumer behavior in the gaming context by shedding light on customer satisfaction, repurchase intention, and positive word-of-mouth intention in the post-purchase period. Second, this study enriches the nomological network of avatar identification theory by linking it to previously neglected post-purchase behavior. Third, this study extends the avatar-mediated communication framework by incorporating the human-items association (i.e., psychological ownership), showing that the human-avatar association can transfer a positive influence on the human-items association. Fourth, this study reveals that the development of psychological ownership over virtual items may be influenced by the degree of self-investment in the avatar. This finding extends the explanatory power of psychological ownership theory in the context of video games by introducing a novel perspective.

Practically, the findings can enhance game providers' understanding of how in-game elements, such as avatars and virtual items, and their associations (i.e., player-avatar, avatar-virtual item, and virtual item-player), can be designed to improve long-term marketing performance. Additionally, insights from this study can help players and their guardians understand the psychological factors and mechanisms driving continuous in-game item purchasing helping prevent addictive purchasing behaviors and promoting healthier game consumption habits.

The remainder of this paper is structured as follows: Section 2 reviews the two core theories underpinning this study: avatar identification theory and psychological ownership theory. Section 3 outlines the research model and hypotheses. Section 4 details the sample and data collection methods and evaluates the measurement model using confirmatory factor analysis. Structural equation modeling (SEM) is employed to test all direct effects, while bootstrap methods are utilized in a two-stage process to assess indirect effects, including mediation and serial mediation. The results are presented in Section 5, followed by a discussion of key findings and theoretical and practical implications in Section 6. Finally, Section 7 addresses the study's limitations and suggests avenues for future research, and Section 8 provides the conclusion.

Literature Review

Avatar Identification

Media and information system researchers highlight that a unique aspect of video games is their ability to create a computer-simulated environment (Suh et al., 2011). In gaming worlds, players can engage in various activities, such as entertainment, problem-solving, socializing, self-presentation, environmental transformation, and virtual item usage, by manipulating characters that represent themselves, known as avatars (Choi & Kim, 2004). Avatars are digital graphic or virtual models



that players can control and manipulate to represent themselves in the game's virtual spaces (Trepte & Reinecke, 2010). Across different game designs, avatars can be realistic or stylized, anthropomorphic or non-anthropomorphic, 2D or 3D (Trepte & Reinecke, 2010).

Avatars serve as effective mediums for information exchange and communication, assisting players in various aspects of human-computer and human-human interaction (Choi & Kim, 2004; C. Kim et al., 2012; McCreery et al., 2011). As a result, virtual worlds such as video games is conceptualized as a unique form of computer-mediated communication: avatar-mediated communication (Nowak, 2015; Teng et al., 2023). Within avatar-mediated communication, the cognitive and emotional associations between a person and their avatar are referred to as "avatar identification", which is the starting point and a vital component of this communication framework (Teng et al., 2023).

Avatar identification has its theoretical roots in media character identification theory, which explains a cognitive and emotional state in which audiences may experience a merging of their identity with media characters during media exposure (Cohen, 2001). Christoph et al. (2009) and Hefner et al. (2007) extended this cognitive and emotional association between audience and media character to the context of video games, focusing on the particular media character of avatars. They introduced the concept of avatar identification to describe the phenomenon where users view avatars as part of themselves during gameplay, resulting in a temporary shift of their self-concept by adopting (or absorbing) the characteristics perceived in the avatar (Hefner et al., 2007, p. 200; Klimmt et al., 2009).

Depending on the research objectives, previous literature has operationalized avatar identification as either a unidimensional construct or a multidimensional second-order construct (Teng, 2019). For example, Looy et al. (2012) proposed three dimensions of avatar identification: similarity identification, wishful identification, and embodied identification. Similarly, Li et al. (2013) introduced a four-dimensional measurement approach: feelings during play, absorption during play, positive attitudes toward the avatar, and the importance of the avatar to one's self-identity. On the other hand, other researchers use a unidimensional construct approach to operationalize avatar identification (C. Kim et al., 2012; Suh et al., 2011; Wu & Hsu, 2018).

This study primarily focuses on the entirety of avatar identification and its impact on game players' post-purchase behavioral intention. Thus, following previous literature, we adopt a unidimensional construct approach (Teng, 2019), defining avatar identification as the extent to which game players regard their avatar as an extension of their identity (Teng et al., 2023).

Avatar identification has been shown to positively influence in-game purchase intentions (Park & Lee, 2011) and game loyalty (Teng, 2021). Players often purchase decorative items to enhance their avatars' appearance, which enables them to establish and express their ideal self-identity (Jung & Pawlowski, 2014). Extending



this discussion, X. Wang, Butt, et al. (2021) explored the relationship between self-brand connection and perceived value, finding that identification with celebrity avatars increases the perceived consumption value of in-game items, thus further boosting purchase intentions. Moreover, from the perspective of game media affordances, when players experience high levels of avatar identification, they perceive elements in the virtual environment—including virtual items, events, and shared culture—as more authentic, which further promotes in-game purchase intentions (Wu & Hsu, 2018). However, it remains unclear whether this identification with an avatar has a lasting influence on players' psychological and behavioral intentions in the post-purchase period.

Psychological ownership

The theory of psychological ownership originated from studies on employee ownership within organizations (Pierce et al., 2001). Pierce et al. (2001) observed that employees feel a sense of responsibility and belonging to their organization not only through formal ownership (e.g., employee stock ownership) but also, psychological ownership of the organization through their participation and control in their work (Pierce et al., 2001, 2003). Psychological ownership is defined as a state where individuals perceive that an object or part of it is “theirs” (Pierce et al., 2001, 2003; Pierce & Peck, 2018). These target objects can be tangible (e.g., items, spaces, or people) or intangible (e.g., tasks, organizations, digital technology objects, media content, or creative ideas). These objects may or may not be legally owned by the individual (H. Kim et al., 2024; Pierce et al., 2001). The theory of psychological ownership primarily addresses core questions such as “What is psychological ownership?”, “What motivates individuals to develop psychological ownership?”, “How does psychological ownership occur?”, and “What are the effects of psychological ownership?” (Pierce & Peck, 2018).

Psychological ownership arises from three motivations: efficacy and effectance (desire to feel effective and in control), self-identity (express and define one's identity), and having a place (need for a personal space) (Pierce et al., 2001). It develops through three routes: controlling the target, intimately knowing it, and investing oneself in it. Control allows individuals to manipulate and shape the target, intimate knowledge fosters a deeper connection, and personal investment embeds part of the individual's identity into the target (Pierce et al., 2001). Though initially derived from organizational behavior studies, the theory of psychological ownership has been applied and developed in consumer behavior research since 2019 (H. Kim et al., 2024), particularly in digital markets and media consumption contexts. Studies have found that individuals can establish psychological ownership of various digital objects, such as music streaming services (Sinclair & Tinson, 2017), social media platforms (Karahanna et al., 2015; Zhao et al., 2016), access-based consumption (e.g., Airbnb; J. Li et al., 2024), augmented reality technology (Yuan et al., 2021), online advertisements (Aguirre et al., 2015), and also video games (Moon et al., 2013; Tan & Yang, 2022).



In addition, psychological ownership has been shown to positively affect various consumer behaviors, such as transaction intentions, word-of-mouth communication, brand engagement, and purchase intentions (H. Kim et al., 2024; C. Kirk et al., 2015). In the context of video games, Moon et al. (2013) found that when players experience a sense of ownership over their avatar, they demonstrate greater responsibility, care, and stewardship toward that avatar, leading to increased loyalty to the online game. Tan and Yang (2022) explored the formation of psychological ownership of in-game items and its contribution to overall game enjoyment, finding that intimate knowledge significantly influences players' sense of psychological ownership (Pierce et al., 2001; Tan & Yang, 2022). However, Tan and Yang (2022)'s study did not confirm a noticeable impact of self-investment on psychological ownership. This challenges the traditional psychological ownership theory, which posits that self-investment is a crucial path to fostering psychological ownership (Pierce et al., 2001). To address this inconsistency, our study suggests that the self-investment route to psychological ownership may be influenced by the avatar-mediated communication nature of game context.

Research model and Hypotheses development

Based on avatar identification theory and psychological ownership theory, we developed a research model to examine the effect of avatar identification on both intrapersonal and interpersonal aspects of post-purchase intentions (i.e., customer satisfaction, repurchase intention, and positive word-of-mouth intention) and the underlying psychological mechanisms of this effect (see **Fig. 1**).

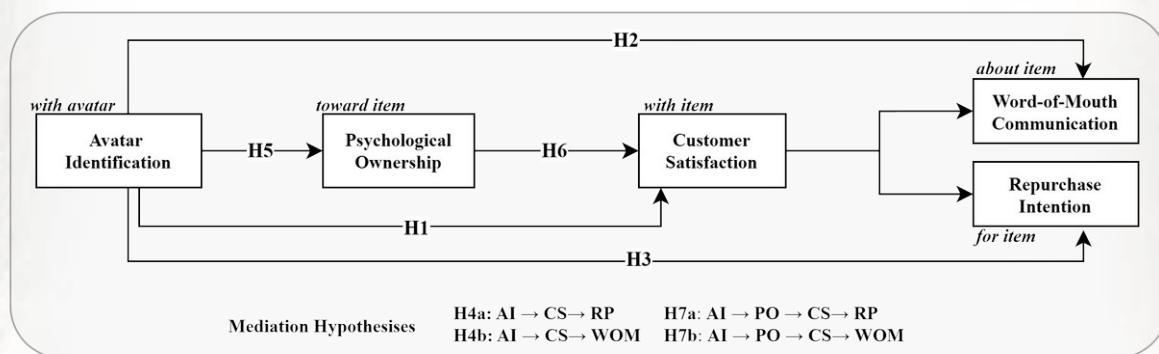


Figure 1. Theoretical Framework

Avatar Identification, Customer Satisfaction, Repurchase Intention, and Positive Word-of-Mouth

Avatar identification influences how individuals perceive and evaluate in-game items, ultimately contributing to greater satisfaction. First, avatar identification automatically transfers the perceived value of virtual items from the avatar



to the player. As suggested by previous literature, the various added values of in-game items for avatars crucially influence players' purchase intentions. Functional value enhances avatar competency, social value increases avatar visual authority, and hedonic value derives from aesthetic enjoyment of the avatar (Marder et al., 2019; Park & Lee, 2011). According to avatar identification theory, players who identify with their avatars will place themselves in the avatar's position, experiencing the media content as if the events happening to the avatar were happening to themselves (Looy et al., 2012). Following this reasoning, players who identify with their avatars are likely to feel that the value added to the avatar through item usage is also experienced by them. In this way, the improvement of the avatar's competency becomes an improvement in their own abilities and competitiveness, the attainment of the avatar's visual authority as an elevation of their own social status within the game, and the increase in the avatar's aesthetic elements as an enhancement of their own attractiveness. Second, avatar identification also strengthens players' perception of the authenticity of virtual items (Wu & Hsu, 2018). This perception of authenticity, derived from avatar identification, will, to some extent, further facilitate the transfer of added value (e.g., abilities, aesthetics, or attractiveness) in a more genuine manner. Third, avatar identification may deepen satisfaction with in-game items by reducing information uncertainty. As avatar identification increases, players perceive the avatar as an effective tool for conveying product information, supporting their ability to evaluate product details more effectively (Suh et al., 2011). The greater the details about in-game items obtained, the higher players' confidence that an in-game item will match their expectations of the product (Changchit & Klaus, 2020).

In addition, identity literature also provides evidence of the positive relationship between avatar identification and customer satisfaction of in-game items. According to the literature on identity-based motivation in consumer behavior, when stimuli become associated with a positively regarded identity, those stimuli will automatically receive more positive evaluations (Reed et al., 2012). When players strongly identify with their avatars, they will develop a positive attitude toward the avatar, which represents their identity (D. D. Li et al., 2013). Hence, in-game items that add value to the avatar will inherently receive higher levels of customer satisfaction, as this satisfaction reflects post-purchase evaluation motivated by identity (Mano & Oliver, 1993).

In summary, avatar identification offers a direct, authentic, and effective way for players to consume, experience, and evaluate in-game items, implicitly transferring a positive attitude towards these items. This, in turn, increases the likelihood of player satisfaction with purchased in-game items. Hence, this leads to the following hypothesis:

Hypothesis 1: Avatar identification has a positive effect on game players' satisfaction with purchased in-game items.



After purchasing and consuming in-game items, players may engage in continuance behaviors based on their post-purchase ownership, usage, and evaluation (Westbrook, 1987). Positive post-purchase intention can lead to long-term business success and sustainable development, which are critical goals for game companies. For instance, positive word-of-mouth intention reduces game companies' marketing costs and repurchase behavior results in higher player retention rates (B. Kim, 2012; W.-T. Wang & Chang, 2014). In this study, we focus on players' intentions to repurchase and recommend in-game items through positive word-of-mouth to capture both intrapersonal and interpersonal behavioral intentions in the post-purchase stage (Kuo et al., 2009). Repurchase intention refers to the player's intention to purchase virtual items in the same game again in the future based on their positive post-purchase usage experience (B. Kim, 2012; J. Lee et al., 2015). Positive word-of-mouth intention refers to the informal sharing of players' positive evaluations of in-game virtual items with other potential consumers (B. Kim, 2012; Westbrook, 1987).

Repurchase intention is influenced by past purchase experience and post purchase usage (Kuo et al., 2009). Players who strongly identify with their avatars are more inclined to create a unique and positive avatar image (Teng, 2019). They will value in-game items higher than others and purchase again, since many virtual items are designed to add value to the avatar such as character competency, aesthetics, or visual authority value (Park & Lee, 2011). Furthermore, avatar identification represents an emotional and cognitive attachment between avatars and their users (Cohen, 2001; D. D. Li et al., 2013; Suh et al., 2011). Players who strongly identify with their avatars are more willing to continue purchasing in-game items to demonstrate their dedication to their avatars and maintain their attachment (Marder et al., 2019). Hence, this leads to the following hypothesis:

Hypothesis 2: Avatar identification will positively influence game players repurchase intention for in-game items.

An important determinant of word-of-mouth is the user's desire to gain external attention, recognition, or status by sharing their purchase experience with others (Westbrook, 1987). In the video game context, the desire for self-presentation that motivates players to purchase in-game items is positively affected by avatar identification (Chen & Chen, 2022; H.-W. Kim et al., 2012; Shang et al., 2012; Takano & Taka, 2022). Thus, word-of-mouth communication can fulfill individuals' self-presentation needs in a positive way (E. W. Anderson, 1998; Goffman, 2023). Therefore, when players identify with their avatars, they are more motivated to communicate with other players about in-game items that can enhance their merged identity. In other words, by conveying messages about the higher abilities, social status, and attractiveness that in-game items bring to their merged identity, players actively engage in social comparison to achieve higher self-esteem. Hence, this leads to the following hypothesis:



Hypothesis 3: Avatar identification will positively influence game players' positive word-of-mouth intention about in-game items.

Mediating Role of Customer Satisfaction

Research in the marketing and information systems fields noted that customer satisfaction is a strong predictor of users repurchase intention and positive word-of-mouth intention (E. W. Anderson, 1998; Yi & La, 2004). In a study of multi-user social virtual worlds (e.g., Second Life and Cyworld), B. Kim (2012) found that user satisfaction positively affects repurchase and recommendation intention on digital items. Since these social-oriented virtual worlds rely on avatars to represent users and sell digital items as video games do, we propose that in video games, customer satisfaction will also positively influence both positive word-of-mouth intention and repurchase intention. W.-T. Wang & Chang (2014) also confirmed that higher levels of satisfaction with virtual products lead to a greater likelihood of customers purchasing these products again, from the perspective of expectancy disconfirmation.

This study argues that the positive influence of avatar identification on repurchase behavior and positive word-of-mouth is strongly dependent on customer satisfaction. If players are not satisfied with in-game items, they will not develop the belief that these items can add extra value and advantages to their merged identity. Consequently, repurchase intention will be reduced as the items become meaningless to them, and word-of-mouth will be diminished, as it would undermine and detract from their perceived elevated social status. Hence, this leads to the following hypothesis:

Hypothesis 4a: Game players' satisfaction with purchased in-game items will mediate the relationship between avatar identification and repurchase intention.

Hypothesis 4b: Game players' satisfaction with purchased in-game items will mediate the relationship between avatar identification and positive word-of-mouth intention.

Avatar Identification and Psychological Ownership

According to psychological ownership theory, there are three primary routes to developing a sense of ownership: controlling the target, intimately knowing the target, and investing oneself into the target (Pierce et al., 2001). This study posits that avatar identification can facilitate these three routes to psychological ownership of in-game items within the game environment.

First, avatar identification enhances players' perceived controllability over in-game items. When players identify with their avatar, they perceive it as an extension of themselves (Suh et al., 2011; Teng et al., 2023). This self-perception is reflected in their language, where players refer to their avatar's actions and surroundings using personal pronouns like "I" and "here" (Looy et al., 2012; Teng et al., 2023). For instance, players might say, "I pick it up," "I wear it," or "I explore this virtual land," thereby directly linking their actions to the avatar. This identifica-



tion enhances the perceived controllability over in-game items, making interactions more direct and personal. Furthermore, players with high avatar identification experience greater levels of telepresence and flow within the game (Liao et al., 2019; Soutter & Hitchens, 2016; Teng, 2019). This heightened engagement leads to a more vivid and authentic experience of manipulating and controlling virtual items (Y. Lee & Chen, 2011; Wu & Hsu, 2018). In summary, higher levels of avatar identification make players feel that controlling virtual objects through their avatar is equivalent to controlling them personally, blurring the boundary between the player and the avatar.

Second, players who are highly identified with their avatar may have more opportunities and be more successful in acquiring intimate knowledge of in-game items. On the one hand, avatar identification has been proven to be positively related to users' time spent playing (Kao et al., 2022), game loyalty (Teng, 2019, 2021), and in-game engagement (Turkay & Kinzer, 2014). This indirectly provides more opportunities for players to inspect, consume, and deeply experience in-game items, especially when the utilization of items is highly related to the avatar itself (e.g., decorations and virtual weapons). On the other hand, avatar identification makes the acquisition of information about in-game items more effective. For example, avatar identification can improve users' perceived diagnosticity (i.e., the ability of virtual avatars to provide useful information and assistance in specific situations) in the virtual space (Suh et al., 2011). This indicates that when avatar identification occurs, the avatar becomes an effective tool for conveying product information, helping players better evaluate the quality, functionality, and utility of in-game virtual items. In summary, the higher the level of avatar identification, the more likely players are to learn intimate knowledge about in-game items.

Third, avatar identification increases players' perceived investment of self into in-game items by merging two associations (i.e., the "avatar-items association" and the "self-items association") into one. Studies have shown that avatar identification heightens players' self-presentation desire (Takano & Taka, 2022), and this desire can be gratified through purchasing in-game items (Chen & Chen, 2022; H.-W. Kim et al., 2012). Therefore, if a game setting significantly enables players to create and modify their avatars for desirable self-presentation (i.e., avatar customization), players will identify more strongly with their avatars (Teng, 2019). Furthermore, avatar identification theory suggests that the identification process is marked by internalizing the features, values, emotions, and points of view they perceive from their avatar (Klimmt et al., 2009; D. D. Li et al., 2013). Consequently, the avatar, together with in-game items, will be internally merged into the player's identity. In other words, as avatar identification increases, in-game items will become more relevant to the player's identity. According to psychological ownership theory, the investment of a player's time, emotion, energy, values, and identity allows them



to see their reflection in the in-game items, fostering a sense of psychological ownership (Pierce et al., 2001).

In summary, avatar identification enhances players' perceived controllability, intimate knowledge, and self-investment in in-game items, which are critical routes to developing psychological ownership. This leads to the following hypothesis:

Hypothesis 5 Avatar identification has a positive effect on game players' psychological ownership over purchased in-game items.

Mediating Role of Psychological Ownership

Psychological ownership may be one underlying mechanism through which avatar identification affects customer satisfaction for at least three reasons. First, avatar identification leads individuals to feel that the avatar is part of their self-concept (Klimmt et al., 2009; Looy et al., 2012). It has also been shown to result in psychological ownership of the avatar per se (Moon et al., 2013; Teng, 2019). In an avatar-mediated communication environment, the consumption and utilization of virtual items heavily relies on the presence of the avatar. Hence, in-game items, together with the avatar, are integrated into one's self-concept as a combined entity during avatar-mediated interactions and utilization. Since individuals who strongly identify with their avatar also psychologically own it, this integration further creates a sense of psychological ownership over the combined entity. Consequently, satisfaction with in-game items stems from both identity-triggered and psychological ownership-based evaluations (D. Li & Atkinson, 2020; Reed et al., 2012), with a significant portion of psychological ownership of virtual items stemming from identification with the avatar.

Second, psychological ownership and customer satisfaction may both be influenced by avatar identification due to shared underlying factors. For example, the comprehensive information about virtual items enhanced by avatar identification may lead to both intimate knowledge and uncertainty reduction (Changchit & Klaus, 2020; Suh et al., 2011). These factors, in turn, serve as shared antecedents of both psychological ownership and customer satisfaction.

Third, according to the endowment effect, people tend to assign higher value to items when they feel a sense of psychological ownership over them (C. Kirk et al., 2015; Shu & Peck, 2011), especially for identity-associated items (e.g., social identity; Dommer & Swaminathan, 2013). Hence, this leads to the following hypothesis:

Hypothesis 6: Game players' psychological ownership over purchased in-game items will mediate the relationship between avatar identification and customer satisfaction.

Serial Mediating Role of Psychological Ownership and Customer Satisfaction

Based on the discussion of Hypotheses 1 through 6, a clear sequential mediation path exists through psychological ownership and customer satisfaction



between avatar identification and positive continuance behaviors (i.e., repurchase intention and positive word-of-mouth intention). When avatar identification triggers a sense of psychological ownership over in-game items, it establishes a human-avatar-item association. As a result, when evaluating their in-game possessions, individuals view them from a personal perspective, thinking, “This avatar is me, these items are my belongings, and together they represent who I am.” Subsequently, identity and ownership cues contribute collectively to a positive attitude during the cognitive and emotional evaluation of in-game items, resulting in increased satisfaction. Finally, this satisfaction leads to both repurchase intention and positive word-of-mouth intention for identity-related reasons. These reasons include enhancing one’s identity through desired added value and engaging in social comparisons of one’s identity through word-of-mouth. Hence, this leads to the following hypothesis:

Hypothesis 7a: The relationship between avatar identification and repurchase intention is serially mediated by game players’ psychological ownership and satisfaction.

Hypothesis 7b: The relationship between avatar identification and positive word-of-mouth intention is serially mediated by game players’ psychological ownership and satisfaction.

Method

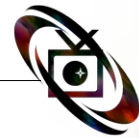
Sample and data collection

Given that this study aims to investigate how current psychological states (i.e., avatar identification and psychological ownership) influence attitudinal responses (i.e., customer satisfaction, positive word-of-mouth, and repurchase intention), a cross-sectional design was adopted. All focal latent variables are measured using only established scales.

Data collection was conducted via an online survey. Initially, 25 university student gamers were administered a pilot test to identify and rectify any ambiguities in the questionnaire based on their feedback. The refined questionnaire was then disseminated through “sojump”, an online survey platform. Participants were recruited from various gaming groups on WeChat, a virtual community where players exchange game-related information and experiences. Respondents were compensated with 1 RMB as a token of appreciation upon completing the survey.

The survey was conducted in August 2023 reaching 910 gamers. Screening questions (e.g., “Have you purchased in-game virtual items in the last three months?”) filtered out those who hadn’t recently made in-game purchases, resulting in 710 initial responses. After further screening for short attention times, incomplete answers, and missing information, 439 valid questionnaires were retained, yielding a valid response rate of 48%.

As shown in **Table 1**, among the valid respondents, 71.1% were male, and 28.9% were female, with ages primarily ranging from 18 to 25 years old (83%, 365 respon-



dents). Most participants had an undergraduate education level or higher (82%, 360 respondents). Regarding gaming habits and spending, 44.3% (204 respondents) reported daily gaming time of 1-3 hours, followed by 26.1% (120 respondents) with 0.5-1 hour. Monthly disposable income was mainly between 1000-2000 RMB (26.2%, 121 respondents) and 2000-3000 RMB (26.0%, 120 respondents). Most respondents spent less than 100 RMB per month on games (27.8%, 128 respondents), followed by 100-200 RMB (20.4%, 94 respondents).

Table 1. Sample description

Variable	Categories	Frequency	Variable	Categories	Frequency
Gender	Male	71% (312)	Daily Gaming Time (Hours)	<0.5	6% (28)
	Female	29% (127)		0.5-1	27% (120)
Education	Middle school or below	0% (0)		1-3	46% (204)
	High school	6% (25)		>3	20% (87)
	Undergraduate	76% (333)		<1000	5% (23)
	Graduate and above	18% (81)		1000-2000	28% (121)
Age	<18	2% (8)	2000-3000	27% (120)	
	18-25	83% (365)	3000-4000	18% (77)	
	26-30	10% (42)	4000-5000	8% (36)	
	31-40	5% (23)	5000-6000	4% (18)	
	40-50	0.002% (1)	6000-7000	3% (11)	
Occupation	Corporate Employee	14% (61)	7000-8000	1% (4)	
	Student	77% (340)	8000-9000	2% (7)	
	Public Servant	1% (6)	9000-10000	1% (3)	
	Freelancer	7% (32)	>10000	4% (19)	
	Gaming Device	Mobile Games	79% (346)	<100	29% (128)
Web games		17% (75)	100-200	21% (94)	
PC Games		57% (252)	200-300	18% (77)	
Console Games		14% (63)	300-400	9% (38)	
Handheld Games		12% (54)	400-500	9% (38)	
Frequent Purchase Items Type	Cosmetics	75% (328)	500-600	5% (21)	
	Equipment	63% (275)	600-700	2% (7)	
	Game Characters	51% (226)	700-800	1% (5)	
	Loot Box	38% (167)	>800	7% (31)	

Regarding gaming devices, mobile gaming was the most prevalent (75.1%, 346 respondents), followed by PC gaming (54.7%, 252 respondents), web games (16.3%, 75 respondents), console games (e.g., PS5/XBOX) (13.7%, 63 respondents), and handheld games (e.g., Switch) (11.7%, 54 respondents). The most popular types of purchased virtual items were cosmetic items (e.g., skins/effects) (71.2%, 328 respondents), followed by equipment and tools (e.g., weapons) (59.7%, 275 respondents), in-game characters (49.0%, 226 respondents), and random items such as loot boxes



(36.6%, 169 respondents). Furthermore, 84% (370 respondents) reported participating in in-game social activities.

Measurement

In this study, established scales from previous research were adopted to measure five focal constructs: avatar identification (5 items), psychological ownership (3 items), customer satisfaction (3 items), repurchase intention (3 items), and positive word-of-mouth intention (4 items). Respondents were asked to rate their agreement with each item using a Likert scale ranging from 1 (totally disagree) to 7 (totally agree).

The scale measuring avatar identification was adopted from Wu & Hsu (2018) and Suh et al. (2011), which was initially adapted from brand identification scales (He et al., 2012). The scale measuring psychological ownership was adopted from Tan & Yang (2022) and Peck & Shu (2009). The scale measuring customer satisfaction was adopted from W.-T. Wang & Chang (2014). The scale measuring repurchase intention was adopted from W.-T. Wang & Chang (2014) and Rezaei & Ghodsi (2014). The scale measuring positive word-of-mouth intention was adopted from Rezaei & Ghodsi (2014) and Srinivasan et al. (2002).

Table 2 lists all 18 study items, with certain measures adapted to suit the context of in-game item purchases. According to previous literature focusing on the antecedents of in-game purchase intention, gamers' gender, education level, daily gaming time, and monthly game expenditure were controlled (Hsiao & Chen, 2016; H.-W. Kim et al., 2012; Mäntymäki & Salo, 2013; Teng, 2017; L. Wang et al., 2022). We do not incorporate age as a control variable mainly for two reasons. First, many respondents in our sample are "Generation Z", ranging from 18-30 years old (93%). We believe players in this age range may share a similar digital culture (both internet and gaming), especially compared to older people. Second, previous literature found no significant difference in the influence of age on in-game purchase behavior (Teng, 2017; L. Wang et al., 2022).

Model analysis method

This study uses self-report data and scales to measure all the focal latent variables. A two-stage structural equation modeling (SEM) approach is suggested to ensure valid measurements of the constructs before causal inferences in the structural relationships (J. C. Anderson & Gerbing, 1988). Following this approach, this study first tested the measurement model by performing confirmatory factor analysis (CFA) and then examined the relations of the constructs we hypothesized by performing a structural model.

Psychometric properties the measures

This study uses the Lavaan package within the R statistical environment to perform the Confirmatory Factor Analysis (CFA) (Rosseel, 2012), testing instrument reliability and validity (i.e., convergent and discriminant validity). Maximum likelihood (ML) estimation was used for model fitting and parameter estimation.



Table 2 shows the results of confirmatory factor analysis (CFA). The chi-square statistic is 387.053 with 125 degrees of freedom ($p < .001$). Key fit indices meet standard thresholds: the Comparative Fit Index (CFI) is 0.949 and the Tucker-Lewis Index (TLI) is 0.938 (both > 0.90), the Root Mean Square Error of Approximation (RMSEA) is 0.069 (90% CI: [0.061, 0.077], < 0.08), and the Standardized Root Mean Square Residual (SRMR) is 0.038 (< 0.05). Additional indices, including the Normed Fit Index (NFI) at 0.927, the Incremental Fit Index (IFI) at 0.949, the Goodness-of-Fit Index (GFI) at 0.905, and the Relative Fit Index (RFI) at 0.911, all exceed 0.90, supporting good fit. The chi-square to degrees of freedom ratio (χ^2/df) is 3.10, within the acceptable benchmark of 5. Overall, the CFA results suggest the model fits the data well (Kline, 2016).

Construct reliability is assessed using Cronbach's alpha, Average Variance Extracted (AVE), and Composite Reliability (CR) as shown in Table 2. The Cronbach's alpha values are 0.887 [95% CI: 0.866, 0.906] for Avatar Identification, 0.819 [95% CI: 0.766, 0.861] for Psychological Ownership, 0.904 [95% CI: 0.882, 0.921] for Word-of-Mouth, 0.858 [95% CI: 0.823, 0.885] for Repurchase Intention, and 0.814 [95% CI: 0.772, 0.849] for Customer Satisfaction. All alpha values exceed the acceptable threshold of 0.70 (Nunnally, 1978) and most confidence intervals are tight, indicating precise estimates (Iacobucci & Duhachek, 2003). This demonstrates that the scales used in our study achieve strong internal consistency reliability. Further, Composite Reliability (CR) and AVE were also examined to achieve more accurate reliability measures for latent variables used in a structural equation model (SEM) (Fornell & Larcker, 1981). The results showed that for each set of indicator variables of all constructs, CR exceeded the generally acceptable level of 0.70 ($0.818 < CR < 0.904$), and all AVE values exceeded the generally acceptable level of 0.50 ($0.598 < AVE < 0.704$), thus establishing reliability (Fornell & Larcker, 1981).

Table 2. Summary of confirmatory factor analysis

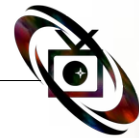
Construct-Item	M	SD	λ	α	C.I. of α	CR	AVE
avatar identification	4.473	1.296		0.887	[0.866 0.906]	0.889	0.613
AI1: When someone criticizes my in-game avatar, it feels like a personal insult.	4.333	1.705	0.760				
AI2: I am very interested in what others think about my in-game avatar.	4.547	1.666	0.775				
AI3: My in-game avatar's successes are my successes.	4.690	1.610	0.780				
AI4: When someone praises my in-game avatar, it feels like a personal compliment.	4.510	1.581	0.791				
AI5: If a story in the media criticized my in-game avatar, I would feel embarrassed.	4.287	1.664	0.810				



Psychological ownership	5.433	1.087		0.819	[0.766 0.861]	0.819	0.601
PO1: I feel like these in-game virtual items are mine.	5.499	1.373	0.792				
PO2: I feel a very high degree of personal ownership for these in-game virtual items.	5.314	1.407	0.722				
PO3: I feel like I own my in-game virtual items.	5.487	1.279	0.817				
word-of-mouth	4.726	1.299		0.904	0.882 0.921]	0.904	0.704
WOM1: I tell others positive things about the virtual items in this game.	5.048	1.548	0.839				
WOM2: I recommend the virtual items in this game to anyone who seeks my advice.	4.768	1.564	0.851				
WOM3: I encourage my friends to purchase virtual items in this game.	4.474	1.753	0.832				
WOM4: I do not hesitate to refer my acquaintances to the virtual items in this game.	4.615	1.798	0.836				
Repurchase intention	5.087	1.172		0.858	[0.823 0.885]	0.859	0.669
RP1: I intend to buy in-game items again in the future to decorate my character or enhance its abilities.	5.132	1.413	0.830				
RP2: I have a strong willingness to buy in-game items again.	4.907	1.394	0.804				
RP3: The likelihood of me buying in-game items again is high.	5.221	1.422	0.819				
Customer satisfaction	5.027	1.089		0.814	[0.772 0.849]	0.818	0.598
CS1: I am satisfied with the quality of the in-game items and associated services.	5.219	1.344	0.810				
CS2: Given their prices, I am pleased with the in-game items.	4.667	1.546	0.729				
CS3: The in-game items I use have met my expectations.	5.194	1.243	0.795				

Note. SD. denotes standard deviation; λ denotes standardized factor loadings; α denotes Cronbach's α ; CR denotes composite reliability; AVE denotes Average Variance Extracted

Regarding construct validity, discriminant and convergent validity are assessed using the criteria by Fornell & Larcker (1981). Table 2 shows all the calculations



required to examine discriminant validity. First, all indicators' standardized factor loadings were significant and exceeded 0.70. Second, all composite reliabilities exceeded 0.80. Third, the average variance extracted (AVE) for each construct was greater than the variance due to measurement error ($AVE > 0.50$). Therefore, convergent validity is confirmed (Fornell & Larcker, 1981). Further, the elements in Table 3 indicate that the square roots of the AVEs for each construct (i.e., the diagonal elements, with the lowest being 0.773 for customer satisfaction) are higher than the squared correlations between any pair of constructs (i.e., the off-diagonal elements, with the largest being 0.666 for the squared correlation between repurchase intention and customer satisfaction). Therefore, discriminant validity among all the independent constructs is confirmed (Fornell & Larcker, 1981).

Table 3. Correlations among the study constructs

	Mean	SD	1	2	3	4	5
1. Avatar Identification	4.473	1.320	0.783				
2. Psychological Ownership	5.433	1.088	0.237	0.775			
3. Word-of-Mouth	4.726	1.299	0.501	0.369	0.839		
4. Repurchase Intention	5.087	1.173	0.448	0.507	0.609	0.818	
5. Customer Satisfaction	5.027	1.088	0.408	0.465	0.636	0.666	0.773

Note. The off-diagonal elements are the squared values of each element of the latent correlation matrix. The diagonal elements are the square root of the average variance extracted (AVE)

Since this study uses self-report surveys for data collection, which may cause common method bias. We perform a CFA for Harman's single-factor test technique suggested by Malhotra et al. (2006). The poor fit indices ($CFI = 0.766$, $TLI = 0.734$, $RMSEA = 0.143$, $SRMR = 0.083$) and the significant chi-square test ($\chi^2(135) = 1342.536$, $p < 0.001$) of the single-factor model suggest the hypothesized model does not fit the data well. Hence, common method biases are not assumed to be substantial (Malhotra et al., 2006; Podsakoff et al., 2017).

Result

Assessment of the structural model and main effect hypotheses

This study used the Lavaan package within the R statistical environment to perform the structural equation modeling (SEM) (Rosseel, 2012). Maximum likelihood (ML) estimation was employed for model fitting and parameter estimation. All constructs are modeled as first-order. The chi-square statistic is 564.742 with



191 degrees of freedom ($p < .001$). The Comparative Fit Index (CFI) is 0.929, and the Tucker-Lewis Index (TLI) is 0.916, exceeding the threshold of 0.90. The Root Mean Square Error of Approximation (RMSEA) is 0.067 (90% CI: [0.060, 0.073]), which is below the recommended threshold of 0.08, and the Standardized Root Mean Square Residual (SRMR) is 0.081, close to the acceptable threshold of 0.08. The chi-square to degrees of freedom ratio (χ^2/df) is 2.96, within the acceptable range. Overall, the model demonstrates an acceptable fit to the data (Kline, 2016).

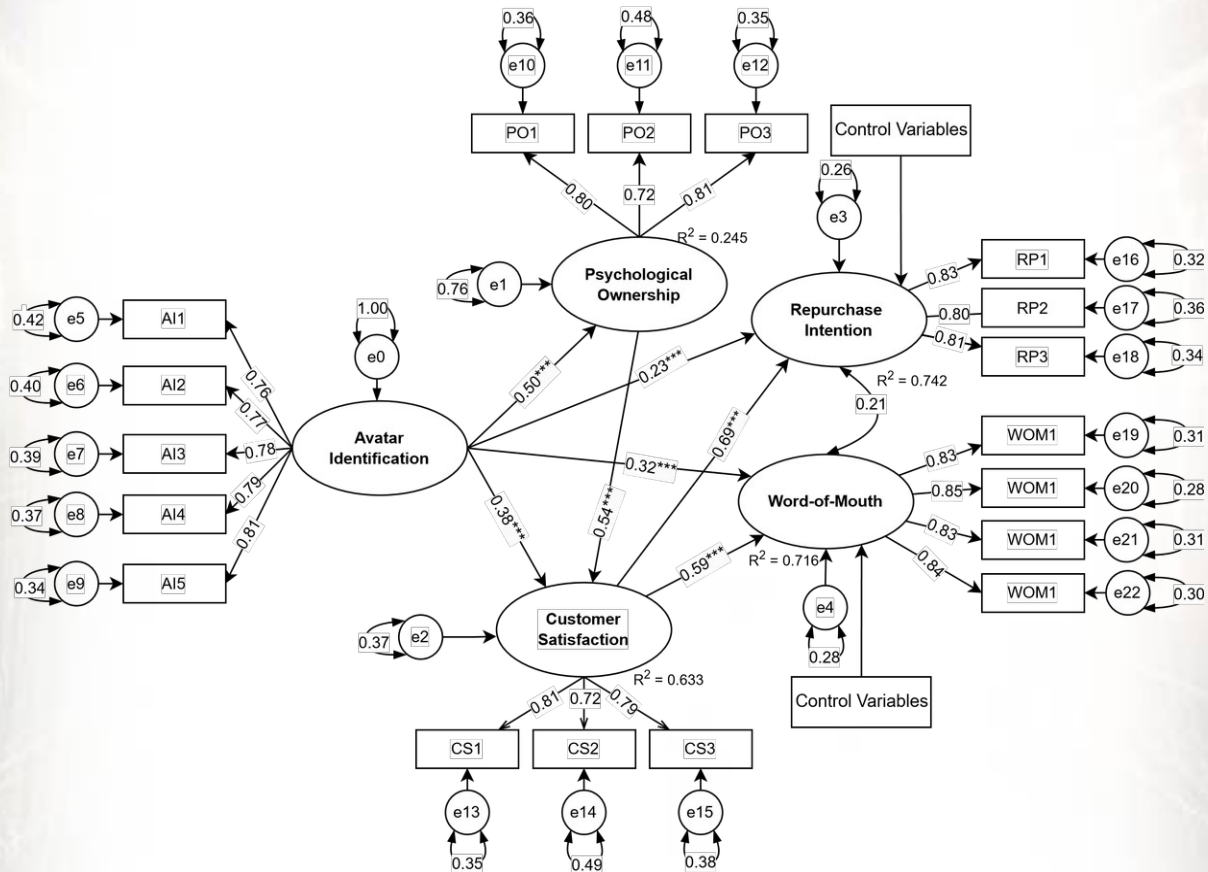


Figure 2. SEM model and main effects

Note. Path coefficients are standardized (std.all), *** $p < 0.001$.

As presented in Fig. 2, avatar identification had a positive effect on game players' customer satisfaction with purchased in-game items (standardized path coefficient = 0.378, SE = 0.044, $p < 0.001$), supporting H1. Avatar identification was positively related to repurchase intention for in-game items (standardized path coefficient = 0.228, SE = 0.049, $p < 0.001$), supporting H2. Avatar identification was positively related to positive word-of-mouth intention about in-game items (standardized path coefficient = 0.322, SE = 0.052, $p < 0.001$), supporting H3. Avatar identification had a positive effect on game players' psychological ownership over purchased in-game items (standardized path coefficient = 0.495, SE = 0.048, $p < 0.001$), supporting H5.



Regarding the control variables, gender was not significantly related to positive word-of-mouth intention (standardized path coefficient = -0.031, SE = 0.095, $p = 0.349$) and repurchase intention (standardized path coefficient = 0.022, SE = 0.090, $p = 0.525$), indicating no significant difference based on gender. Education level was not significantly related to positive word-of-mouth intention (standardized path coefficient = 0.025, SE = 0.057, $p = 0.434$), but it was positively associated with repurchase intention (standardized path coefficient = 0.100, SE = 0.054, $p = 0.004$). Daily gaming time was not significantly related to positive word-of-mouth intention (standardized path coefficient = -0.052, SE = 0.055, $p = 0.145$), nor to repurchase intention (standardized path coefficient = 0.052, SE = 0.052, $p = 0.161$). Monthly game expenditure was positively related to positive word-of-mouth intention (standardized path coefficient = 0.108, SE = 0.017, $p = 0.002$) and repurchase intention (standardized path coefficient = 0.072, SE = 0.016, $p = 0.049$).

Assessment of the mediation and serial-mediation hypotheses

As suggested by methodology literature, we use a two-stage workflow to examine the mediation and serial-mediation hypotheses (Cheung & Cheung, 2024). In the first stage, the same structural model (Fig.2) was estimated using *lavaan* package. The 95% bootstrap confidence intervals (95%BCCI) associated with the standardized effects were derived via bootstrapping (5000 resamples). In the second stage, the *manymome* package is used to compute the indirect impact and test the mediation and serial-mediation hypotheses (Cheung & Cheung, 2024). The results of indirect effect analysis are shown in **Table 4**.

Table 4. Summary statistics for the mediation hypothesis

Effect Type	Path	SE	CI	p
Direct	AI → CS	0.378	[0.260 0.495]	<0.001
Indirect	AI → PO → CS	0.266	[0.188 0.351]	<0.001
Total	AI → CS and AI → PO → CS	0.644	[0.557 0.728]	<0.001
Indirect	AI → CS → RP	0.259	[0.168 0.373]	<0.001
Indirect	AI → PO → CS → RP	0.183	[0.115 0.253]	<0.001
Total Indirect	AI → CS → RP and AI → PO → CS → RP	0.442	[0.331 0.575]	<0.001
Total	AI → RP, AI → CS → RP and AI → PO → CS → RP	0.67	[0.584 0.748]	<0.001
Indirect	AI → CS → WOM	0.225	[0.141 0.331]	<0.001
Indirect	AI → PO → CS → WOM	0.158	[0.100 0.219]	<0.001
Total Indirect	AI → CS → WOM and AI → PO → CS → WOM	0.383	[0.280 0.506]	<0.001
Total	AI → WOM, AI → CS → WOM and AI → PO → CS → WOM	0.705	[0.632 0.773]	<0.001

Note. SE denotes Standardized Effect, CI denotes 95.0% Bootstrap, p denotes Bootstrap p-value

Regarding the relationship between avatar identification and customer satisfaction, a significant direct effect (path: AI → CS; standardized effect: 0.378; 95% BCCI: [0.260, 0.495]; Bootstrap p-value < 0.001), a significant indirect impact (path: AI → PO → CS; standardized indirect effect: 0.266; 95% BCCI: [0.188, 0.351]; Boot-



strap p -value < 0.001), and a significant total effect (combined paths: AI \rightarrow CS and AI \rightarrow PO \rightarrow CS; standardized effect: 0.644; 95% BCCI: [0.557, 0.728]; Bootstrap p -value < 0.001) are confirmed; thus support **H6**.

Regarding the relationship between avatar identification and repurchase intention, a significant direct effect (path: AI \rightarrow RP; standardized effect: 0.228; 95%BCCI: [0.073, 0.372]; Bootstrap p -value = 0.004 $<$ 0.05), a significant one-stage indirect effect (path: AI \rightarrow CS \rightarrow RP; standardized effect: 0.259; 95%BCCI: [0.168 to 0.373]; Bootstrap p -value $<$ 0.001); a significant two-stage indirect effect (path: AI \rightarrow PO \rightarrow CS \rightarrow RP; standardized effect: 0.183; 95%BCCI: [0.115 to 0.253]; Bootstrap p -value $<$ 0.001); a significant total indirect effect (combined path: AI \rightarrow CS \rightarrow RP and AI \rightarrow PO \rightarrow CS \rightarrow RP; standardized effect: 0.442; 95%BCCI: [0.331 to 0.575]; Bootstrap p -value $<$ 0.001); and a significant total effect (combined path: AI \rightarrow RP, AI \rightarrow CS \rightarrow RP and AI \rightarrow PO \rightarrow CS \rightarrow RP; standardized effect: 0.670; 95%BCCI: [0.584 to 0.748]; Bootstrap p -value $<$ 0.001) are confirmed; thus supporting **H4a** and **H7a**.

Regarding the relationship between avatar identification and positive word-of-mouth intention, a significant direct effect (path: AI \rightarrow WOM; standardized effect: 0.322; 95%BCCI: [0.182, 0.459]; Bootstrap p -value = 0.001), a significant one-stage indirect effect (path: AI \rightarrow CS \rightarrow WOM; standardized effect: 0.225; 95%BCCI: [0.141 to 0.331]; Bootstrap p -value $<$ 0.001); a significant two-stage indirect effect (path: AI \rightarrow PO \rightarrow CS \rightarrow WOM; standardized effect: 0.158; 95%BCCI: [0.100 to 0.219]; Bootstrap p -value $<$ 0.001); a significant total indirect effect (combined path: AI \rightarrow CS \rightarrow WOM and AI \rightarrow PO \rightarrow CS \rightarrow WOM; standardized effect: 0.383; 95%BCCI: [0.280 to 0.506]; Bootstrap p -value $<$ 0.001); and a significant total effect (combined path: AI \rightarrow WOM, AI \rightarrow CS \rightarrow WOM and AI \rightarrow PO \rightarrow CS \rightarrow WOM; standardized effect: 0.705; 95%BCCI: [0.632 to 0.773]; Bootstrap p -value $<$ 0.001) are confirmed; thus supporting **H4b** and **H7b**.

Discussion

Main findings

Understanding the positive post-purchase intention for in-game virtual items is crucial for comprehending long-term consumer behaviors in game. This study focuses on how avatar identification, a vital component of the avatar-mediated communication feature in video games (Teng et al., 2023), influences players' post-purchase behavioral intention. The research findings can be summarized in four parts, corresponding to the proposed research questions.

First, the results of H1, H2, and H3 indicate that, in the context of video games, avatar identification predicts customer satisfaction with purchased in-game items, repurchase intention for those items, and the likelihood of recommending them to other potential customers. Second, the findings of H4a and H4b reveal that avatar identification enhances satisfaction with in-game items, driving repurchase and recommendation intentions. Third, results of H5 and H6 show that avatar identification positively influences psychological ownership of in-game items, which in turn



enhances player satisfaction. Lastly, the results of H7a and H7b suggest that avatar identification enhances repurchase intention and positive word-of-mouth intention by increasing satisfaction through a sense of psychological ownership. In other words, the identity-triggered perception of in-game virtual items (i.e., psychological ownership) leads to a positive evaluation of these items (i.e., customer satisfaction), which subsequently results in both intrapersonal continuance behavioral intention (i.e., repurchase intention) and interpersonal continuance behavioral intention (i.e., positive word-of-mouth intention).

Theoretical implications

Drawing on and combining avatar identification theory and psychological ownership theory, this study explores how avatar identity contributes to players' positive continuance behavior. Overall, the findings may expand existing theories and literature in several ways.

First, previous literature primarily focuses on purchase intention in the pre-purchase stage (Hamari & Keronen, 2017) and loyalty to the entire game (Liao et al., 2019; Teng, 2019), while research on post-purchase behavioral intention is relatively rare (Hamari & Keronen, 2017; W.-T. Wang & Chang, 2014). This study addresses this gap by examining the antecedents of customer satisfaction, repurchase intention, and positive word-of-mouth intention, thereby adding valuable insights to the full spectrum of knowledge on consumer behavior in the gaming context.

Second, this study contributes valuable insights to the literature on avatar identification as an antecedent of game players' consumption behavior. Previous research has explored the role of avatar identification in influencing players' in-game purchase behavior (i.e., purchase intention; Park & Lee, 2011; Wu & Hsu, 2018) and game loyalty (Liao et al., 2019; Teng, 2017, 2021). Several studies have revealed mechanisms through which avatar identification impacts, such as increasing perceived authenticity (Wu & Hsu, 2018) and the perceived value of in-game items (Park & Lee, 2011). This study extends these literatures by linking avatar identification to three post-purchase behavioral intentions and exploring the mechanisms by which this occurs, focusing on how the player-avatar association (i.e., avatar identification) transfers a positive effect to the player-virtual item association (i.e., psychological ownership), subsequently influencing repurchase intention and positive word-of-mouth intention.

Thirdly, this study extends the literature on avatar-mediated communication (AMC) by incorporating the human-items association (i.e., psychological ownership) into it. AMC is defined as a framework consisting of a four-part human-object-object-human relationship, where the human-object (or object-human) component is conceptualized as avatar identification (Nowak & Fox, 2018; Teng et al., 2023). However, this framework neglects the role of another type of object, i.e., in-game virtual items, in facilitating information exchange and processing. This study fills this gap by revealing that the human-avatar association can have a positive influ-



ence on the human-items association. Consequently, it provides an initial understanding of the “human-avatar-items” association as an essential component of the avatar-mediated communication process in the video game context.

Fourth, this study contributes to the psychological ownership literature in the video game context by focusing on in-game virtual items and investigating avatar identification as an antecedent. Several relevant studies focus on psychological ownership toward the entire game (C. P. Kirk & Swain, 2018; X. Wang, Abdelhamid, et al., 2021) rather than in-game virtual items. Although Tan & Yang (2022)’s study focused on the item level and examined two of the three primary routes through which players develop psychological ownership (Pierce et al., 2003), they found that intimate knowing positively relates to psychological ownership. At the same time, investment of the self does not have an impact. These findings are inconsistent with the broader psychological ownership theory literature (H. Kim et al., 2024; Pierce et al., 2003). Consequently, the results of this study may help explain this inconsistency by suggesting that, in the video game context, the avatar may mediate the process of developing psychological ownership through investment of the self.

Practical implications

For game developers and managers, our findings underscore the importance of designing avatars and in-game items that foster a strong sense of identification and ownership. Previous literature provides substantial evidence on how to induce avatar identification and psychological ownership. For instance, avatars can promote higher identification by offering extensive customization options, ensuring physical attractiveness, enhancing achievement capabilities, and designing unique avatars within team contexts (Teng, 2019, 2021). To induce psychological ownership in games, developers should provide clear goals and competitive elements for achievement motivation, design immersive environments with compelling narratives and customization options, and foster intimate knowledge of the game (Tan & Yang, 2022; X. Wang, Abdelhamid, et al., 2021). As this study suggests, game developers should consider how to induce identity-triggered psychological ownership. For example, cues that imply the virtual items belong to the focal avatar should be displayed in the in-game store. Developers could also provide access mechanisms that utilize the avatar to explore or evaluate in-game items rather than relying on simple mouse clicks or screen touches. Furthermore, making avatars and their associated items an inseparable whole narrative can create a stronger connection between these elements, enhancing the player’s sense of involvement and ownership. These insights can assist game company managers in understanding how to strategically design and integrate in-game elements, such as avatars and virtual objects, and their interactions (i.e., player-avatar, avatar-virtual item, and virtual item-player associations), to optimize marketing performance and create more engaging and profitable gaming experiences.



From a player well-being perspective, this study provides valuable insights into the factors that drive continuous in-game item purchasing. On the dark side, avatar identification is considered a predictor of problematic gaming and gaming disorder (Green et al., 2021; Stavropoulos et al., 2020), which is highly related to overconsumption among teenagers around 20 years old (Ayraler Taner et al., 2022). This study explains the psychological triggers behind these purchases from the perspectives of identity and ownership, helping players and their guardians prevent addictive purchasing behaviors. Moreover, this study provides insights for gaming companies to promote healthier gaming consumption habits and create a more balanced and enjoyable gaming environment, which is considered an aspect of Corporate Social Responsibility.

Research limitations and future research directions

This study has several limitations that provide directions for future research. First, as with much behavioral research, the generalizability of this study may be limited due to several factors unique to the research sample, such as race, gender, and cultural backgrounds. Additionally, previous research has shown that players exhibit different spending tendencies depending on the game genre they play, such as first-person shooter games, role-playing games, and real-time strategy games (Ayraler Taner et al., 2022; J. Lee et al., 2015). Moreover, spending tendencies vary based on the value of different in-game items (Hamari et al., 2020; Park & Lee, 2011). Future research can take these variables into account to validate the results.

Second, this study has found that the self-investment route, through which players develop psychological ownership toward in-game items, may be mediated by their avatars. This contributes to the existing literature on psychological ownership theory in the gaming context (Tan & Yang, 2022). However, the mechanisms through which this effect occurs remain unclear. Further investigation is needed to reveal the nuances of the cognitive and emotional processes through which human-avatar associations influence human-item associations. Additionally, since several intrinsic psychological motivations drive psychological ownership, players may engage in symbolic attribution or identity construction to imbue in-game items with different meanings when these motivations are gratified. Therefore, future research should consider individual differences to explore the boundary conditions of this effect.

Third, another significant concern is the limitation of defining and measuring the construct of avatar identification as a unidimensional construct (Teng et al., 2023). This study operationalized avatar identification as a unidimensional construct, focusing on the overall effect avatar identity could have in this research context. Consequently, it sacrificed the detailed examination of how different components of avatar identification might play distinct roles. For example, Looy et al. (2012)'s study conceptualized and operationalized avatar identity as a second-order construct consisting of three dimensions: similarity identification, wishful



identification, and embodied identification. These three dimensions represent different ways in which avatar identity is formed. It would be beneficial for future research to investigate whether different dimensions of avatar identification lead to variations in post-purchase behavioral intention.

Fourth, this study considers customer satisfaction as an outcome of players' evaluations of in-game items when they experience a sense of avatar identification and psychological ownership. Although it contributes to the in-game consumption literature by linking pre-purchase psychological states to post-purchase evaluations, future research can extend this understanding by investigating other evaluation outcomes, such as the perceived value of in-game items. Furthermore, this study focuses on evaluation outcomes only at the item level, which may limit the understanding of the effect of human-avatar-item associations on the overall evaluation outcomes. Future research can explore higher-level evaluation outcomes, such as game-level and community-level satisfaction, to enrich relevant knowledge. Additionally, designing multilevel research could elucidate how evaluation outcomes at different levels interact in shaping further behaviors in the post-purchase stage.

Fifth, this study examined how identity-triggered psychological ownership toward in-game items influences further intrapersonal and interpersonal post-purchase behaviors. However, the conditions under which these effects occur remain underexplored. Previous research has found that player identification is related to individual preferences and contextual factors. For example, L. Wang et al. (2022) found that players with a "play-to-win" or "play-for-fun" orientation may both develop game-level identification but exhibit different preferences for types of in-game items. Additionally, Teng (2017) found that avatar identification positively influences players' social environment, leading to higher levels of social presence and participation in the gaming community. Therefore, future research should investigate these issues by considering potential individual preferences and contextual influences.

Conclusions

Drawing on avatar identification theory and psychological ownership theory, this study connects human-avatar associations and human-item associations to investigate their combined impact on players' post-purchase behavioral intention. Using structural equation modeling (SEM) on survey data from 439 gamers, the results show that avatar identification enhances players' psychological ownership of in-game items, leading to increased satisfaction and both intrapersonal and interpersonal post-purchase behavioral intention. The research findings enrich the literature on in-game purchases by shedding light on post-purchase behavior and its interactions; contribute to the nomological network of avatar identification theory by considering it as an antecedent of in-game purchases; expand the avatar-mediated communication framework by incorporating the human-avatar-item



association as a component; and extend the psychological ownership theory in the game context by confirming an avatar-mediated self-investment route of psychological ownership development. Practitioners can use these insights to design in-game elements that foster strong player-avatar-item associations, triggering positive continuance behaviors. Overall, this study paves the way for an initial understanding of the dynamics between avatar identification and post-purchase behavioral intention, offering a foundation for future research in virtual consumption behavior.

Funding

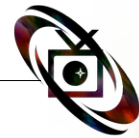
This study is supported by The National Social Science Fund of China (Grant No. 24BG143) and the Fundamental Research Funds for the Central Universities (Grant No. CUC200D034).

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