Journal of Innovation & Knowledge 10 (2025) 100753

Contents lists available at ScienceDirect

Journal of Innovation & Knowledge

journal homepage: www.elsevier.com/locate/jik

Unlocking playful dimensions: Developing and validating a scale for assessing video game-related hedonic experiences

Amir Zaib Abbasi [a], Ding Hooi Ting [b], Helmut Hlavacs [c,*], Bradley Wilson [d,e,f], Mousa Albashrawi [g,h], Yogesh K. Dwivedi [g,h]

[a] IRC for Finance and Digital Economy, KFUPM Business School, King Fahd University of Petroleum & Minerals, Dhahran, Saudi Arabia
[b] Department of Management, Universiti Teknologi PETRONAS, Seri Iskandar, Malaysia
[c] Research Group Education, Didactics and Entertainment Computing, University of Vienna, Vienna, Austria
[d] Universidad de Los Andes, Facultad de Administración., Bogota, Colombia
[e] RMIT University, School of Media and Communication, Melbourne, Australia
[f] Department of Services Management, University of Bayreuth, Bayreuth, Germany
[g] IRC for Finance and Digital Economy, King Fahd University of Petroleum and Minerals (KFUPM), Dhahran, Saudi Arabia
[h] ISOM Department, KFUPM Business School, King Fahd University of Petroleum & Minerals, Dhahran, Saudi Arabia

ARTICLE INFO

JEL classification:
M31
M15
M100
C83

Keywords:
Video game
Hedonic product
Hedonic theory
PCE
Scale development
Theory of reasoned action

ABSTRACT

This study aims to develop and validate an instrument to measure video game-related playful consumption experiences (PCEs), assessing a player's imaginal, emotional, and sensory experiences during video gameplay. We initially conceptualize the theoretical framework of video game-related PCEs. Next, we develop a scale through three analytical phases. In the first phase, exploratory factor analysis is conducted with 225 Malaysian video game players. In the second phase, the partial least squares structural equation modeling (PLS-SEM) is applied to a sample of 444 Malaysian gamers to validate the scale at a higher-order level and evaluate the conceptual model's acceptability. In the third phase, the PCE scale's nomological validity is established using the Theory of Reasoned Action (TRA) by analyzing 294 Pakistani PUBG players with the PLS-SEM approach. All hypotheses based on the TRA network are supported. This study uniquely applies the hedonic theory of consumption to operationalize PCEs, assessing gamers' playful experiences. Additionally, it extends the TRA by elucidating attitude formation through PCEs in PUBG gameplay.

Introduction

Modern consumers engage with various electronic devices, including handheld gaming consoles, Xbox, smartphones, PlayStation, and personal computers, for gaming activities (Phan et al., 2016). Since the commercial releases of the first video games, "Computer Space" and "Pong," in the 1970s (Mukherjee et al., 2016), gaming has evolved into a popular recreational activity, driving a multi-billion-dollar industry (Szolin et al., 2023). According to the Entertainment Software Association (2023), global consumer spending on gaming products exceeds $56.6 billion, with Malaysia ranking 21st, generating $633 million in video game revenue. The gaming industry's economic impact, including job creation, technological advancements, and widespread adoption, has positioned gaming as a significant subject for interdisciplinary academic inquiry. From a cultural perspective, video games extend beyond entertainment, shaping social interactions, fostering digital communities, and serving as platforms for artistic expression. Consequently, researchers across disciplines have increasingly explored gaming's effects on cognition (e.g., emotional involvement and immersive engagement), co-creation experiences, identity formation, and emotional well-being (Jiang et al., 2025; Welden et al., 2025). This growing interest has underscored the need to understand players' experiences to optimize digital engagement and user satisfaction for game developers, marketers, psychologists, and scholars (Fayyaz et al., 2025; Seo et al., 2015).

The concept of "experience" in the field of video game studies represents a complex and multidimensional construct (Brown & Cairns, 2004; Cheng et al., 2015; Ermi & Mäyrä, 2005; Jennett et al., 2008; Sanchez & Langer, 2020). Several studies have advanced the understanding and measurement of this complexity (Brown & Cairns, 2004;

* Corresponding author.
E-mail address: helmut.hlavacs@univie.ac.at (H. Hlavacs).

https://doi.org/10.1016/j.jik.2025.100753
Received 20 January 2025; Accepted 4 June 2025
Available online 27 June 2025

Cheng et al., 2015; Ermi & Mäyrä, 2005; Hassenzahl et al., 2003; Jennett et al., 2008; Qin et al., 2009). Specifically, research has focused on developing instruments tailored to assess player experiences in gaming contexts. For instance, Hassenzahl et al. (2003) developed the Attrak-Diff2 questionnaire, which evaluates both hedonic and pragmatic aspects of interactive products, including gaming applications. Such instruments have deepened insights into factors influencing player satisfaction, enjoyment, and overall engagement.

To quantify player experiences, researchers have drawn on various theoretical frameworks. The theory of flow has informed instruments measuring optimal gameplay experiences (Choi & Kim, 2004), escapist experiences (Ermi & Mäyrä, 2005), game enjoyment, and flow-related experiences (Fang et al., 2010, 2013), and engaging experiences (IJsselsteijn et al., 2008; Jennett et al., 2008). Some studies have also incorporated the theory of immersion to assess player involvement during gameplay (Cheng et al., 2015; Ermi & Mäyrä, 2005; Jennett et al., 2008; Sanchez & Langer, 2020). These studies argue that immersion is a more suitable concept for describing the video gameplay experience as it encompasses a non-extreme and suboptimal state reflecting the involvement level in the activity (Cheng et al., 2015). Presence theory has been employed to capture gamers' interactions with other players (De Kort et al., 2007) and their state of being present in the virtual world, even when losing their sense of time (Jennett et al., 2008).

Researchers have developed various scales and questionnaires to measure player experience. Ryan et al. (2006) introduced the Player Experience of Need Satisfaction (PENS) scale, which predicts motivations for game enjoyment and future play intentions. Calvillo-Gámez et al. (2015) employed a qualitative grounded theory approach to develop the Core Elements of the Gaming Experience Questionnaire to evaluate the overall gaming experience. Other studies have utilized lexical approaches to identify key factors in user experience (Zhu & Fang, 2015) and develop playability heuristics (Zhu et al., 2017). The Game User-Experience-Satisfaction (GUESS) scale evaluates gamers' satisfaction based on their gaming experiences (Phan et al., 2016). In gamification, scales such as GAMEX and GAMEFULQUEST assess gameful experiences in gamified applications (Eppmann et al., 2018; Högberg et al., 2019). These applications employ gameful designs to enhance engagement and performance by adding playfulness and motivation. Recent studies have examined its synergy with flow experiences (Welden et al., 2025). Sanchez and Langer (2020) introduced the Video Game Pursuit measure, which evaluates factors such as flow, enjoyment, difficulty, and self-efficacy to determine game-based outcomes (e.g., performance and game knowledge). Additionally, Possler et al. (2024) extended Scharkow et al.'s (2015) gaming motives, developing a novel survey incorporating eudaimonic dimensions inspired by gaming literature and positive psychology.

Previous research emphasized the significance of investigating playful experiences within the realm of video games. Parnell (2009) developed a gameplay questionnaire incorporating ergonomic (usability) and hedonic (experiential) factors to predict players' attitudes toward the appeal of video games. Scholars define playful experience as an "intrinsically motivated activity that is free of extrinsic goals and consequences" (Pavlas et al., 2012, p. 214), rooted in gaming, pleasure-oriented experiences, emotions, and play characteristics (Boberg et al., 2015). Instruments such as the Play Experience Scale (Parnell, 2009) and Playful Experiences Questionnaire (Boberg et al., 2015) measure attributes of playfulness, capturing engagement in enjoyable gaming activities that evoke emotional responses (Lin & Yeh, 2019; Zhao & Renard, 2018). However, terms such as "playfulness" or "playful experiences" often align with the hedonic theory of consumption experience, which has been underutilized. Holbrook et al. (1984) introduced the playful consumption concept, which encompasses intrinsically motivating behaviors such as hobbies, leisure activities, sports, and games. O'Sullivan and Shankar (2019) emphasized "consuming as play" as a key consumption aspect. Several marketing scholars have recognized the significance of investigating playful consumption experiences in the context of computer games (Buchanan-Oliver & Seo, 2012; Seo et al., 2015) and have called for further research, particularly focusing on player-game interactions and associated experiences.

Existing theoretical constructs, such as immersion, presence, flow, and cognitive absorption, describe players' experiences during digital game-playing (Calvillo-Gámez et al., 2015; Cheng et al., 2015; De Kort et al., 2007; Ermi & Mäyrä, 2005; Fang et al., 2013; Jennett et al., 2008). For instance, Denisova et al. (2016) identified that the PENS scale includes components such as competence, control, autonomy, and presence/immersion. This scale was developed based on self-determination theory, which focuses on experiences that fulfill universal needs and motivations for computer gameplay (Johnson et al., 2018).

To assess immersion experienced by gamers, Jennett et al. (2008) developed the immersive experience questionnaire (IEQ), which includes components such as cognitive involvement, real-world dissociation, challenge, emotional involvement, and control. Conversely, the game experience questionnaire (GEQ) comprises components such as immersion, competence, challenge, frustration, flow, and positive and negative affect (IJsselsteijn et al., 2007, 2008; Johnson et al., 2018). Johnson et al. (2018) noted that IJsselsteijn et al. (2008) did not base the GEQ on a specific theory but developed it through focus groups and expert reviews. Recent studies by Shelstad et al. (2019) and Denisova et al. (2016) observed that, although scales such as GEQ, IEQ, PENS, and GUESS exist, they may overlap yet not measure identical experiences.

Video game and gamification literature frequently employ theoretical frameworks such as immersion, presence, flow, and cognitive absorption to assess player experiences. These constructs primarily capture players' subjective mental states during gameplay. For instance, flow describes a state of deep engagement in a video game, where players lose track of time and disregard their surroundings (Klasen et al., 2012). Similarly, absorption entails the suspension of players' emotions, thoughts, and feelings (Brockmyer et al., 2009). By contrast, immersion refers to a psychological sense of being in the game, while retaining some environmental awareness (Brockmyer et al., 2009). Presence denotes complete engrossment in a virtual world (McMahan, 2003; Qin et al., 2009). However, few studies, such as Eppmann et al. (2018), emphasize positive emotional factors (e.g., enjoyment) and the absence of negative affect, often focusing on gamification rather than on the full spectrum of experiences offered by video games.

Previous research has primarily evaluated the impact of video gameplay on players' mental states, overlooking other significant experiences, including emotional and sensory dimensions. Högberg et al. (2019) underscored the importance of sensory experiences in assessing playful experiences in video games, which offer unique opportunities for multisensory engagement compared to typical gamification contexts.

Although scales, such as IEQ, PENS, GEQ, and GUESS, are multidimensional (IJsselsteijn et al., 2008; Jennett et al., 2008; Phan et al., 2016; Ryan et al., 2006), none have applied the hierarchical component model proposed by Sarstedt et al. (2019) to rigorously specify, estimate, and validate these scales. This model could enhance the understanding and validity of scales measuring various dimensions of the video game-playing experience.

A comprehensive review of prior research reveals that existing scales for video game experiences have not incorporated the hedonic theory of consumer experience to evaluate playful experiences. This theory, emphasizing emotive, sensory, and imaginative dimensions, is crucial for understanding playful experiences related to video games (Wu & Holsapple, 2014). These dimensions capture the range of experiences gamers may encounter while engaging in gameplay.

Video game-play, driven by intrinsic motivation, constitutes a leisure activity that fosters pleasurable, ludic, non-utilitarian, and autotelic experiences involving emotions, imagination, and sensory engagement (Abbasi et al., 2019; Holbrook et al., 1984; Hollebeek et al., 2022; Wu & Holsapple, 2014). By integrating this theory, researchers can develop scales that effectively capture and measure the multifaceted nature of

playful experiences, providing insights into factors contributing to the enjoyment and satisfaction derived from video games.

Current scales lack comprehensive coverage of emotional, imaginal, and sensory dimensions, which play a crucial role in human-computer interaction (HCI) and understanding gamers' playful experiences during video game engagement. Recognizing the importance of these perceived experiences is vital for developers seeking to enhance video game development and innovation. Limited knowledge in this area necessitates this study to address the gap.

To overcome this limitation, our study builds upon the hedonic theory of consumption experience, introducing the Playful Consumption Experience (PCE) scale. The PCE scale encompasses imaginal, emotional, and sensory dimensions, providing a multidimensional perspective on gamers' playful experiences. The imaginal component comprises escapism, role-projection, and fantasy, capturing the immersive and imaginative engagement. The emotional dimension comprises enjoyment, arousal, and emotional involvement, reflecting the affective responses during gameplay. The sensory component measures the multisensory modalities, such as sight, sound, and touch, encountered by players, enhancing the overall immersive experience.

In summary, our study addresses deficiencies in existing measures of player experiences by introducing the PCE scale, a comprehensive tool capturing the multidimensional nature of gaming experiences. Video games uniquely combine interactivity with hedonic consumption, requiring continuous user input to foster sustained cognitive and emotional engagement (Welden et al., 2025). Emerging technologies, such as artificial intelligence (AI)-driven adaptability, virtual reality (VR), and augmented reality (AR), intensify these dynamics by enabling immersive, responsive, and personalized gameplay environments (Jiao et al., 2025). The PCE scale offers a holistic framework to assess player interactions, providing insights for leveraging AI, VR/AR, and adaptive gameplay mechanics to design immersive and personalized gaming environments, fostering innovation in storytelling, sensory engagement, and emotional connectivity. This contribution not only advances video game research but also provides practical implications for developing cutting-edge, player-centered experiences in the evolving landscape of gaming technology.

This study pioneers the application of the hedonic theory of consumption experience in video game literature by developing and validating a multidimensional PCE scale in the Malaysian context. It bridges the knowledge gap and contributes to a more inclusive understanding of the development of the PCE construct, shedding light on the interplay between behavior and entertainment. Following Sarstedt et al.'s (2019) guidelines, the scale employs a hierarchical component model validated through partial least squares structural equation modeling (PLS-SEM), ensuring methodological rigor. The PCE scale captures emerging characteristics of video game players, stimulating further inquiry into their experiences. By integrating imaginal, emotional, and sensory experiences, developers can enhance gaming ecosystems to increase player satisfaction (Fayyaz et al., 2025; Mandal et al., 2025). They can empower players to create custom content, such as levels, storylines, or characters, fostering creativity and imaginative play. Emotional connections can be strengthened through AI-driven interactive storytelling and co-creation tools, allowing players to shape personalized narratives. Sensory immersion can be amplified using VR/AR technologies, haptic feedback, and dynamic and adaptive environments. Gaming platforms can act as collaborative hubs, connecting developers, artists, and players to co-create enriched experiences while integrating complementary services such as social matchmaking or gamified fitness. By mirroring digital platform strategies, such as app stores, video games can inspire innovation, deeper immersion, and meaningful player engagement.

This study offers significant implications for academics and practitioners seeking to understand video game player behavior. The PCE scale facilitates a realistic measurement of interactive game usage, informing decision-making in practical settings. Additionally, our theoretical approach, rooted in the hedonic theory of consumption experience, provides a robust foundation for measuring video game-related PCEs, advancing understanding and opening avenues for future research and practical applications.

PCE conceptualization through the lens of hedonic theory

In their seminal article, Hirschman and Holbrook (1982) emphasized the rational and irrational aspects of purchasing needs, while overlooking consumption experiences involving sensory pleasures and playful leisure activities. This oversight prompted them to introduce experiential marketing to comprehend and capture these playful experiences. They defined hedonic consumption as consumer behavior encompassing multisensory, fantasy, and emotive facets of product experiences (Alba & Williams, 2013; Hirschman & Holbrook, 1982). Hedonic consumption involves emotional motives, fantasies, and multisensory characteristics evoked by hedonic products.

Video games, classified as hedonic products, evoke imagination, emotional responses, and sensory modalities (Marchand & Hennig-Thurau, 2013). Their interactive nature, played within a computer-mediated structure, enables players to engage in a playful experience, equating playing a video game with experiencing it (Buchanan-Oliver & Seo, 2012; Eskelinen, 2001; Salem & Zimmerman, 2004). Consequently, marketing and video game research has conceptualized video game-play as a PCE (Buchanan-Oliver & Seo, 2012; Holbrook et al., 1984).

PCE

PCE refers to intrinsically motivating, self-driven consumer behavior pursued for pleasure (Buchanan-Oliver & Seo, 2012; Hirschman & Holbrook, 1982; Holbrook et al., 1984; Mukherjee et al., 2016). This multidimensional construct comprises imaginal, emotional, and sensory dimensions, stimulated by consumption of hedonic products such as video games (Holbrook et al., 1984). Buchanan-Oliver and Seo (2012) highlighted playful consumption's significance in computer-mediated environments, particularly video games.

The imaginal experience involves intrinsic, private mental states of imagining unreal scenarios (Abbasi et al., 2016a). This dimension, capturing the fantasy component of PCE, includes fantasy, role-projection, and escapism (Hirschman, 1983; Hirschman & Holbrook, 1982; Lacher & Mizerski, 1994; Wu & Holsapple, 2014). Fantasy entails constructing imaginary worlds, role-projection involves assuming specific roles or characters, and escapism allows players to redirect their attention from real-world pressures and worries (Abbasi et al., 2021; Hirschman, 1983; Wu & Holsapple, 2014).

Emotional experiences comprise affective states triggered by specific events (Abbasi et al., 2016a; Wu & Holsapple, 2014). Defined by enjoyment, arousal, and emotional involvement, this dimension reflects the feelings facet of PCE (Hirschman & Holbrook, 1982; Holbrook et al., 1984; Lacher & Mizerski, 1994; Lee et al., 2009; Mizerski et al., 1988; Pucely et al., 1988; Stewart, 2013; Wu & Holsapple, 2014). Enjoyment involves seeking pleasure and happiness, arousal reflects emotional activation and attentiveness due to external stimuli, and emotional involvement describes deep engagement in the activity (Holsapple & Wu, 2007; Lacher & Mizerski, 1994; Lee et al., 2009; Wu & Holsapple, 2014). Hussain et al. (2024) highlighted the role of imaginal and emotional experiences in shaping positive attitudes toward virtual items, enhancing loyalty, willingness to pay, and word-of-mouth, although they overlooked sensory experiences.

The third element within the PCE framework is sensory experience, characterized as the assimilation of sensory modalities—touch, sight, and sound—shaping the overall consumer experience (Hirschman & Holbrook, 1982; Holbrook et al., 1984). This dimension underscores the multisensory engagement inherent in video gameplay.

Overview of PCE

This study develops a PCE scale, as depicted in Fig. 1 to comprehensively assess factors contributing to such experiences in video gameplay. We believe these are causative effects from the first-order components, which subsequently contribute to or drive the overall PCE level. On the primary higher-order construct, as shown in Fig. 1, the PCE construct is at a higher level of abstraction. PCE is influenced by three key playful hedonic experiences—fantasy, sensory attributes, and emotional reactions. Therefore, at this higher-order abstraction level, as depicted in Fig. 1, two second-order formative constructs (imaginal and emotional experiences) and one first-order reflective construct are posited, which further contributes to the primary higher-order formative construct (PCE). Three other first-order reflective constructs further represent each second-order formative construct. For instance, imaginal experience is a second-order formative construct determined by three first-order reflective constructs *(role-projection, fantasy, and escapism)*. Emotional experience is observed as a second-order formative level construct that is further quantified by three *(arousal, enjoyment, and emotional involvement)* first-order reflective constructs. The following section discusses the PCE scale development process.

Scale development

Scale development procedure for PCE

To develop a PCE scale, we followed a structured procedure recommended by key studies (Ali et al., 2017; Churchill, 1979; MacKenzie et al., 2011; Tsaur et al., 2016). As illustrated in Fig. 2, this process comprises seven phases: (1) conceptualization, (2) questionnaire development, (3) model specification, (4) data collection and scale refinement for study 1, (5) data collection and reassessment of scale dimensions for study 2, (6) reliability and validity tests for reflective and formative constructs, and (7) data collection for study 3 to establish and validate nomological validity.

Conceptualization

Definition of PCE

The conceptualization process entails defining PCE and its dimensions. Following Churchill (1979) and MacKenzie et al. (2011), a literature review approach clarified the PCE domain in video gameplay. PCE emerges as *an intrinsically motivated behavior* encompassing three hedonic experiences: sensory, emotional, and imaginal (Abbasi & Jamak, 2017; Abbasi et al., 2016b; Buchanan-Oliver & Seo, 2012; Holbrook et al., 1984; Mukherjee et al., 2016).

Construct dimensionality

As depicted in Fig. 1, PCE comprises three key dimensions: imaginal, emotional, and sensory experiences (Alba & Williams, 2013; Hirschman & Holbrook, 1982; Wu & Holsapple, 2014). The imaginal experience includes three sub-dimensions—fantasy, role-projection, and escapism (Hirschman, 1983; Hirschman & Holbrook, 1982; Wu & Holsapple, 2014), whereas emotional experience is based on three lower-order

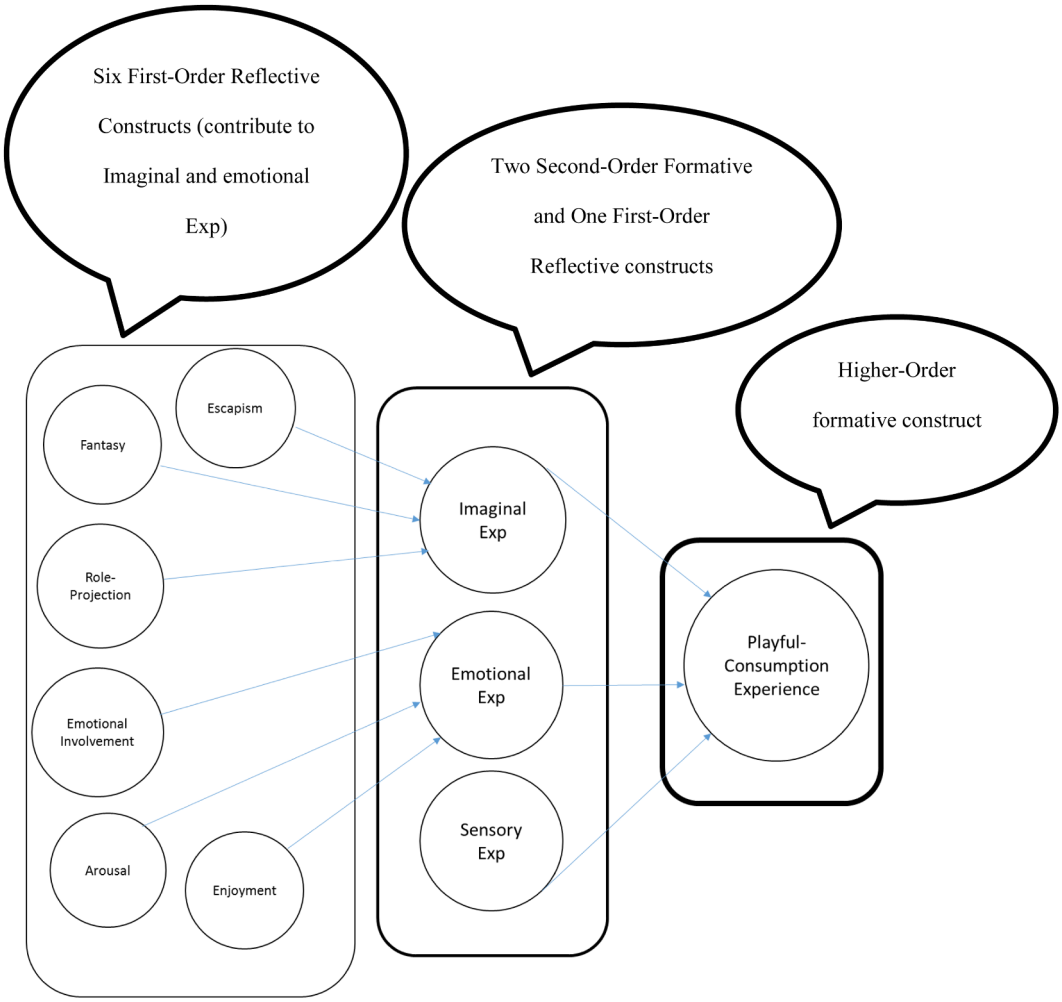

Fig. 1. An overview of PCE.

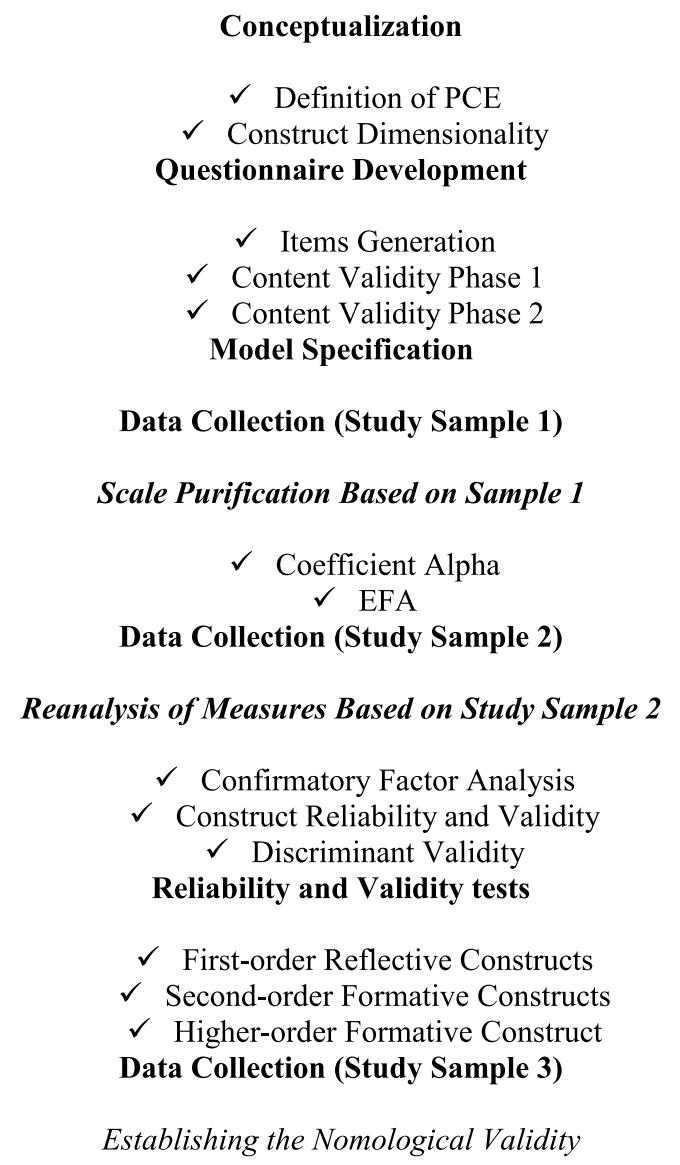

Fig. 2. Scale development Process.

factors comprising arousal, emotional involvement, and enjoyment (Hirschman & Holbrook, 1982; Lee et al., 2009; Mizerski et al., 1988; Pucely et al., 1988; Stewart, 2013; Wu & Holsapple, 2014). Through literature review, we identified seven first-order constructs—fantasy, emotional involvement, escapism, arousal, enjoyment, role-projection, and sensory experience—collectively forming the hedonic experiences of PCE. In the next section, we provide details of the questionnaire developed for the identified factors.

Questionnaire development

Item generation

To generate measurement items, we adopted methods recommended by Churchill (1979) and MacKenzie et al. (2011), including literature reviews, focus-group discussion, deductions from theoretical definitions of the construct, experience surveys, prior studies on the main variable, expert suggestions, and interviews. After defining PCE and its dimensions, we employed multiple approaches: literature reviews, deductions from theoretical definitions, expert recommendations, and open-ended survey questionnaires. These methods generated items for the seven first-order reflective constructs: escapism, emotional involvement, fantasy, role-projection, enjoyment, sensory experience, and arousal.

A comprehensive literature review compiled scale items from existing studies. Items of role-projection and fantasy were adapted from Hirschman (1983), Lacher and Mizerski (1994), and Wu and Holsapple (2014). Escapism items were sourced from Hirschman (1983), Mathwick et al. (2001), Overmars and Poels (2015), Swanson (1978), and Wu and Holsapple (2014). Emotional involvement items were adapted from Swanson (1978) and Wu and Holsapple (2014). Enjoyment items were drawn from Agarwal and Karahanna (2000) and Mathwick et al. (2001). Arousal items were sourced from Holbrook et al. (1984) and Wu and Holsapple (2014). Sensory experience items were developed using Brakus et al. (2009), Mathwick et al. (2001), Stewart (2013), and Yingling (1962). This process yielded a pool of 39 items representing the seven first-order reflective constructs of PCE (see Table 1). Content validity assessment of the 39 items followed.

Content validity

Content validity, a prerequisite for scale quality, involves a systematic evaluation of how well items represent a dimension's domain Hair et al. (2013); Worthington and Whittaker, (2006). Experts were invited to assess items for grammar, conciseness, clarity, reading ability, coherence, face validity, and redundancy (Cabrera-Nguyen, 2010; Worthington & Whittaker, 2006). They also offered their suggestions on item modification and addition or deletion. For this study, 4 Ph.D students from Malaysia with marketing and gaming knowledge, 4 academic experts from Malaysia and Columbia Business School, New York, USA (specializing in marketing), and 3 video game users from the UK, Malaysia, and Pakistan (including one with industry experience) evaluated the 39 items.

First round: expert evaluation of items

Experts reviewed each item for grammar, conciseness, clarity, reading ability, coherence, and semantic redundancy. They recommended discarding two items each from escapism, enjoyment, and emotional involvement due to semantic redundancy. All sensory experience items were also removed, as they lacked video game specificity and failed to capture tactile interactions with gaming equipment (e.g., joysticks). Experts suggested developing video game-specific sensory items. This round reduced the item pool to 26 (see Table 2).

To regenerate sensory experience items, we employed two additional qualitative techniques: deduction from the theoretical definition and open-ended survey questionnaires (Spry & Pich, 2021). Eight experienced video game users, selected through purposive sampling, participated in an open-ended questionnaire. They reviewed the sensory experience definition and described sensory attributes felt during video gameplay. Their responses were coded to develop six new sensory experience items, resulting in a pool of 32 items (see Table 2).

Second round: expert evaluation of items

The same experts reviewed the revised 32-item pool, including the

Table 1
Items generation.

Constructs	Measure Source
Fantasy	(Hirschman, 1983; Lacher & Mizerski, 1994; Wu & Holsapple, 2014)
Role-Projection	(Hirschman, 1983; Lacher & Mizerski, 1994; Wu & Holsapple, 2014)
Escapism	(Hirschman, 1983; Mathwick et al., 2001; Overmars & Poels, 2015; Swanson, 1978; Wu & Holsapple, 2014)
Emotional Involvement	(Swanson, 1978; Wu & Holsapple, 2014)
Enjoyment	(Agarwal & Karahanna, 2000; Mathwick et al., 2001)
Arousal	(Holbrook et al., 1984; Wu & Holsapple, 2014)
Sensory Experience	(Brakus et al., 2009; Mathwick et al., 2001; Stewart, 2013; Yingling, 1962)

Table 2
A summary of the construct items derived from the literature and content validity.

Construct	No. of items	Source	Results: 1st Round of Content Validity	Modifications After 1st round of Content Validity	Results: 2nd Round of Content Validity
Escapism	6	(Hirschman, 1983; Mathwick et al., 2001; Overmars & Poels, 2015; Swanson, 1978; Wu & Holsapple, 2014).	2 items were discarded (due to semantically redundancy).		In total, 32 items passed the content validity.
Fantasy	4	(Hirschman, 1983; Lacher & Mizerski, 1994; Wu & Holsapple, 2014)	No item discarded.		
Role-projection	4				
Enjoyment	6	(Agarwal & Karahanna, 2000; Mathwick et al., 2001)	2 items were discarded (due to semantically similar).		
Emotional Involvement	5	(Swanson, 1978; Wu & Holsapple, 2014)	No item discarded.		
Arousal	5	(Holbrook et al., 1984; Wu & Holsapple, 2014)	No item discarded.		
Sensory experience	9	(Brakus et al., 2009; Mathwick et al., 2001; Stewart, 2013; Yingling, 1962)	All 9 items were discarded due to not reflecting the aspects of sensory experience in the videogame.	Regenerated 6 items through (deduction from the theoretical definition of the construct and open-ended survey)	

Note:.
The discarded 9-items of sensory experience are given below:.
1. While playing this video-game, I was moving some part of my body (head, foot, hand) with the video-game play.
2. The background music of this video-game naturally stimulates me towards more playing.
3. The background music of this video-game sends shivers down my spine (e.g., a frightened or excited feeling).
4. This video-game attracts me towards more playing.
5. The interface of this video-game is aesthetically appealing me towards more playing.
6. I like the appearance, graphics of this video-game.
7. This videogame creates a powerful impact on my visual and other sensory experiences.
8. I find this video-game engaging and stimulating from a sensory perspective.
9. This video-game fails to appeal to my senses.
The discarded 2-items of enjoyment are stated below:.
10. I enjoy playing this videogame for my own sake.
11. Playing this videogame is pure enjoyment for me.
The discarded 2-items of escapism are specified below:.
12. Playing this videogame gets me away from it all.
13. Playing this videogame helps me in forgetting everything else.

new sensory experience items. Only minor grammatical errors were identified, finalizing the 32 items (see Table 2). The next section details the validation of the PCE scale using data from studies 1 and 2, employing exploratory factor analysis (EFA), reliability testing, and Partial Least Squares Path Modeling (PLS-PM) to assess the scale and its underlying model.

Sampling selection and data collection

For study 1, participants aged 16–19 years from educational institutions in Selangor and Perak, Malaysia were selected due to their active engagement in video games, making them intense video game consumers (Lee & LaRose, 2007; Yeh, 2015). To collect data for studies 1 and 2, we used a multistage sampling technique, as defined by Acharya et al. (2013), involving listing and sampling steps. Initially, four Malaysian states *(Penang, Selangor, Perak, and Johor)* were selected, given their population and density. We then randomly selected two states *(Perak and Selangor)* from the list.

A list of institutes *(universities, colleges, and schools)* in these two states was compiled and three private institutes, three colleges, two schools, and one public sector university in Perak were randomly chosen. After finalizing the institutions, we obtained permission for data collection from one public university, two private universities, one college, and one school. In each of these institutions, we applied systematic sampling, selecting every 2nd class *(1, 3, 5, 7, etc.)* for study 1. We requested 15 min from the lecturer of the selected classes to conduct the survey. Students, aged 16–19 years enrolled in either Foundation, Diploma, or first-year undergraduate programs participated in the survey in a classroom environment. Participants were asked whether they played video games; only those responding affirmatively were asked to proceed with the survey. Of 275 distributed questionnaires, 225 valid responses were obtained after addressing missing data. The questionnaire included demographic details and the PCE scale, with demographic profiles presented in Table 3. We used all 225 valid cases to perform EFA and reliability tests for scale purification.

For study 2, the same multistage and systematic sampling procedures were applied, targeting five public universities, three private universities, and one college in Selangor. Permissions were secured from three public and two private universities. In each chosen university, surveys were conducted in classroom settings in which respondents were asked whether they played video games; only those responding affirmatively were asked to proceed with the survey. Of 540 distributed questionnaires, 444 valid responses were retained after excluding cases with missing values exceeding 5 % per indicator, suspicious response designs (e.g. diagonal, straight, and zigzag response pattern; Abbasi et al., 2020a), or participants not meeting the survey criteria. Missing values below 5 % per indicator were treated using arithmetic mean replacement in WarpPLS. Table 3 details the demographic profile of the participants for both studies. We employed 444 valid cases for scale validation through PLS-PM.

Scale refinement and validation

EFA on study sample 1 ($N = 225$)

In the EFA stage, we used Bartlett's test of sphericity and the Kaiser-Meyer-Olkin (KMO) measure to assess sampling acceptability. The KMO value of 0.86 exceeded the threshold value of 0.50 (Kaiser, 1974) and Bartlett's test yielded statistics of 3450.91 (df=351, $p = 0.000$), confirming suitability for factor analysis/EFA. An EFA was performed using samples from study 1 *($n = 225$)* to reduce the number of items. Principal components extraction with promax rotation identified the number of

Table 3
Demographics based on EFA and CFA studies.

	Study Sample 1 (N = 225), % EFA	Study Sample 2 (N = 444), % CFA
Sex		
Male	68.0	59.7
Female	32.0	40.3
Age		
15–16years	12.9	1.4
17–18years	18.2	19.4
19years	68.9	79.3
Origins		
Malay	11.6	55.4
Chinese	72.9	36.5
Indian	15.6	8.1
Education-level		
Secondary School Pupil	26.7	9.2
Diploma/Foundation	18.7	43.5
Pupil	54.7	47.3
Fresh Undergraduate Pupil		
Frequency of playing games		
Daily	34.2	35.6
Once per week	23.6	20.5
A few times a week	42.2	43.9
Average daily hrs spent on gaming	71.1	71.6
1 to 4 hrs/Daily	24.4	24.8
Above 4 to 8 hrs/Daily	3.6	2.3
Above 8 to 12 hrs/Daily	.9	1.4
Over 12 hrs/Daily		
Responses were recorded using a multiple-response format (percent of cases indicates that each percentage is calculated out of 100)		
Most often videogames play		
Action	62.2	64.2
Adventure	52.9	61.0
Arcade	28.0	32.4
Shooter	52.0	53.4
Role-Playing	44.4	42.8
Fighting	43.6	48.2
Strategy	54.7	57.2
Sports Game	31.6	38.1
Racing	42.7	49.3
Casual	23.6	22.1
Children' Entertainment	5.3	11.9
Family Entertainment	13.3	17.6
Flight	12.9	13.5
Other video games/Genre	3.1	6.5

factors and their associated indicators. Items with factor loadings below 0.40 or cross-loadings above 0.40 were considered for deletion (Kim et al., 2012). Five items were removed due to poor loading and cross-loadings, leaving 27 items (see Table 4 and Appendix B for a detailed overview of the study instrument).

A seven-factor solution emerged based on eigenvalues greater than 1, as recommended by Jolliffe (2002) and Kaiser (1960). These factors *(enjoyment, escapism, sensory experience, role-projection, fantasy, emotional involvement, and arousal)* each achieved a composite reliability above 0.70 (Hair et al., 2013), as shown in Table 4. Correlations among constructs were examined, with the highest correlation (0.467) between role-projection and fantasy (sub-dimensions of imaginal experience) and the lowest (0.162) between role-projection and enjoyment (distinct dimensions of imaginal and emotional experience). Multicollinearity assessment revealed variance inflation factors (VIF) below 2, indicating no multicollinearity issues in our dataset.

PLS-SEM on study 2 sample (N = 444)

Confirmatory factor analysis, construct validity, and reliability assessments were conducted on study 2 data *(N = 444)* to evaluate the psychometric properties of the PCE construct (Churchill, 1979; Tsaur et al., 2016). The PLS-SEM approach was employed due to the presence of both reflective and formative constructs in the PCE model. PLS-SEM suits models with formative constructs, as it mitigates model misspecification risks inherent in covariance-based SEM, which can lead to Type I and Type II errors, ultimately resulting in invalid conclusions about the nature and strength of the relationships among constructs and their indicators (Chin, 2010; Hair et al., 2011; Jarvis et al., 2003; MacKenzie et al., 2005; Rasoolimanesh et al., 2016). WarpPLS 7.0 facilitated confirmatory factor analysis, reliability tests, validity tests, and higher-order analysis (Kock, 2015).

Validation followed three stages, as depicted in Fig. 1. The first stage involved the confirmatory factor analysis, reliability, and validity tests (e.g., convergent and discriminant) for the seven first-order *(fantasy, enjoyment, role-projection, escapism, arousal, sensory experience, and emotional involvement)* reflectively measured constructs. The second stage comprised evaluating two second-order formative constructs (emotional and imaginal experience) derived from six first-order reflective constructs *(arousal, emotional involvement, escapism, role-projection, fantasy, and enjoyment)*. The third stage validated the higher-order formative construct of PCE, formed from the three main second-order formative constructs *(emotional, imaginal, and sensory experience)*.

Evaluation of seven first-order reflective constructs of PCE

The seven first-order reflective constructs of PCEs were assessed following guidelines by Hair et al. (2011) and Hair et al. (2013). Outer loadings of items required a minimum of 0.40, ideally above 0.60 (Chin, 2010), composite reliability needed to exceed 0.70, and average variance extracted (AVE) for convergent validity had to surpass 0.5. Discriminant validity, an important component of construct validity in scale validation, was evaluated using Fornell and Larcker (1981) criterion, where the square root of AVE (diagonal values) for each construct should exceed its corresponding correlation coefficient, and Henseler et al.'s (2015) heterotrait-monotrait (HTMT) ratio, with values preferably below 0.85 or at most 0.90.

Outer loadings for all measurement items exceeded 0.6, except for Es3 and Rp2, the latter of which was deleted due to weak loadings. By contrast, Es3 was retained, as its loading of 0.537 exceeded 0.40, the minimum critical value, and the construct's AVE and composite reliability met thresholds (Hair et al., 2013). All constructs achieved AVE above 0.50 and CR above 0.70, confirming convergent validity (see Table 5).

Discriminant validity was established, with square roots of AVE (diagonal values) exceeding corresponding correlation coefficients (Table 6), and HTMT ratios below 0.85 (Table 7).

We also measured full collinearity (FVIF), assessing the vertical and lateral collinearity of one construct with other constructs (Kock & Lynn, 2012). FVIFs were below 3.3, meeting the strictest threshold (Hair et al., 2011; Kock & Lynn, 2012), as shown in Tables 5 and 7.

Evaluation of two second-order formative constructs of PCE

The second stage validated two second-order formative constructs: imaginal experience, formed from three lower-order reflective dimensions *(fantasy, escapism, and role-projection),* and emotional experience, created from three lower-order reflective dimensions *(arousal, enjoyment, and emotional involvement)*. A two-stage approach in WarpPLS, recommended by Becker et al. (2012), was applied to assess hierarchical models. Formative constructs were evaluated using VIFs to check collinearity among associated indicators, with thresholds of 5, or ideally 3.3 (Kock & Lynn, 2012). Chin (2010) and Hair et al. (2011) have further suggested assessing the outer weights and significance of the items used to form the formative construct.

We assessed the two second-order formative constructs. The results, reported in Table 8, showed that VIFs for all formative indicators were below 3.3, and indicator weights for the six first-order constructs

Table 4
EFA - study sample 1 ($N = 225$).

Item Code	Escapism	Fantasy	Role-Projection	Enjoyment	Emotion-Involvement	Arousal	Sensory Experience
(Eigenvalue = 1.624; Variation = 6.013 %; Cronbach's Alpha = 0.801)							
Es1	.812						
Es2	.833						
Es3	.905						
Es4	.575						
(Eigenvalue = 1.482; Variation = 5.488 %; Cronbach's Alpha = 0.862)							
Fa1		Deleted					
Fa2r		.964					
Fa3		.978					
Fa4		.670					
(Eigenvalue = 8.720; Variation = 32.295 %; Cronbach's Alpha = 0.902)							
Rp1			.837				
Rp2			.945				
Rp3			.928				
Rp4			.823				
(Eigenvalue = 2.000; Variation = 7.409 %; Cronbach's Alpha = 0.850)							
En1r				.716			
En2				.778			
En3				.872			
En4				.882			
(Eigenvalue = 1.322; Variation = 4.898 %; Cronbach's Alpha = 0.798)							
EI1					Deleted		
EI2					Deleted		
EI3					.655		
EI4					.804		
EI5					.881		
(Eigenvalue = 1.046; Variation = 3.874 %; Cronbach's Alpha = 0.772)							
Ar1						Deleted	
Ar2r						Deleted	
Ar3						.710	
Ar4						.563	
Ar5						.859	
(Eigenvalue = 2.611; Variation = 9.670 %; Cronbach's Alpha = 0.813)							
SE1							.461
SE2							.577
SE3							.520
SE4							.598
SE5							.884
SE6							.846

Table 5
Results of CFA and reliabilities for the first-order reflective constructs study sample 2 ($N = 444$).

Construct Scale	Item	Convergent Validity		CR	Cronbach's Alpha	Full Collinearity
		Loadings	AVE			
Escapism	Escap1	0.832	0.556	0.830	0.725	1.453
	Escap2	0.799				
	Escap3	0.537				
	Escap4	0.779				
Fantasy	Fan2r	0.705	0.641	0.842	0.715	1.416
	Fan3	0.890				
	Fan4	0.797				
Role-projection	Rolpr1	0.767	0.696	0.873	0.779	1.509
	Rolpr2**	Deleted				
	Rolpr3	0.906				
	Rolpr4	0.825				
Enjoyment	Enj1r	0.721	0.711	0.907	0.862	1.262
	Enj2	0.877				
	Enj3	0.875				
	Enj4	0.889				
Emotional-Involvement	EmoIn3	0.843	0.644	0.844	0.723	1.561
	EmoIn4	0.765				
	EmoIn5	0.798				
Arousal	Arous3	0.828	0.690	0.870	0.776	1.596
	Arous4	0.851				
	Arous5	0.813				
Sensory-Experience	SenEx1	0.676	0.555	0.882	0.839	1.646
	SenEx2	0.776				
	SenEx3	0.751				
	SenEx4	0.743				
	SenEx5	0.785				
	SenEx6	0.734				

Table 6
Discriminant validity (Approach: fornell and larcker criteria).

	Escapism	Fantasy	Rolepro	Enjoyment	Arousal	EmoInvo	Sensory
Escapism	0.746						
Fantasy	0.333	0.801					
Rolepro	0.436	0.377	0.835				
Enjoyment	0.355	0.2	0.209	0.843			
Arousal	0.34	0.283	0.381	0.354	0.831		
EmoInvo	0.365	0.476	0.314	0.319	0.428	0.803	
Sensory	0.384	0.312	0.465	0.3	0.529	0.392	0.745

Note: The diagonal displays the square roots of the average variances extracted (AVEs).

Table 7
Discriminant validity (Approach: HTMT ratios).

	Escapism	Fantasy	Roleproj	Enjoyment	Arousal	EmoInvol	SensoryE
Escapism							
Fantasy	0.457						
Roleproj	0.589	0.499					
Enjoy	0.459	0.254	0.270				
Arousal	0.442	0.376	0.492	0.430			
EmoInvol	0.512	0.661	0.422	0.406	0.570		
SensoryE	0.476	0.400	0.576	0.346	0.657	0.503	

HTMT ratios.
(**good** if < 0.90, **best** if < 0.85).

Table 8
Assessing the formative measurement model on the designated second-order constructs.

Constructs	Items	Scale type	Weights	Significance	Full collinearity	VIF
Imaginal-Experience		Formative			1.588	
	Escapism		0.428	<0.001		1.329
	Fantasy		0.404	<0.001		1.239
	Role-projection		0.452	<0.001		1.420
Emotional-Experience		Formative			1.708	
	Enjoyment		0.413	<0.001		1.190
	Emotional-Involvement		0.444	<0.001		1.274
	Arousal		0.457	<0.001		1.309

significantly contributed to their respective second-order constructs (imaginal and emotional experiences), confirming their validity.

Evaluation of the higher-order PCE construct

In the final stage, we validated the main higher-order formative PCE construct, formed by emotional, sensory, and imaginal experiences, using the two-stage WarpPLS approach. Validation followed criteria by Chin (2010) and Hair et al. (2011), assessing VIFs and indicator significance. Table 9, presenting the results for PCE, illustrates that VIFs of all formative indicators (imaginal, emotional, and sensory experiences) were lower than 3.3, and their weights were significant, confirming PCE as a multidimensional construct comprising reflective and formative elements (Chin, 2010; Hair et al., 2011; Kock & Lynn, 2012).

Nomological validity

Nomological validity assesses a scale's ability to align with theoretical expectations by empirically verifying hypothesized relationships within a nomological network (Dedeoğlu et al., 2020; Taufique et al., 2019). In this study, we applied the theory of reasoned action (TRA) to establish relationships between the newly developed scale (PCE) and TRA constructs. TRA posits that behavior stems from behavioral intention, driven by attitudes and subjective norms, with attitudes reflecting positive or negative evaluations of a behavior (Fishbein & Ajzen, 1975; Madden et al., 1992). Although TRA does not specify attitude formation, in video game research, attitudes toward gameplay have been predicted using variables such as flow, perceived ease of use, perceived enjoyment, and perceived usefulness (Alzahrani et al., 2017; Lee & Tsai, 2010; Mäntymäki et al., 2014). However, these variables are often overused, and PCE's role in attitude formation remains underexplored (Baranowski & Lyons, 2020; Wang & Goh, 2017). PCE, defined as intrinsically motivating, self-driven video gameplay for pleasure, involves hedonic experiences (feelings, sensory, and fantasy) under the hedonic theory of consumption (Abbasi et al., 2017; Alba & Williams, 2013; Hirschman & Holbrook, 1982; Holbrook et al., 1984; Wu & Holsapple, 2014). Hedonic consumption experience is derived from engaging with products such as music, drama, movies, and video games,

Table 9
Assessing the formative measurement model on the designated third-order construct.

Constructs	Items	Scale type	Weights	Significance	Full Collinearity	VIF
Playful Hedonic Experiences		Formative			N/A	
	Imaginal-Experience		0.400	<0.001		1.588
	Emotional-Experience		0.413	<0.001		1.708
	Sensory-Experience		0.392	<0.001		1.513

fostering recreational engagement (Wu & Holsapple, 2014). In this study, we consider the hedonic consumption experience as the PCE of PUBG. Greater involvement in PUBG enhances PCE, shaping positive attitudes toward play. Hence, we hypothesize that:

H1: PCE of PUBG positively impacts attitudes toward playing PUBG.

Attitudes, reflecting positive or negative evaluations, drive behavioral intention within TRA (Fishbein & Ajzen, 1975; Madden et al., 1992). Satisfying PCEs fosters positive attitudes, encouraging continued play, as evidenced in online gaming (Lee & Tsai, 2010). Consequently, positive attitudes toward PUBG are expected to influence players' intent to continue playing. Hence, we hypothesize that:

H2: Attitudes toward PUBG positively influence behavioral intention to play PUBG.

Behavioral intention, a primary determinant of behavior in TRA, is supported by other related theories, such as TAM and TPB (Bassiouni et al., 2019; Chu & Chen, 2016; Madden et al., 1992; Xiao, 2020). Research on MMORPGs confirms that intention predicts usage behavior (Wu & Holsapple, 2014). Accordingly, intention to play PUBG is expected to drive its usage, leading to the following hypothesis:

H3: Behavioral intention to play PUBG positively predicts PUBG usage behavior.

These hypotheses, grounded in TRA and PCE's role in video game engagement, are depicted in the nomological network (see Fig. 3).

To validate these hypotheses and establish nomological validity, data were collected from 294 regular PUBG players via purposive sampling through social media platforms and WhatsApp groups. Participants, predominantly male (84 %), aged 16–30 years (86 %) or 31–40 years (14 %), used smartphones as gaming devices (72.1 %) and played online with peers (60 %) at home (81 %) almost daily (56 %). We used WarpPLS 7.0 to validate the hypotheses and establish the nomological validity of our scale.

Our results indicated that PCE positively influenced gamers' attitudes toward playing PUBG, which drove behavioral intention, subsequently predicting usage behavior (see Table 10 and Fig. 4).

In summary, we demonstrated that overall perceived PCE is the key factor in developing gamers' attitudes toward a particular video game (i.e., PUBG). Such attitudes foster players' intention to play and increase their usage behavior. This suggests that engaging PCEs enhances satisfaction, attachment, and loyalty, encouraging sustained engagement.

Discussion

In this paper, we developed a novel multidimensional scale to assess PCE in video gameplay, addressing gaps in prior research that overlooked sensory experiences and hierarchical modeling (Sarstedt et al., 2019). Existing scales, such as IEQ, PENS, GEQ, and GUESS, while multidimensional, rarely applied hierarchical component models to specify, estimate, and validate the scales. Drawing on marketing and video game literature, we conceptualized PCE as an intrinsically motivated behavior encompassing sensory, emotional, and imaginal experiences, guided by the hedonic theory of consumption (Buchanan-Oliver & Seo, 2012; Holbrook et al., 1984). This framework positions video games as hedonic products that evoke feelings, imagination, and sensory engagement, enhancing understanding of players' complex experiences.

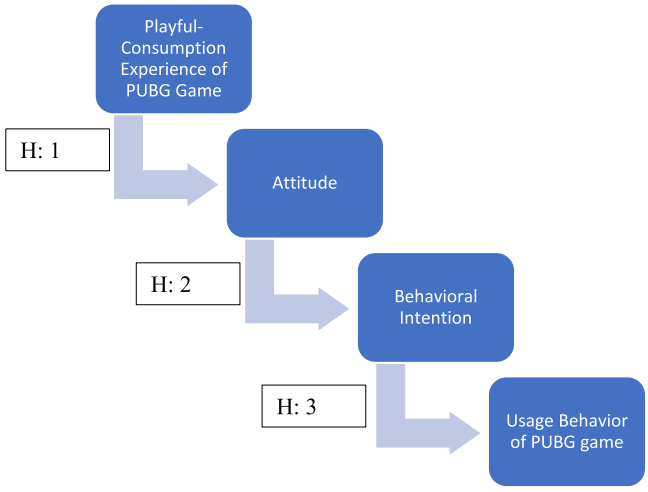

Fig. 3. Extended model of TRA in context of videogame playing.

The PCE scale development followed a five-step procedure, integrating hedonic theory to operationalize sensory, emotional, and imaginal dimensions. Data from two studies validated PCE as a multidimensional and reflective-formative construct. Study 1 (N = 225) employed EFA and reliability testing, yielding a seven-factor solution (enjoyment, escapism, sensory experience, role-projection, fantasy, emotional involvement, arousal) after deleting five items, with all constructs exceeding respective reliability thresholds. Study 2 (N = 444) used the PLS-SEM approach to validate the PCE scale in three phases: (1) CFA, reliability test, and construct validity for seven first-order reflective factors; (2) evaluation of second-order formative constructs (emotional and imaginal experiences); and (3) validation of the main higher-order formative construct, PCE. Results confirmed convergent and discriminant validity for first-order constructs, and second- and higher-order constructs demonstrated robust psychometric properties, affirming PCE's multidimensional nature.

The study offers several theoretical contributions. Unlike prior studies using immersion, presence, flow, and cognitive absorption to assess player experiences (Calvillo-Gámez et al., 2015; Cheng et al., 2015; De Kort et al., 2007; Ermi & Mäyrä, 2005; Jennett et al., 2008), this study leverages the existing literature on HCI by using the hedonic theory of consumption experience to redefine PCE as a multidimensional construct.

We extend beyond traditional conceptualizations of player experience by arguing that game consumption is focused not only on fulfilling a need but also on seeking pleasure, fantasy, emotional engagement, and sensory gratification, which we align with the hedonic consumption perspective introduced by Hirschman and Holbrook (1982). Thus, we provide a more refined insight into gaming as a multidimensional phenomenon, elucidating the interplay between imaginal, emotional, and sensory dimensions in influencing consumer engagement with video games.

Additionally, the integration of the hedonic consumption theory bridges the gap between marketing, consumer behavior, and game studies. This is an important aspect of our study, which provides a more experience-driven method to understand player motivations. We contradict the traditional player experience models that primarily examine interaction mechanics and cognitive states, whereas our approach emphasizes fantasy-driven, emotionally immersive, and sensory-stimulating aspects of gaming (Hua et al., 2024). This insight contributes to enhancing the theoretical framework, which strives to position video games as interactive digital products and experiential commodities that lead to pleasure, escapism, and deep emotional investment.

As our study defined PCE as a multidimensional construct, we provide a theoretically sound and empirically relevant framework to evaluate video game experiences that are beyond ordinary usability or engagement metrics (Abbasi et al., 2021). This new perspective can transform future research in game design, marketing strategies, and player psychology, where a more intricate understanding of how and why individuals can derive pleasure from digital gaming experiences is presented. In other words, our study redefines how digital gaming experiences can be evaluated by ensuring a more holistic and player-centered approach for optimized player satisfaction and engagement.

Several studies have developed scales to quantify player experiences in video gameplay (Calvillo-Gámez et al., 2015; Cheng et al., 2015; De

Table 10
Hypotheses testing in a nomological network.

Hypothesis testing		Path Coefficient	SE	F2	T-value	P- value	R2	Q2	Result
H1:PCE	Attitude	0.560	0.053	0.313	10.567	<0.001	0.31	0.320	Supported
H2: Attitude	Behavioral Intention	0.432	0.054	0.187	8	<0.001	0.19	0.189	Supported
H3:Behavioral Intention	Usage Behavior	0.423	0.055	0.179	7.690	<0.001	0.18	0.172	Supported

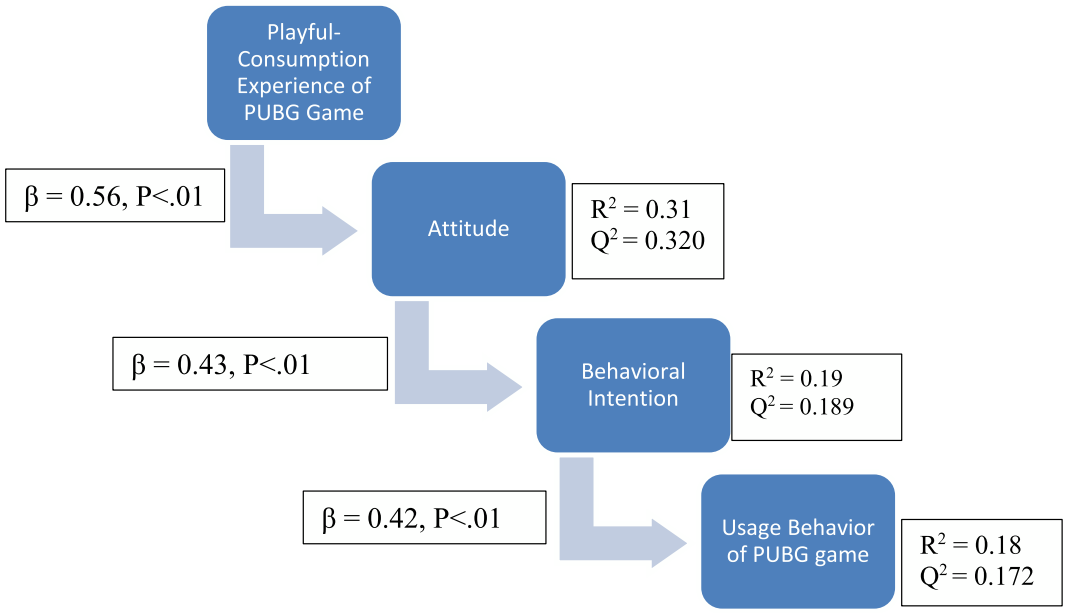

Fig. 4. Hypotheses testing.

Kort et al., 2007; Ermi & Mäyrä, 2005; Fang et al., 2013; Fu et al., 2009; IJsselsteijn et al., 2008; Jennett et al., 2008; Phan et al., 2016; Qin et al., 2009). These studies often focused on assessing the mental and emotional-related experiences, overlooking sensory experiences. However, our study adds value by developing a novel PCE scale that captures the emotional, sensory, and imaginal experiences. Our scale extended the emotional experiences in video gameplay by incorporating earlier scales' arousal and emotional involvement factors. Besides, our scale included the imaginal experience comprising fantasy, role-projection, escapism, and sensory experience. These multiple experiences can be applied to study the behavioral intention to play video games. Previously, authors only examined imaginal and emotional experiences to predict behavioral intention to play video games and overall usage behavior (Wu & Holsapple, 2014). Several variables, such as consumer video game engagement, gamers' satisfaction, subjective well-being, continuous behavioral intention, gamers' loyalty, and gamers' observational learning, can be examined with PCE video games. PCE provides a multidimensional view that offers options to researchers to capture either parsimonious relationships (using second-order constructs, i.e., imaginal, emotional, and sensory experiences or higher-order constructs, i.e., PCE) or detailed experiences (using first-order constructs such as escapism, fantasy, role-projection, arousal, emotional involvement, enjoyment, and sensory experience).

This study also advances methodological rigor in HCI literature by validating the PCE scale using a hierarchical component model, addressing limitations in prior multidimensional scales such as IEQ, PENS, GEQ, and GUESS (IJsselsteijn et al., 2008; Jennett et al., 2008; Phan et al., 2016; Ryan et al., 2006). Unlike these scales, which rarely employ hierarchical approaches for multidimensional validation, the PCE scale was specified, estimated, and validated following Sarstedt et al.'s (2019) recommendations, ensuring robust psychometric properties in the video game context.

Theoretically, this study extends prior video game studies that relied on flow experience, perceived usefulness, perceived enjoyment, and perceived ease of use to examine gamers' attitudes toward play (Alzahrani et al., 2017; Lee & Tsai, 2010). By examining PCE's impact on attitudes toward PUBG, this study provides empirical evidence that PCE, as a multidimensional construct, significantly shapes gamers' attitudes, enriching the TRA in gaming contexts. These findings offer a novel hedonic perspective on attitude formation, demonstrating satisfactory results.

Practically, the PCE scale equips developers with a versatile tool to assess seven gaming experiences—role-projection, escapism, fantasy, enjoyment, arousal, emotional involvement, and sensory experience—across various genres of games. This assessment informs design strategies to enhance behavioral intention, engagement, and observational learning (Abbasi et al., 2018; Abbasi et al., 2020b). Developers can assess players' gaming experiences at the domain (imaginal, emotional, and sensory experiences) and higher-order (overall PCE) levels tailoring games to diverse player needs.

As PCE is important in enhancing player engagement, satisfaction, and long-term retention, game developers should prioritize sensory immersion through high-fidelity graphics, enriched sound design, and haptic feedback (Yuhan et al., 2024). This is an important consideration to create immersive and emotionally compelling gaming experiences. Such enhancements deepen player involvement, strengthen competitive differentiation, and foster loyalty. Similarly, emotionally compelling narratives, achieved via personalized character development or branching storylines, create deeper connections with game characters, enhancing satisfaction and prolonging gameplay (Wibowo et al., 2025). Emotionally compelling experiences can improve the overall gaming experience, rendering the gaming experience more memorable and impactful.

The PCE scale can also be improved by introducing open-ended and

sandbox elements, allowing players to create and craft their narratives (Leinonen et al., 2021). This is because such elements lead to creative freedom, establish autonomy, and personalize experiences. Gamers are prone to crafting their unique narratives and exploring diverse possibilities. This enables them to shape their in-game journeys, promoting a sense of ownership, immersion, and prolonged engagement in the gaming world.

Additionally, developers can embed AI elements to personalize gameplay experiences and generate dynamic narratives based on player behavior. The use of non-playable characters (NPC), which serve different roles, can enhance players' immersion (Uludağlı & Oğuz, 2023). The relatively more realistic NPC interactions can generate an intensified sense of immersion and game excitement. Game developers can enhance AI-driven NPC behaviors to enable more realistic and dynamic conversations, adaptive and interactive responses, and lifelike movements. This improved NPC can allow players to immerse themselves in the game and experience elevated agency in shaping in-game narratives.

Conclusion

In this study, we operationalized PCE in video games using the hedonic theory of consumption, developing a valid and reliable scale to measure imaginal, emotional, and sensory experiences. We also conducted a third study to establish our scale's nomological validity by extending TRA, demonstrating that PCE positively predicts attitudes toward PUBG, which drives behavioral intention and usage behavior. The scale's robust psychometric properties confirm its utility for assessing playful gaming experiences.

Future research should validate the PCE scale across diverse countries, age groups, and mediums such as exergames (Pham et al., 2020) and violent games (Abbasi et al., 2022), extending beyond the current 16–19-year-old Malaysian and Pakistani samples. Exploring criterion-related validity with outcomes, including consumer video game engagement, satisfaction, or subjective well-being, and comparing PCE across game genres (e.g., imagination-based, sports, or physical enactment games) using multigroup analysis, could reveal distinct types of gaming experiences such as imaginal, emotional, and sensory experiences (Cheah et al., 2023; Jang & Byon, 2020).

We acknowledge that mediation and moderation effects were not tested in this study, which could further enrich the understanding of the model. As a potential avenue for future research, we propose investigating the mediating role of consumer video game engagement in the relationship between PCE and personality traits such as openness to experience (e.g., creativity, aesthetic appreciation, and inquisitiveness; Abbasi et al., 2025; Lee et al., 2022; Zeigler-Hill & Monica, 2015). Additionally, different game genres (e.g., imagination-driven games including DOTA2 or physical enactment games such as *Counter-Strike: Global Offensive*) may act as meaningful moderators in these relationships (Jang & Byon, 2020). These suggestions are grounded in the theoretical lens of trait activation theory and hedonic consumption frameworks, which emphasize how individual traits and contextual factors interact to shape the user experience.

We also acknowledge that the use of Malaysian and Pakistani samples may limit the broad generalizability of our findings. However, both countries represent emerging yet vibrant esports ecosystems. Malaysia, for instance, has received strong governmental support, hosts major international tournaments, and promotes esports education (ESI Editorial Team, 2024). Pakistan's esports market is also growing rapidly, with increasing user penetration and interest from global sponsors (Statista, 2025). These dynamic settings offer valuable insights into underexplored gamer segments in emerging markets.

Moreover, given the inherently global and culturally transcendent nature of esports, played widely across regions and demographics, we believe the applicability of our scale extends beyond the current sample. The constructs examined are grounded in gamer behavior that transcends specific national contexts, enhancing the scale's potential for broader adoption and acceptability. Nevertheless, we agree that more culturally diverse studies are needed to further validate the scale and examine its antecedents and consequences in varied socio-cultural settings.

Efforts are underway to translate the PCE scale into multiple languages to further validate its applicability across diverse linguistic contexts. Our study applied the TRA to develop the nomological network hypotheses but omitted subjective norms, a critical TRA component influencing behavioral intention. Therefore, future research should consider all TRA and TPB to comprehensively model gaming behavior. By advancing a robust, multidimensional PCE scale, this study paves the way for global research into video game experiences, fostering deeper insights into player engagement and satisfaction.

Funding

This project was funded by IRC for Finance and Digital Economy-KFUPM under project no. INFE2402.

CRediT authorship contribution statement

Amir Zaib Abbasi: Writing – review & editing, Writing – original draft, Visualization, Validation, Software, Resources, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Ding Hooi Ting:** Writing – review & editing, Writing – original draft, Validation, Supervision, Methodology, Investigation, Conceptualization. **Helmut Hlavacs:** Writing – review & editing, Writing – original draft, Supervision, Software, Methodology, Investigation. **Bradley Wilson:** Writing – review & editing, Writing – original draft, Methodology. **Mousa Albashrawi:** Writing – review & editing, Validation, Supervision. **Yogesh K. Dwivedi:** Writing – review & editing, Supervision.

Declaration of competing interest

The authors confirm that there is no conflict of interest related to this study

Acknowledgments

The authors would like to thank Morris B. Holbrook (Dillard Professor Emeritus of Marketing, Graduate School of Business, Columbia University, New York City) for generously helping us in developing the questionnaire.

Appendix A. Scales on game user experiences research

Sr. #	Measurement scale	Theory/Construct Definition	Dimensions	Covering aspects

(*continued on next page*)

(*continued*)

Sr. #	Measurement scale	Theory/Construct Definition	Dimensions	Covering aspects
1	*AttrakDiff2 Questionnaire* Hassenzahl et al. (2003)	No relevant theory is applied.	Hedonic Quality factors (Stimulation and Identity) and Pragmatic quality	Quantify the usability experience (especially assessing the user interface of a particular software product).
2	*Flow-State-Questionnaire* Choi and Kim (2004)	Flow theory	Intrinsic interest, curiosity, control, and attention focus	Examines the level of optimal experience while playing a videogame
3	*Gameplay-Experience-Questionnaire* Ermi and Mäyrä (2005)	Immersion theory	Challenge-based, sensory, and imaginative immersion	Captures gameplay experiences that are also categorized as escapist experiences
4	*Player-Experience-of-Need Satisfaction* (PENS) Ryan et al. (2006)	Self-determination theory (SDT)	Autonomy, relatedness, and connectedness	Examines the motivations for computer gameplay
5	*Social-Presence-In-Gaming Questionnaire* (SPGQ) De Kort et al. (2007)	Theory of social presence	Emotions in terms of psychological involvement-Negative feelings, psychological involvement-empathy, and behavioral engagement.	Player awareness and involvement with other players
6	*Immersive-Experience-Questionnaire (IEQ)* Jennett et al. (2008)	Cognitive absorption, flow, presence, and immersion theory	Cognitive absorption, flow, presence, and immersion theory	Assess the experience of immersion
7	*Game-Experience-Questionnaire* (GEQ) IJsselsteijn et al. (2008)	Flow and immersion theories	Immersion, challenge, flow, tension, competence, negative, and positive affect	Evaluate the gaming experience
8	*Gameplay-Scale* Parnell (2009)	No proper theory used	Affective Experience, focus, playability barriers, and usability barriers	Evaluate a player's attitudes towards the videogame's quality and appeal
9	*Play-Experience-Scale* (PES) Pavlas et al. (2012)	PES scale was constructed based on multiple play definitions such as, play is an intrinsically motivated activity, is executed freely, play requires and captures the gamer's attention, and it is not reliant on external consequences or rewards.	Play-direct, freedom, autotelic-focus, and no extrinsic	Examines the play experience of video gamers
10	*Flow-Questionnaire* Fang et al. (2013)	Flow theory	Autotelic experience, concentration on the task at hand, control, immersion, a challenging activity that require skills, clear goals and feedback	Assess all the elements of flow in computer gameplay
11	*Core-Elements-of-the-Gaming Experience Questionnaire* (CEGEQ) Calvillo-Gámez et al. (2015)	The theory of the Core Elements of the Gaming Experience (CEGE), which is developed through Qualitative approaches	Environment, enjoyment, control, ownership, facilitators, and gameplay	Measures the essential elements of player experience when playing a videogame
12	*Game-Immersion-Experience* Cheng et al. (2015)	Immersion theory	Engagement, total immersion, and engrossment	Evaluate the level of felt immersion while playing a digital game
13	*Playful-Experiences Questionnaire* Boberg et al. (2015)	Playfulness is "a state of mind whereby people approach everyday activities with a frivolous, purposeless, and frisky attitude".	Thrill, captivation, control, completion, challenge, competition, suffering, cruelty, subversion, discovery, sensation, exploration, relaxation, expression, nurture, fellowship, and humor.	Estimates the different attributes of playfulness while using an interactive product or service
14	*Game-User-Experience-Satisfaction Scale* (GUESS) Phan et al. (2016)	No specific theory is used instead existing scales on experience were used to develop the GUESS scale	Visual aesthetics, usability/playability, social connectivity, creative freedom, narratives, play engrossment, personal gratifications, audio aesthetics, and enjoyment	Measures the features of a videogame that further contribute to player satisfaction, also assisting in questioning the videogame player on their videogame playing experience
15	*Gameful Experience in Gamification (GAMEX)* Eppmann et al. (2018)	Gameful experience in a non-game context refers to the positive emotional and involving qualities of using a gamified application.	Enjoyment, creative thinking, dominance, absorption, activation, and absence of negative affect	Captures gameful experiences of consumers with gamified applications that are developed in non-game contexts
16	*UPEQ (Ubisoft Perceived Experience Questionnaire)* (Azadvar & Canossa, 2018)	Developed based on SDT theory	Autonomy, relatedness, and competence	Assessing players' need satisfaction in terms of basic psychological needs
17	*Gameful Experience Questionnaire (GAMEFULQUEST)* Högberg et al. (2019)	No specific theory or definition has been used. Instead, the authors developed the scale using a qualitative technique	Accomplishment, competition, immersion, challenge, guided, social experience, and playfulness	Examines the gameful experiences of consumers in the context of services and systems
18	*Video Game Pursuit (VGPu) Scale* Sanchez and Langer (2020b)	No relevant theory is applied.	Prone to game immersion, Intentional game play, generalized self-efficacy, enjoyment of games	A tool to assess and represent individuals who pursue videogames
19	*Player Experience Inventory* (Abeele et al., 2020)	Means-End theory	Functional (e.g., ease of control, goals and rules, progress feedback, challenge, and audiovisual appeal) and psychosocial consequences (e.g., mastery, immersion, autonomy, meaning, and curiosity)	Estimates players' experience at functional and psychosocial levels.
20	*Basic Needs in Gaming Scale (BANGS)* (Ballou et al., 2024)	SDT theory	Autonomy satisfaction, autonomy frustration, competence satisfaction, competence frustration, relatedness satisfaction, and relatedness frustration.	Estimates basic psychological needs (e.g., satisfaction and frustration).
21	Present Study *Developing a PCE scale*	Hedonic Theory of Consumption experience to define and operationalize the PCE of a videogame. PCE refers to	Escapism, fantasy, emotional involvement, enjoyment, role-projection, arousal, sensory experience	Measures players' experiences in videogame environment through imaginal, emotional, and sensory experience

Appendix B

	PCE Scale (Final Version)
Es1	Playing ___ gets me away from reality.
Es2	Playing ___ gets me away from the problems and pressures.
Es3	Playing ___ helps me escape from things that are unpleasant and worrying.
Es4	Playing ___ makes me feel like I am in a different world of reality.
Fa1*	Playing ___ helps me construct fantasies.
Fa2r	Playing ___ does not stimulate my imagination.
Fa3	Playing ___ helps me create daydreams.
Fa4	Playing ___ helps me augment reality.
Rp1	Playing ___ enables me to project myself into a particular role.
Rp2**	Playing ___ enables me to project myself into a particular character.
Rp3	Playing ___ enables me to project myself into a particular task.
Rp4	Playing ___ enables me to project myself into someone else.
En1r	Playing ___ is not really fun.
En2	Playing ___ provides me with a lot of enjoyment.
En3	Playing ___ is enjoyable.
En4	I enjoy playing ___.
EI1*	When I am playing ___, I feel carried off.
EI2*	When I am playing ___, I feel as I am part of this video-game.
EI3	When I am playing ___, I feel deeply about this video-game.
EI4	When I am playing ___, I get into this video-game.
EI5	After I finish playing ___, I may carry the video-game playing experience with me for a while.
Ar1*	Playing ___ makes me stimulated.
Ar2r*	Playing ___ does not make me excited.
Ar3	Playing ___ makes me inspired.
Ar4	Playing ___ makes me wide-awake.
Ar5	Playing ___ makes me motivated.
SE1	Playing ___ influences my physical movement.
SE2	My body adapts sudden actions, as a reaction to certain situations in the video-game (e.g. *trying to move my hand in the direction of the gun I am pointing in the game, etc.*).
SE3	The peripheral video-gaming device (joy-stick, joy-pad, and other accessories) makes me actually feel the physical experience of the game.
SE4	The video-game music stimulates my emotions to adapt and react accordingly (e.g. *I play aggressively with aggressive music, I play calmly with soft music and react in fear to horror music, etc.)*.
SE5	The scenic beauty of the video-game is aesthetically appealing to me.
SE6	The visuals of the video-game fill my appetite for unique and different structures, shapes and designs.

Note: Items with * deleted in the EFA Stage. Items with **deleted in the CFA
In Study Sample 1 and 2, we used a videogame in the space section. In Study Sample 3, we used the PUBG game in the Space section.

References

Abbasi, A. Z., Asif, M., Hollebeek, L. D., Islam, J. U., Ting, D. H., & Rehman, U. (2020a). The effects of consumer esports videogame engagement on consumption behaviors. *Journal of Product & Brand Management*. https://doi.org/10.1108/JPBM-04-2020-2839

Abbasi, A. Z., Azeem, S., & Ting, D. H. (2025). Validating the HEXACO Malay version as reflective-formative model: The application of hierarchical component model. *Cogent Psychology, 12*(1), Article 2466311.

Abbasi, A. Z., & Jamak, A. B. S. A. (2017). Playful-consumption experience of videogame-play influences consumer video-game engagement: A conceptual model. *Global Business and Management Research, 9*(1s), 244.

Abbasi, A. Z., Rehman, U., Hussain, K., Ting, D. H., Hlavacs, H., & Qummar, H. (2022). The effect of three violent videogame engagement states on aggressive behavior: A partial least squares structural equation modeling approach. *Frontiers in Psychology, 13*, 918968.

Abbasi, A. Z., Shamim, A., Ting, D. H., Hlavacs, H., & Rehman, U. (2021). Playful-consumption experiences and subjective well-being: Children's smartphone usage. *Entertainment Computing, 36*, Article 100390.

Abbasi, A. Z., Ting, D. H., & Hlavacs, H. (2016a). Proposing a new conceptual model predicting consumer videogame engagement triggered through playful-consumption experiences. In , *15. Proceeedings of the entertainment computing-ICEC 2016: 15th IFIP TC 14 international conference* (pp. 126–134). Springer International Publishing. *September 28-30, 2016, Proceedings*.

Abbasi, A. Z., Ting, D. H., & Hlavacs, H. (2016b). A revisit of the measurements on engagement in videogames: A new scale development. In , *15. Proceeedings of the entertainment computing-ICEC 2016: 15th IFIP TC 14 international conference* (pp. 247–252). Springer International Publishing. *September 28-30, 2016, Proceedings*.

Abbasi, A. Z., Ting, D. H., & Hlavacs, H. (2017). Playful-consumption experience in digital game playing: A scale development. In N. Munekata, I. Kunita, & J. Hoshino (Eds.), *Proceeedings of the entertainment computing – ICEC 2017: 16th IFIP TC 14 international conference* (pp. 290–296). Springer International Publishing. https://doi.org/10.1007/978-3-319-66715-7_32. *September 18-21, 2017, Proceedings*.

Abbasi, A. Z., Ting, D. H., Hlavacs, H., Costa, L. V., & Veloso, A. I. (2019). An empirical validation of consumer video game engagement: A playful-consumption experience approach. *Entertainment Computing, 29*, 43–55. https://doi.org/10.1016/j.entcom.2018.12.002

Abbasi, A. Z., Ting, D. H., Hlavacs, H., & Fayyaz, M. S. (2018). Modeling consumers' observational learning in digital gaming: A conceptual model. In , *4. Proceeedings of the serious games: 4th joint international conference, JCSG 2018* (pp. 159–168). Springer International Publishing. *November 7-8, 2018, Proceedings*.

Abbasi, A. Z., Ting, D. H., Hlavacs, H., Wilson, B., Rehman, U., & Arsalan, A. (2020b). Personality differences between videogame vs. non-videogame consumers using the HEXACO model. *Current Psychology*. https://doi.org/10.1007/s12144-020-00793-2

Acharya, A. S., Prakash, A., Saxena, P., & Nigam, A. (2013). Sampling: Why and how of it? *Indian Journal of Medical Specialities, 4*(2), 330–333. https://doi.org/10.7713/ijms.2013.0032

Agarwal, R., & Karahanna, E. (2000). Time flies when you're having fun: Cognitive absorption and beliefs about information technology usage. *MIS Quarterly, 24*(4), 665–694.

Alba, J. W., & Williams, E. F. (2013). Pleasure principles: A review of research on hedonic consumption. *Journal of Consumer Psychology, 23*(1), 2–18.

Ali, F., Hussain, K., & Ryu, K. (2017). Resort hotel service performance (RESERVE)–an instrument to measure tourists' perceived service performance of resort hotels. *Journal of Travel & Tourism Marketing, 34*(4), 556–569.

Alzahrani, A. I., Mahmud, I., Ramayah, T., Alfarraj, O., & Alalwan, N. (2017). Extending the theory of planned behavior (TPB) to explain online game playing among Malaysian undergraduate students. *Telematics and Informatics, 34*(4), 239–251.

Association, E.S. (2023). Essential facts about the video game industry. https://www.theesa.com/2023-essential-facts/.

Baranowski, T., & Lyons, E. J. (2020). Scoping review of Pokemon Go: Comprehensive assessment of augmented reality for physical activity change. *Games for Health Journal, 9*(2), 71–84.

Bassiouni, D. H., Hackley, C., & Meshreki, H. (2019). The integration of video games in family-life dynamics: An adapted technology acceptance model of family intention to consume video games. *Information Technology & People, 32*(6), 1376–1396.

Becker, J.-M., Klein, K., & Wetzels, M. (2012). Hierarchical latent variable models in PLS-SEM: Guidelines for using reflective-formative type models. *Long Range Planning, 45*(5), 359–394.

Boberg, M., Karapanos, E., Holopainen, J., & Lucero, A. (2015). PLEXQ: Towards a playful experiences questionnaire. In *Proceedings of the annual symposium on computer-human interaction in play* (pp. 381–391).

Brakus, J. J., Schmitt, B. H., & Zarantonello, L. (2009). Brand experience: What is it? How is it measured? Does it affect loyalty? *Journal of Marketing, 73*(3), 52–68.

Brockmyer, J. H., Fox, C. M., Curtiss, K. A., McBroom, E., Burkhart, K. M., & Pidruzny, J. N. (2009). The development of the game engagement questionnaire: A measure of engagement in video game-playing. *Journal of Experimental Social Psychology, 45*(4), 624–634.

Brown, E., & Cairns, P. (2004). A grounded investigation of game immersion. In *Proceedings of the CHI'04 extended abstracts on human factors in computing systems* (pp. 1297–1300).

Buchanan-Oliver, M., & Seo, Y. (2012). Play as co-created narrative in computer game consumption: The hero's journey in Warcraft III. *Journal of Consumer Behaviour, 11*(6), 423–431.

Cabrera-Nguyen, P. (2010). Author guidelines for reporting scale development and validation results in the Journal of the Society for Social Work and Research. *Journal of the Society for Social Work and Research, 1*(2), 99–103.

Calvillo-Gámez, E. H., Cairns, P., & Cox, A. L. (2015). Assessing the core elements of the gaming experience. *Game User Experience Evaluation* (pp. 37–62). Cham: Springer.

Cheah, J.-H., Amaro, S., & Roldán, J. L. (2023). Multigroup analysis of more than two groups in PLS-SEM: A review, illustration, and recommendations. *Journal of Business Research, 156*, Article 113539.

Cheng, M. T., She, H. C., & Annetta, L. A. (2015). Game immersion experience: Its hierarchical structure and impact on game-based science learning. *Journal of Computer Assisted Learning, 31*(3), 232–253.

Chin, W. W. (2010). How to write up and report PLS analyses. *Handbook of partial least squares: Concepts, methods and applications* (pp. 655–690). Berlin, Heidelberg: Springer Berlin Heidelberg.

Choi, D., & Kim, J. (2004). Why people continue to play online games: In search of critical design factors to increase customer loyalty to online contents. *CyberPsychology & Behavior, 7*(1), 11–24.

Chu, T.-H., & Chen, Y.-Y. (2016). With good we become good: Understanding e-learning adoption by theory of planned behavior and group influences. *Computers & Education, 92*, 37–52.

Churchill, G. A., Jr. (1979). A paradigm for developing better measures of marketing constructs. *Journal of Marketing Research, 16*(1), 64–73.

De Kort, Y. A., IJsselsteijn, W. A., & Poels, K. (2007). Digital games as social presence technology: Development of the social presence in gaming questionnaire (SPGQ). In *Proceedings of the PRESENCE* (pp. 1–9). *195203*.

Dedeoğlu, B. B., Taheri, B., Okumus, F., & Gannon, M. (2020). Understanding the importance that consumers attach to social media sharing (ISMS): Scale development and validation. *Tourism Management, 76*, Article 103954.

Denisova, A., Nordin, A. I., & Cairns, P. (2016). The convergence of player experience questionnaires. In *Proceedings of the annual symposium on computer-human interaction in play* (pp. 33–37).

Eppmann, R., Bekk, M., & Klein, K. (2018). Gameful experience in gamification: Construction and validation of a gameful experience scale [GAMEX]. *Journal of Interactive Marketing, 43*, 98–115.

Ermi, L., & Mäyrä, F. (2005). Fundamental components of the gameplay experience: Analysing immersion. In *Proceedings of the DiGRA 2005 conference: Changing views: Worlds in play*.

ESI Editorial Team. (2024). Esports around the world: Malaysia. Esports insider.

Eskelinen, M. (2001). Towards computer game studies. *Digital creativity, 12*(3), 175–183.

Fang, X., Chan, S., Brzezinski, J., & Nair, C. (2010). Development of an instrument to measure enjoyment of computer game play. *International Journal of Human–Computer Interaction, 26*(9), 868–886.

Fang, X., Zhang, J., & Chan, S. S. (2013). Development of an instrument for studying flow in computer game play. *International Journal of Human-Computer Interaction, 29*(7), 456–470.

Fayyaz, M. S., Abbasi, A. Z., Ahmad, R., Qummar, M. H., Tsiotsou, R. H., & Mahmood, S. (2025). Gamers' gratifications and continuous intention to play eSports: The mediating role of gamers' satisfaction-a PLS-SEM and NCA study. *International Journal of Sports Marketing and Sponsorship*. https://doi.org/10.1108/IJSMS-03-2024-0068. *ahead-of-print*(ahead-of-print).

Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention and behavior: An introduction to theory and research*. Addison-Wesley. https://doi.org/10.2307/2065853

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research, 18*(1), 39–50.

Fu, F.-L., Su, R.-C., & Yu, S.-C. (2009). EGameFlow: A scale to measure learners' enjoyment of e-learning games. *Computers & Education, 52*(1), 101–112.

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed a silver bullet. *Journal of Marketing Theory and Practice, 19*(2), 139–152.

Hair, J. F., Jr, Hult, G. T. M., Ringle, C., & Sarstedt, M. (2013). *A primer on partial least squares structural equation modeling (PLS-SEM)*. Sage Publications.

Hassenzahl, M., Burmester, M., & Koller, F. (2003). AttrakDiff: Ein fragebogen zur messung wahrgenommener hedonischer und pragmatischer qualität. *Mensch & Computer 2003: Interaktion in Bewegung*, 187–196.

Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science, 43*(1), 115–135.

Hirschman, E. C. (1983). Predictors of self-projection, fantasy fulfillment, and escapism. *The Journal of Social Psychology, 120*(1), 63–76.

Hirschman, E. C., & Holbrook, M. B. (1982). Hedonic consumption: Emerging concepts, methods and propositions. *Journal of Marketing, 46*(3), 92–101.

Högberg, J., Hamari, J., & Wästlund, E. (2019). Gameful Experience Questionnaire (GAMEFULQUEST): An instrument for measuring the perceived gamefulness of system use. *User Modeling and User-Adapted Interaction, 29*(3), 619–660.

Holbrook, M. B., Chestnut, R. W., Oliva, T. A., & Greenleaf, E. A. (1984). Play as a consumption experience: The roles of emotions, performance, and personality in the enjoyment of games. *Journal of Consumer Research, 11*(2), 728–739.

Hollebeek, L. D., Abbasi, A. Z., Schultz, C. D., Ting, D. H., & Sigurdsson, V. (2022). Hedonic consumption experience in videogaming: A multidimensional perspective. *Journal of Retailing and Consumer Services, 65*, Article 102892. https://doi.org/10.1016/j.jretconser.2021.102892

Holsapple, C. W., & Wu, J. (2007). User acceptance of virtual worlds: The hedonic framework. *ACM SIGMIS Database: The DATABASE for Advances in Information Systems, 38*((4), 86–89.

Hua, W., Liu, Y., Zhang, Z., Li, M., & Yu, X. (2024). Exploring users' adoption intention of virtual try-on apps: How users' individual characteristics affect post-use feelings. *Asia Pacific Journal of Marketing and Logistics, 36*(8), 1898–1917.

Hussain, A., Mirza, F., Sarker, M., & Ting, D. H. (2024). From play to pay: Exploring imaginal and emotional virtual item retail experiences in online game environment. *International Journal of Human–Computer Interaction*, 1–15. https://doi.org/10.1080/10447318.2024.2415758

Ijsselsteijn, W. A., de Kort, Y. A., Poels, K., Jurgelionis, A., & Bellotti, F. (2007). Characterising and measuring user experiences in digital games. In *Proceedings of the conference; ACE 2007; 2007-06-13; 2007-06-15* (pp. 1–4).

IJsselsteijn, W., Poels, K., & De Kort, Y. (2008). *The game experience questionnaire: Development of a self-report measure to assess player experiences of digital games*. Eindhoven, The Netherlands: TU Eindhoven.

Jang, W. W., & Byon, K. K. (2020). Antecedents of esports gameplay intention: Genre as a moderator. *Computers in Human Behavior, 109*, Article 106336.

Jarvis, C. B., MacKenzie, S. B., & Podsakoff, P. M. (2003). A critical review of construct indicators and measurement model misspecification in marketing and consumer research. *Journal of Consumer Research, 30*(2), 199–218.

Jennett, C., Cox, A. L., Cairns, P., Dhoparee, S., Epps, A., Tijs, T., & Walton, A. (2008). Measuring and defining the experience of immersion in games. *International Journal of Human-Computer Studies, 66*(9), 641–661.

Jiang, Q., Qian, J., & Zang, Y. (2025). Integrating intangible cultural heritage elements into mobile games: An exploration of player cultural identity. *Information Technology & People*. https://doi.org/10.1108/ITP-01-2024-0088. Vol. ahead-of-print No. ahead-of-print.

Jiao, H., Wang, T., Libaers, D., Yang, J., & Hu, L. (2025). The relationship between digital technologies and innovation: A review, critique, and research agenda. *Journal of Innovation & Knowledge, 10*(1), Article 100638.

Johnson, D., Gardner, M. J., & Perry, R. (2018). Validation of two game experience scales: The player experience of need satisfaction (PENS) and game experience questionnaire (GEQ). *International Journal of Human-Computer Studies, 118*, 38–46.

Jolliffe, I. (2002). *Principal component analysis*. Wiley Online Library.

Kaiser, H. F. (1960). The application of electronic computers to factor analysis. *Educational and Psychological Measurement, 20*(1), 141–151.

Kaiser, H. F. (1974). An index of factorial simplicity. *Psychometrika, 39*(1), 31–36.

Kim, J.-H., Ritchie, J. B., & McCormick, B. (2012). Development of a scale to measure memorable tourism experiences. *Journal of Travel Research, 51*(1), 12–25.

Klasen, M., Weber, R., Kircher, T. T., Mathiak, K. A., & Mathiak, K. (2012). Neural contributions to flow experience during video game playing. *Social Cognitive and Affective Neuroscience, 7*(4), 485–495.

Kock, N. (2015). *WarpPLS 5.0 user manual*. Laredo, TX: ScriptWarp Systems.

Kock, N., & Lynn, G. (2012). Lateral collinearity and misleading results in variance-based SEM: An illustration and recommendations. *Journal of the Association for Information Systems, 13*(7).

Lacher, K. T., & Mizerski, R. (1994). An exploratory study of the responses and relationships involved in the evaluation of, and in the intention to purchase new rock music. *Journal of Consumer Research, 21*(2), 366–380.

Lee, D., & LaRose, R. (2007). A socio-cognitive model of video game usage. *Journal of Broadcasting & Electronic Media, 51*(4), 632–650.

Lee, K., Ashton, M. C., & Novitsky, C. (2022). Academic majors and HEXACO personality. *Journal of Career Assessment, 30*(2), 345–366.

Lee, M.-C., & Tsai, T.-R. (2010). What drives people to continue to play online games? An extension of technology model and theory of planned behavior. *International Journal of Human–Computer Interaction, 26*(6), 601–620.

Lee, O.-K. D., Xu, P., Kuilboer, J.-P., & Ashrafi, N. (2009). User acceptance of second life: An extended TAM including hedonic consumption behaviours. In *Proceedings of the 17th European conference on information systems (ECIS'09), 2009* (pp. 1–13).

Leinonen, T., Brinck, J., Vartiainen, H., & Sawhney, N. (2021). Augmented reality sandboxes: Children's play and storytelling with mirror worlds. *Digital Creativity, 32*(1), 38–55.

Lin, P.-H., & Yeh, S.-C. (2019). How motion-control influences a VR-supported technology for mental rotation learning: From the perspectives of playfulness, gender difference and technology acceptance model. *International Journal of Human–Computer Interaction, 35*(18), 1736–1746.

MacKenzie, S. B., Podsakoff, P. M., & Jarvis, C. B. (2005). The problem of measurement model misspecification in behavioral and organizational research and some recommended solutions. *Journal of Applied Psychology, 90*(4), 710.

MacKenzie, S. B., Podsakoff, P. M., & Podsakoff, N. P. (2011). Construct measurement and validation procedures in MIS and behavioral research: Integrating new and existing techniques. *MIS Quarterly, 35*(2), 293–334.

Madden, T. J., Ellen, P. S., & Ajzen, I. (1992). A comparison of the theory of planned behavior and the theory of reasoned action. *Personality and Social Psychology Bulletin, 18*(1), 3–9.

Mandal, S., Dubey, R. K., Basu, B., & Tiwari, A. (2025). Exploring the orientation towards metaverse gaming: Contingent effects of VR tools usability, perceived behavioural

control, subjective norms and age. *Journal of Innovation & Knowledge, 10*(1), Article 100632.
Mäntymäki, M., Merikivi, J., Verhagen, T., Feldberg, F., & Rajala, R. (2014). Does a contextualized theory of planned behavior explain why teenagers stay in virtual worlds? *International Journal of Information Management, 34*(5), 567–576.
Marchand, A., & Hennig-Thurau, T. (2013). Value creation in the video game industry: Industry economics, consumer benefits, and research opportunities. *Journal of Interactive Marketing, 27*(3), 141–157.
Mathwick, C., Malhotra, N., & Rigdon, E. (2001). Experiential value: Conceptualization, measurement and application in the catalog and internet shopping environment☆. *Journal of Retailing, 77*(1), 39–56.
McMahan, A. (2003). Immersion, engagement and presence. *The Video Game Theory Reader, 67*, 86.
Mizerski, R., Pucely, M. J., Perrewe, P., & Baldwin, L. (1988). An experimental evaluation of music involvement measures and their relationship with consumer purchasing behavior. *Popular Music & Society, 12*(3), 79–96.
Mukherjee, S., Mukherjee, S., Lau-Gesk, L., & Lau-Gesk, L. (2016). Retrospective evaluations of playful experiences. *Journal of Consumer Marketing, 33*(5), 387–395.
O'Sullivan, S. R., & Shankar, A. (2019). Rethinking marketplace culture: Play and the context of context. *Marketing Theory, 19*(4), 509–531.
Overmars, S., & Poels, K. (2015). How product representation shapes virtual experiences and re-patronage intentions: The role of mental imagery processing and experiential value. *The International Review of Retail, Distribution and Consumer Research, 25*(3), 236–259.
Parnell, M. J., Berthouze, N., & Brumby, D. (2009). *Playing with scales: Creating a measurement scale to assess the experience of video games* (p. 35). London, UK: University College London.
Pavlas, D., Jentsch, F., Salas, E., Fiore, S. M., & Sims, V. (2012). The play experience scale development and validation of a measure of play. *Human Factors: The Journal of the Human Factors and Ergonomics Society, 54*(2), 214–225.
Pham, T. T. L., Huang, H. C., Cheng, T. C. E., Wong, M. K., Liao, Y. N., Yang, Y. H., & Teng, C. I. (2020). The need for exercise in exergaming perspective of the uses and gratifications theory. *Industrial Management & Data Systems, 120*(6), 1085–1099.
Phan, M. H., Keebler, J. R., & Chaparro, B. S. (2016). The development and validation of the game user experience satisfaction scale (GUESS). *Human Factors, 58*(8), 1217–1247.
Possler, D., Daneels, R., & Bowman, N. D. (2024). Players just want to have fun? An exploratory survey on hedonic and eudaimonic game motives. *Games and Culture, 19*(5), 611–633.
Pucely, M. J., Mizerski, R., & Perrewe, P. (1988). A comparison of involvement measures for the purchase and consumption of pre-recorded music. *NA-Advances in Consumer Research, 15*(1).
Qin, H., Patrick Rau, P.-L., & Salvendy, G. (2009). Measuring player immersion in the computer game narrative. *International Journal of Human–Computer Interaction, 25*(2), 107–133.
Rasoolimanesh, S. M., Dahalan, N., & Jaafar, M. (2016). Tourists' perceived value and satisfaction in a community-based homestay in the Lenggong Valley World Heritage Site. *Journal of Hospitality and Tourism Management, 26*, 72–81.
Ryan, R. M., Rigby, C. S., & Przybylski, A. (2006). The motivational pull of video games: A self-determination theory approach. *Motivation and Emotion, 30*(4), 344–360.
Salem, K., & Zimmerman, E. (2004). *Rules of play*. MIT Press.
Sanchez, D. R., & Langer, M. (2020). Video game pursuit (VGPu) scale development: Designing and validating a scale with implications for game-based learning and assessment. *Simulation & Gaming, 51*(1), 55–86.
Sarstedt, M., Hair, J. F., Jr, Cheah, J. H., Becker, J. M., & Ringle, C. M (2019). How to specify, estimate, and validate higher-order constructs in PLS-SEM. *Australasian Marketing Journal, 27*(3), 197–211.
Scharkow, M., Festl, R., Vogelgesang, J., & Quandt, T. (2015). Beyond the "core-gamer": Genre preferences and gratifications in computer games. *Computers in Human Behavior, 44*, 293–298.
Seo, Y., Buchanan-Oliver, M., & Fam, K. S. (2015). Advancing research on computer game consumption: A future research agenda. *Journal of Consumer Behaviour, 14*(6), 353–356.
Shelstad, W. J., Chaparro, B. S., & Keebler, J. R. (2019). Assessing the user experience of video games: Relationships between three scales. In *, 63. Proceedings of the human factors and ergonomics society annual meeting* (pp. 1488–1492). SAGE Publications.
Statista. (2025). *Esports - Pakistan*. Retrieved from https://www.statista.com/outlook/amo/esports/pakistan.
Spry, L., & Pich, C. (2021). Enhancing data collection methods with qualitative projective techniques in the exploration of a university's brand identity and brand image. *International Journal of Market Research, 63*(2), 177–200.
Stewart, S. M. (2013). *Artist-fan engagement model: Implications for music consumption and the music industry*. The University of Alabama TUSCALOOSA.
Swanson, G. E. (1978). Travels trough inner space: Family structure and openness to absorbing experiences. *American Journal of Sociology, 83*(4), 890–919.
Szolin, K., Kuss, D. J., Nuyens, F. M., & Griffiths, M. D. (2023). Exploring the user-avatar relationship in videogames: A systematic review of the Proteus effect. *Human–Computer Interaction, 38*(5–6), 374–399.
Taufique, K. M. R., Polonsky, M. J., Vocino, A., & Siwar, C. (2019). Measuring consumer understanding and perception of eco-labelling: Item selection and scale validation. *International Journal of Consumer Studies, 43*(3), 298–314.
Tsaur, S.-H., Yen, C.-H., & Yan, Y.-T. (2016). Destination brand identity: Scale development and validation. *Asia Pacific Journal of Tourism Research, 21*(12), 1310–1323.
Uludağlı, M.Ç., & Oğuz, K. (2023). Non-player character decision-making in computer games. *Artificial Intelligence Review, 56*(12), 14159–14191.
Wang, X., & Goh, D. H.-L. (2017). Video game acceptance: A meta-analysis of the extended technology acceptance model. *Cyberpsychology, Behavior, and Social Networking, 20*(11), 662–671.
Welden, R., Haenlein, M., Hewett, K., Smith, K. M., & Hulland, J. (2025). Quest for insights: Leveraging data from the video game ecosystem in marketing. *Journal of the Academy of Marketing Science*, 1–22.
Wibowo, A. P., Kusumawati, R. D., & Kumar, V. (2025). *Gamification as a strategic move: Redefining storytelling through a unique medium (Marketing and gamification* (pp. 3–23). Routledge.
Worthington, R. L., & Whittaker, T. A. (2006). Scale development research a content analysis and recommendations for best practices. *The Counseling Psychologist, 34*(6), 806–838.
Wu, J., & Holsapple, C. (2014). Imaginal and emotional experiences in pleasure-oriented IT usage: A hedonic consumption perspective. *Information & Management, 51*(1), 80–92.
Xiao, M. (2020). Factors influencing eSports viewership: An approach based on the theory of reasoned action. *Communication & Sport, 8*(1), 92–122.
Yeh, C. S.-H. (2015). Exploring the effects of videogame play on creativity performance and emotional responses. *Computers in Human Behavior, 53*, 396–407.
Yingling, R. W. (1962). Classification of reaction patterns in listening to music. *Journal of Research in Music Education, 10*(2), 105–120.
Yuhan, N., Kornytska, L., Suchkov, D., Alforova, Z., & Boiko, V. (2024). Virtual reality and interactive technologies in contemporary art: An analysis of creative opportunities. *Journal of Theoretical and Applied Information Technology, 102*(24).
Zeigler-Hill, V., & Monica, S. (2015). The HEXACO model of personality and video game preferences. *Entertainment Computing, 11*, 21–26.
Zhao, Z., & Renard, D. (2018). Viral promotional advergames: How intrinsic playfulness and the extrinsic value of prizes elicit behavioral responses. *Journal of Interactive Marketing, 41*, 94–103.
Zhu, M., & Fang, X. (2015). A lexical approach to study computer games and game play experience via online reviews. *International Journal of Human-Computer Interaction, 31*(6), 413–426.
Zhu, M., Zhao, F., Fang, X., & Moser, C. (2017). Developing playability heuristics based on nouns and adjectives from online game reviews. *International Journal of Human–Computer Interaction, 33*(3), 241–253.