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# Validating Motives of Autonomous Players (MAP) inventory: a bottom-up model of general motivational factors to videogame play

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**Abstract**
In this study, we develop and validate Motives of Autonomous Players (MAP) inventory. Several models on videogame motives have been published recently, but typically these models focus either on specific videogame types, on individual games, or on a particular theory on human motivation. The MAP model takes an integrative approach that considers why people play games in general. This is done by adopting an inductive bottom-up research attitude and by focusing on motives that can be argued to be broadly applicable for all kinds of videogames, ranging from casual mobile games to massively multiplayer online role-playing games. Since the MAP model is based on extensive player data that represent a great variety of player motives, the results are widely applicable in player modeling and in understanding player–game interaction at large. The initial MAP model was developed by analyzing open-ended gaming motive descriptions (N = 1,648) by a content analysis procedure. A preliminary 101-item MAP inventory was included in a UK-based survey (N = 600). A nine-factor model was identified and further validated as a 34-item version by making a confirmatory factor analysis with a USA-based survey data (N = 600). Additional analyses on construct validity were performed for investigating how motives to play videogames predict players' game enjoyment factors that were kept analytically distinct from general motivational factors to play videogames.

**Keywords** Human–computer interaction · Motivation · Factor analysis · Scale validation · Videogames

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## 1 Introduction

An in-depth understanding of what motivates to play and keeps players engaged with games is crucial for designing all types of games and gamified applications, as the main objective of player–game interaction is to provide motivational affordances and incentives that attract players and keep them coming back (Koivisto and Hamari 2014). This knowledge can be utilized in analyzing gratifying and meaningful gameplay experiences, constructing player personas, understanding target audiences, designing game-based solutions that satisfy specific player needs, and predicting patterns in players' game choices and in-game behaviors (Vahlo and Hamari 2019; Webster 2014; Poeller et al. 2018).

The literature on player motives is a rapidly growing area of research in computer science, media psychology, and game studies, with multiple models of gaming motives and motivations developed and validated since the early 2000s. Although player motivation research has matured, the field still lacks both *transparency* and studies that aim to *unify* its findings (Hughes et al. 2021). Many models of motives to play are either game-type-specific (e.g., Yee 2006; Kahn et al. 2015; Park et al. 2011), game-specific (e.g., Zsila et al. 2018; Fuster et al. 2012; Brühlmann et al. 2018), or theory-driven, building on established general models of human motivation (e.g., Ryan et al. 2006; De Grove et al. 2016). In the present study, we aim to contribute to this field of research by focusing on people's general motives for playing videogames by adopting a data-driven, bottom-up approach. This is accomplished through open-ended data gathering and a content analysis procedure. Our goal is to re-conceptualize the phenomenon into a broad and open account that is able to integrate with existing models on player motives, while also being able to discover new themes or underutilized perspectives.

We believe there is room for novelty in the field of research, particularly by embracing a more open approach aimed at identifying general motives to play from qualitative player data. This approach also avoids the conceptual restrictions that can arise from deductive, theory-driven perspectives. While it has the potential to substantiate previous motivational models, it may also reveal dimensions that are new or ambiguously covered in earlier literature. Thus, it essentially lays the groundwork for triangulating earlier motivational models and theories with an open model built on data where players themselves reflect on their general reasons for playing videogames.

Our approach holds a promise for user-modeling, primarily because it aims to provide a unified model of gaming motives applicable across all types of games and player interactions. By deriving motives directly from player descriptions, our model aims to capture a broad spectrum of player motives that would not be confined to specific game genres or theoretical frameworks. This proposed universality makes the approach exceptionally potential for developing adaptive systems that can personalize content and dynamically respond to user needs in real time. Moreover, the methodology facilitates a more granular understanding of player behavior, enabling the creation of more accurate player personas and improving predictive models of player actions and preferences. This is critical not only for enhancing player engagement and satisfaction but also for informing the design of more effective gamified systems at large.

Understanding how players' motive perceptions align with existing models and aiming to design a comprehensive, generalized model are crucial objectives in game-user modeling. Constructing a general motivational model based on detailed, bottom-up descriptions ensures that these motivational dimensions can be readily conveyed to players. Additionally, the model's generality facilitates the comparison of player profiles and user models across diverse games. Another rationale for constructing an inductive and bottom-up model of gaming motives is that such a construct would be applicable to all kinds of videogames, ranging from mobile puzzle games to massively multiplayer online role-playing games.

Conducting comparative studies on players' experiences with different game types necessitates developing a model that is properly validated across a great variety of players. Given that many studies ranging from quantitative to experiential and to qualitative make use of self-report questionnaires, the potential impact of the intended bottom-up model would be most significant if it were developed into a psychometrically valid survey instrument. Therefore, the overall objective of this study is twofold: (a) to identify players' reasons for engaging with videogames by analyzing players' open-ended gaming motive descriptions and (b) on this basis, to develop and validate a novel and psychometrically sound measure for assessing gaming motives that is triangulated with existing theoretical models.

The objective of developing and validating a general inventory of motives to play videogames consequently means that we are not able to fully consider particular contextual factors that impact players' gaming decisions. This delineation has two kinds of impacts on this study and the developed model. First, the demarcation means that elements that can be argued to be game-specific or game type specific fall beyond the scope of this study regardless of the fact that game-specific elements often incorporate persuasive design features including attractive achievements and rewarding action possibilities (Hamari et al. 2014). By and large, the game-specific and game-type-specific elements cover a myriad of particular gameplay features, such as design practices and aesthetic choices canonized within a game genre, as well as technological particularities (e.g., if the game makes use of VR, AR, or some specific type of controller). While earlier research has presented several models that aim to generalize these elements, including the design patterns approach by Björk and Holopainen (2005), an in-depth analysis on how these patterns are associated with player motives falls largely beyond the scope of the current study.

A second limitation of our approach involves broader socio-material contexts of play and players' reasons to play because of these background factors. For instance, motives that relate directly to a particular profession, a learning environment such as a school, or a specific individual are not the focus of this study, despite their potential significance for an individual's overall gaming motivation. Consequently, we have defined the developed model as a general approach to understand and assess Motives of Autonomous Players (MAP).

By making a direct reference to the player autonomy, we aim to flesh out and highlight the more general approach motives of gaming that should not be considered to be products of game-specific features, game type specific features, or a particular socio-material context including certain individual persons. Instead of this, the intended MAP model covers only those prevalent reasons to engage with videogames that can

be considered to motivate voluntary and inherently desirable game play in its many forms.

By focusing on generalized motives rather than context-specific motivational incentives, the MAP model provides a foundational layer that is essential for developing robust user models that can be universally applied. This generality is a key for systems that require the flexibility to adapt across different user environments without needing reconfiguration for specific contexts. The MAP model's emphasis on autonomous player motives aligns seamlessly with the central goals of user-modeling—mainly, to predict user behavior in a way that enhances interaction design and increases the personal relevance of the system responses (Fischer 2001). Such predictions are crucial for designing adaptive features that adjust to the user's evolving motivations and activities. For example, understanding a player's underlying motives can help tailor game difficulty, narrative elements, and interactive components that keep the user engaged over time, based on their motivational profile (Poeller et al. 2018).

We begin the study by relating our approach on motives to play to psychological theories of motives and to prior research on player preferences. We proceed then to describe the bottom-up process on how the motive items for the Motives of Autonomous Players (MAP) inventory were identified and developed into a preliminary inventory. Next, we report results of an exploratory factor analysis (EFA) made with the initial MAP inventory on survey data that was collected in the UK ($N = 600$). This will be followed by an item screening process and discussions of the theoretical implications of the EFA by relating its results to earlier models on gaming motives. We continue then to conduct a confirmatory factor analysis (CFA) with survey data from the USA ($N = 600$). After making validity and reliability tests with the CFA model, we investigate how players' gaming motives relate to their gaming preferences to provide further validation for the MAP model and to demonstrate its usability. The article will be concluded with a discussion on how the results of this study may inform future research and player modeling both in research and in game businesses.

## 2 Theoretical background—Motives of Autonomous Players

### 2.1 Motivation, motives, and the autonomy of an individual

Our understanding of motives and motivations is built upon ecological and enactive conceptualization of the human mind (Gibson 1977; Varela et al. 1992; Noë 2009). The theory of enactive cognition considers humans as inherently active organisms, strongly emphasizing *autonomy* as an essential part of the growth and survival of an organism. Autonomy is even defined as a core organizing principle for all living systems, and it is directly associated with the identity and survival of an organism who is required, hence motivated, to interact with the world to maintain its autonomy and identity (Thompson and Stapleton 2009; Di Paolo and Thompson 2014). In this paper we have chosen to emphasize the viewpoint of an *autonomous agent*, which embraces the volitional nature of a person to act on the environment, as well as to perceive their motives to participate in activities, such as gaming. The enactive framework is particularly fitting for investigating game play motives as the theory emphasizes

interactive, embodied and participatory qualities of human cognition, all of which have been argued in game research to be necessary conditions for player–game interaction (Murray 1997; Aarseth 1997; Vahlo 2017; Dourish 2001).

Games are considered to be exercises of "voluntary control systems" (Avedon and Sutton-Smith 1971). The player is fundamentally a free, autonomous actor and the main cause for distal effects that take place in the game. Through the modes of interaction, the player may gain the "pleasure of being the cause" as (Groos 1899, pp. 88–89) already put it, describing motivation and enjoyment in play. Although in some instances gameplay may be mandatory (e.g., work or training), players are, generally speaking, motivated to begin to play, free to play by themselves or together with other players, and capable to test their skills and knowledge within a game system. However, for understanding how the autonomy to play is achieved, also situational context of play should be considered (Deterding 2016).

In the Self-Determination Theory (SDT) of human motivation, autonomy is considered to be a core tenet and one of the three basic human needs, the satisfaction of which engenders experiences of intrinsic motivation (Ryan and Deci 2000). In both the SDT and in the fields of game and play research at large, autonomy underlines freedom of choice, exploration and playfulness, and interest and curiosity. It is the"capacity for and desire to experience self-regulation and integrity" (Deci and Ryan 2012, p. 85). SDT-based models of motivation have been very influential in psychological and HCI literature on gaming behavior and game experience research (Ryan et al. 2006). Games facilitate experiences of autonomy by fostering exploratory behavior and by providing a setting that affords constituting of purposeful in-game goals for the player within the ongoing player–game interaction. Therefore, games epitomize the human need to act voluntarily and to seek experiences of full-blown agency. Indeed, since the late nineteenth century, play has been argued to be a precondition for adaptation and survival for humans and mammals (Groos 1899), which implies that—in the phylogenetic continuum—human species are tuned to playful experiences that enable self-actualization and autonomous sensemaking.

Motivation research can be divided into studies that focus on (1) dispositional characteristics of the individual and (2) situational factors that impact motivational development. Studies on situational motivational stimuli (contextual models) focus on investigating behavior in specific contexts, whereas examinations of dispositional factors (general models) focus on sustaining motivational traits of individuals that affect their actions across different situations (Scheffer and Heckhausen 2018; Beckmann and Heckhausen 2018; Schultheiss and Wirth 2018). For instance, a study on situational motivational stimuli could investigate how motivational cues of a game encourage players to engage in competitive player vs. player game modes, whereas a study on dispositional factors could explore how players who are generally motivated by competition come to choose and engage with the game modes under analysis. Thus, general models are more person-centered than the models that study situational motivational stimuli. Since general models analyze motives as relatively stable predispositions for action, they are also well-suited for large-scale survey-based studies aiming to distinguish how motives differ from one another.

Perhaps at the most rudimentary level, motives can be defined as "predispositions to approach a particular class of incentives or to avoid a particular class of threats"

(Thrash et al. 2012, p. 141). As an analytical concept, motive aims to describe and predict goal-oriented behavior and what an individual strives to achieve across different situations. Unlike traditional views that define motives as static predispositions for specific actions, we conceptualize them as dynamic, metaregulative resources that evolve and adapt during participatory activities. This perspective emphasizes how motives are not fixed traits but are shaped and reshaped through ongoing interactions and experiences, reflecting their reciprocal relationship with engagement (Vahlo et al. 2022).

Motives can be differentiated based on whether they are explicit or implicit (McClelland et al. 1989; Brunstein 2018). Implicit motives, such as the need for affiliation and the need for positive reinforcement, develop early and operate below the level of conscious awareness or reflection. These motives are associated with affective preferences toward situational incentives. On the other hand, explicit motives are self-attributed and reflected-upon personal dispositions that can be measured via questionnaires and other methods of self-reporting. Explicit motives are "reasons people hold for initiating and performing voluntary behavior" (Reiss 2004), thus expressions of values, goals, and self-identities. Implicit and explicit motives are often aligned, where implicit motives serve an energizing function and explicit motives a directive function (Brunstein 2018). However, if motivation and situational incentives are understood from the viewpoint of a positively valued goal state and its outcomes, the activity itself may be viewed only as a means for achieving a goal rather than being motivating in itself (Rheinberg and Engeser 2018). In the context of playing games, this view on motives would suggest that people play only because of the type of end goal they are trying to achieve by playing games, instead of finding the gameplay itself gratifying (Poeller et al. 2018).

Playing games is a well-known example of an activity that is performed mostly because of activity incentives rather than object-oriented incentives external to the game experience: gaming is argued to be rewarding and meaningful in itself (Huizinga 2014 [1950]; Goffman 2013 [1961]; Csíkszentmihályi 1990; Bateson 2000 [1955]; Mead 2015 [1934]). According to several classic game definitions, games are not even supposed to produce real-life consequences. Rather, "every game implicitly asserts the premise that the value of the game is intrinsic" (Salen and Zimmerman 2004, p. 332). Gameplay consists of activity and outcome incentives that are both intrinsic to its own interactional dynamics. Games present in-game goals that are attainable only through player performance, which is constantly evaluated by the game system in an ongoing activity of gameplay (Karhulahti 2015; Vahlo 2017).

We have outlined the aim of this study to employ a bottom-up research strategy for developing and validating a psychometrically sound model that assesses player-centric motives to play videogames. Our goal is to create a model that is versatile across various game types and player demographics, developed through an extensive bottom-up approach. Additionally, the model is designed to explore scenarios where individuals act autonomously and engage voluntarily with videogames. We contend that the intended model will measure stable dispositions that not only reflect personal introspection but also guide decision-making processes. Next, we will contextualize our approach within the existing research on player preferences and motivation.

### 2.2 Two models of player understanding: gameplay motivation and game enjoyment

In his early seminal work on game design as a form of art, Chris Crawford (1984) argued that we must distinguish between the general reasons why people play games and the factors that influence players' choices for individual games. According to him, the question 'Why do we play games?' should be kept distinct from 'What makes one game more fun than another?' We should not assume that players' *motivational factors* for engaging in gameplay in general are the same as their *enjoyment factors* related to the qualities of a specific game or type of gameplay.

Although Crawford's work has been impactful in game design and game research, his insightful distinction between motivational factors and enjoyment factors has gone largely unnoticed and seems to be almost forgotten in the contemporary study of player preferences and motives. This oversight might be due to many studies on game experience focusing on analyzing player preferences and motivations for specific games, rather than building an understanding of how enjoyment and motivational factors differ among players and across their various game choices (Högberg et al. 2019). When research focuses on a single game, enjoyment and motivational factors naturally intertwine, making it difficult or even unnecessary to separate them. However, the study by Abeele et al. (2020) is an exception, as it explores how functional consequences—defined as immediate experiences—impact gratifying game experiences both directly and through mediation by second-order psychosocial consequences, such as immersion and mastery. While functional consequences are not merely synonymous with enjoyment factors, and psychosocial consequences with motivational factors, the Means-Ends theory-based model used by Abeele et al. (2020) discusses the gratification derived from gaming experiences in a manner similar to the theoretical considerations presented by Crawford (1984).

Since our goal is to develop a bottom-up model of *motivational factors* for playing videogames, *enjoyment factors* that inform us about the enjoyability of a specific game or game type fall beyond the scope of this study. In the literature on player preferences, enjoyment factors have been mainly categorized into three areas: player behavior, game engagement, and gameplay-type preferences (Vahlo and Karhulahti 2020). Player behavioral models (e.g., Bartle 1996, 2003; Cowley and Charles 2016; Mulligan and Patrovsky 2003; Tseng 2010) analyze the playing styles adopted by players during gameplay. These models examine how players differ in their behavioral patterns and the styles of play they enjoy. Game engagement approaches (e.g., Deterding 2013; Ip and Jacobs 2005; Kallio et al. 2011; Högberg et al. 2019) often overlap with player behavior models by exploring how players' characteristic ways of thinking, attitudes, or levels of engagement (e.g., casual or committed) influence their approach to playing videogames. More recent studies have proposed models investigating patterns in players' gameplay type preferences (Hamari and Tuunanen 2014; Tondello et al. 2017, 2018, 2019; Vahlo et al. 2017, 2018), asking how preferences for gameplay activity types, challenge types, and game aesthetics influence game choice (Vahlo and Karhulahti 2020).

In contrast to research on enjoyment factors, studies on motivational factors (e.g., Bateman et al. 2011; Brockmyer et al. 2009; De Grove et al. 2016, 2017; Demetrovics et al. 2011; Fritz and Stöckl 2022; Fuster et al. 2012; Hamari and Keronen 2017; Hamari and Tuunanen 2014; Kahn et al. 2015; Király et al. 2022; Krcmar and Strizhakova 2009; Meriläinen and Ruotsalainen 2024; Myrseth et al. 2017; Park et al. 2011; Phan et al. 2016; Przybylski et al. 2010; Sherry et al. 2006; Vahlo and Hamari 2019; Williams et al. 2008; Yee 2006; Yee et al. 2012; Zsila et al. 2018) investigate why we engage with videogames in the first place. Motivation research can generally be divided into contextual models and general models. For instance, Yee's (2006) empirical approach identifies motives for playing online games (i.e., contextual approach, including later development of the model in commercial uses as the Quantic Foundry model), whereas Ryan et al. (2006) advocate a Self-Determination Theory (SDT) perspective, arguing that studies on game-playing motives should focus on psychological theories of human motivation rather than the specific characteristics of gaming situations. Similarly, Poeller et al. (2021) have adopted the Motive Disposition Theory to furthermore investigate how social motivations related to affiliation and power are associated with the SDT need satisfaction. These general approaches suggest that our needs for playing are aligned with our reasons for engaging in any activity, positing that gaming situations are not fundamentally different from everyday life situations.

In our development of the MAP model, the focus is set on motivational factors to play videogames that are self-attributed and self-reflective in terms of psychological needs (Ryan and Deci 2000; Przybylski et al. 2010). We acknowledge that game-specific enjoyment factors, such as game challenges and sensory-motor gratifications, impact the personal development of motives to play. In this study, however, enjoyment factors are only addressed indirectly in cases where they emerge as generalized, need-based motivational factors, rather than being directly relating to gameplay gratification or preferences. As an example of such indirect cases, we may consider "personal mood management" as a motive to play games. While mood is associated with contextual game engagement, the motive essentially denotes a need of employing a psychological self-regulation strategy, without specifying any preferred game-based factors. The assumed dynamic relationship between need-based motivational factors, contextual enjoyment factors and Motives of Autonomous Players is illustrated in Fig. 1. However, none of the inventory items in this study will measure how players prefer to play particular games (behavior), the contextual or sustained gaming attitudes they exhibit (engagement), or the gameplay activity types, challenge types, and aesthetic qualities they find appealing and enjoyable in games.

Establishing a conceptual distinction between motivational factors and enjoyment factors is important for providing a coherent and integrative model for studying reasons to engage with videogames, rather than simply analyzing what makes a particular game gratifying and enjoyable for an individual. Indeed, a challenge for many previous motives-to-play inventories is that they often conflate general motives to play, gameplay type preferences, modes of game engagement, and playstyle attributes (see, e.g., De Grove et al. 2017, 2016; Kahn et al. 2015; Yee 2006). This observation is not intended as a critique of these models per se, as it is reasonable to include all these elements when investigating motives to play a specific game or game type. However, from the perspective of the MAP model and our goal of developing a more general

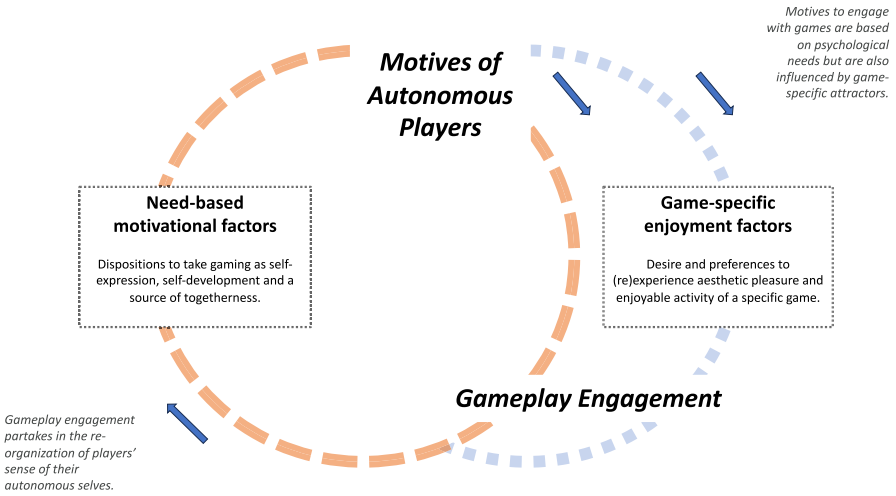


**Fig. 1** The proposed dynamic relationship between need-based motivational factors and game-specific enjoyment factors in the development of autonomous players' motives

model to understand motives for engaging with different types of games, it is crucial to keep motivational factors and enjoyment factors of player preference analytically distinct.

We propose the MAP model as a complementary approach to both contextual and general motivational models, as it allows for a comparative analysis of players' motivational factors alongside enjoyment factors across different game types and cultures. In other words, the MAP model enables us to examine how motivational and enjoyment factors relate beyond the confines of a single game or specific game genre. This framework facilitates the study of players' motives for playing various game types and their preferences regarding the recurrent and characteristic enjoyment factors of those games. To ensure the MAP model effectively captures and reflects these complex relationships, we plan to develop it using a bottom-up, inductive research approach. This will involve collecting extensive data that represent diverse player profiles and gaming preferences, which are essential for accurately validating the model's applicability in analyzing prevalent player motives and their interplay with enjoyment factors.

## 3 Development of the Motives of Autonomous Players (MAP) inventory

To develop an inventory for assessing general motives to play videogames, we designed an open-ended item generation process. Initially, we collected survey data consisting of players' open-ended descriptions of their reasons for playing videogames, which were then coded into preliminary motive categories. These descriptions were gathered as individual, one-sentence responses to the question: 'Why do you play videogames?'

**Table 1** Descriptive statistics of the sample (N = 402) regarding preferred game genres, weekly play hours, and preferences in game types. Reporting mean values and standard distributions of the variables

| | Mean value | Std. dev | | Mean value | Std. dev |
|---|---|---|---|---|---|
| *Genre preferences* | | | *Weekly play hours* | | |
| Adventure | 5.43 | 1.44 | On computer/console | 12.2 | 16.54 |
| Puzzle | 5.40 | 1.42 | On mobile devices | 6.13 | 7.89 |
| Strategy | 5.33 | 1.46 | | | |
| Action-adventure | 5.24 | 1.51 | *Game type preferences* | | |
| Action | 5.06 | 1.55 | Single-player computer or console games | 4.30 | 0.89 |
| Role-playing (RPG) | 4.91 | 1.85 | Single-player mobile games | 3.76 | 1.18 |
| Simulation | 4.86 | 1.66 | Collaborative multiplayer computer or console games | 3.58 | 1.13 |
| Platformer | 4.49 | 1.56 | Competitive multiplayer computer or console games | 3.38 | 1.21 |
| Sandbox | 4.42 | 1.68 | Collaborative multiplayer mobile games | 3.01 | 1.25 |
| Educational games | 4.33 | 1.61 | Competitive multiplayer mobile games | 2.90 | 1.28 |
| Racing | 4.30 | 1.84 | | | |
| Party | 4.30 | 1.56 | | | |
| Visual novel | 4.05 | 1.62 | | | |
| Fighting | 3.77 | 1.90 | | | |
| Sports | 3.67 | 2.00 | | | |

Subsequently, we developed these results into an extensive initial item pool for the MAP model. We will next describe this process and its results in detail.

Open-ended survey data ($N = 402$) on motives to play videogames was collected in the UK (Table 1). Study participants were recruited through Prolific Academic Ltd., which is a UK-based private company that holds an online panel of 130,000 participants worldwide. The survey was targeted to adult (ages 18–70) Prolific panel participants who were UK residents and who were interested in playing any type of videogames (on computer, on console, or on smartphones) at least occasionally. At the time of the data collection, a total of 23,004 Prolific UK-based participants fulfilled these criteria. All participants provided their written informed consent in which they agreed to participate in this study.

The data were collected using Prolific's balanced sample collection option, which aimed to distribute the study evenly across genders. Although the survey was intended to be evenly distributed, the actual data collection resulted in a sample that was not perfectly even or representative regarding demographics but was still fairly well-balanced demographically. The sample included 223 female participants (55.5%), 175 male participants (43.5%), and 4 non-binary participants (1%). The mean age of the participants

was 32.9 years. Table 1 presents the weekly average playtime (asked originally as average daily playtime, reported as transformed into weekly playtime), the most preferred game genres (rated from 1 = Strongly dislike to 7 = Strongly like), and preferences for playing different game types (rated from 1 = Very unpleasant to 5 = Very pleasant) of the survey participants.

The sample included individuals who did not report playing games at all on a typical day (8.2% of the respondents) as well as those who played more than 4 h each day (19.4% of the respondents). Adventure games, puzzle games, strategy games, and action-adventure games were among the most preferred genres. Conversely, sports games and fighting games were the least preferred, yet they were still strongly liked by 44 and 35 participants, respectively. Additionally, the data included 109 respondents who reported enjoying multiplayer games more than single-player games. Based on these descriptive statistics, we considered the sample to represent a wide variety of player preferences and to be a valuable source for collecting open-ended video game play motive descriptions.

### 3.1 Open-ended motive descriptions

The survey participants (N = 402) were asked to specify their reasons for playing videogames by responding to the following prompt: "Why do you play videogames? Please think about the question for a while and then mention 1–5 reasons for your game-playing habit. Answer by completing the following sentence with your own words: I play videogames, because…" Immediately below this question, there were five small fields for participants' open-ended gaming motive descriptions. Each participant was required to write down at least one description of their gaming motives, while the additional four fields were optional. In total, the 402 participants provided 1,668 open-ended motive descriptions. Subsequently, the data were cleaned of descriptions that were too broad or ambiguous (e.g., "I'm a big kid", "It's cool"), which did not clearly inform us about gaming motives, resulting in a final sample of 1,648 motive descriptions, averaging 4.1 descriptions per respondent. Conventional content analysis was employed to outline thematic categories in the qualitative data. The purpose of the content analysis was to systematically classify a large amount of motive descriptions into an efficient number of main categories that convey similar meanings (Weber 1990; Hsieh and Shannon 2005). Following the procedure of conventional data-driven content analyses, we derived the motive categories inductively from the data without relying on a predefined theory of recurrent motivational constructs and without preconceived motive categories (Kondracki and Wellman 2002).

The motive descriptions were first carefully read through by a researcher. Typically, each motive description was a concise sentence averaging 5.3 words, directly and sensibly completing the prompt "I play videogames, because…" During the coding process, specific words that captured recurrent motive concepts were initially highlighted. Subsequently, the researcher made notes on these words and phrases, thereby constructing an initial coding scheme that reflected several of the keywords and phrases found in the data. These codes were then sorted into categories based on their relationships to each other. Next, the sentences were coded into broad motive

categories or themes, which were generated based on the main reasons for gaming that each sentence portrayed and how these descriptions related to each other. The coding process continued until no new categories were identified, reaching saturation at 21 motive categories. These thematic motive categories, along with example motives, are reported in Table 2.

Three thematic motive categories were removed from the MAP inventory development process: aesthetic preferences (19), challenge preferences (20), and gameplay preferences (21). This decision was made because these preference categories directly associate with contextual enjoyment factors of different games rather than motivational factors that are based on psychological motivation theories (see discussion in 2.2). Although it can be argued that specific challenges (e.g., physical, emotional, or analytical), gameplay activities (e.g., warfare, character customization, or driving), and aesthetics (e.g., a specific art and music style) indeed motivate gameplay, these game elements vary significantly between games and thus better predict the choice of games that players play rather than informing us about the underlying reasons why people play games in the first place (Vahlo et al. 2018). In sum, the omitted three motivational themes are deemed as enjoyment factors and thus represent a different level of abstraction compared to the other 18 categories, which illustrate motivational factors to play videogames. For instance, whereas the item "…they challenge me" in the Competence/Mastery category reveals whether an individual is motivated by game challenges, the items "…because of the puzzles" and "I enjoy strategizing" specify what types of challenges the individual prefers in games (Vahlo and Karhulahti 2020). The omitted three themes are covered in a separate field of player preference research, specifically in studies on gameplay preference types (Hamari and Tuunanen 2014; Tondello et al. 2017; Vahlo et al. 2017).

Results of the qualitative coding process show that some motive categories were clearly more prevalent in the open-ended data than the others. Descriptions of the motives related with Affective Engagement had almost twice as many mentions than the second most mentioned motive category Boredom. These categories were followed by Mood Management, Escapism/Diversion, and Social interaction all of which were mentioned more than 150 times in the data. In contrast to these categories, motives related to Power were mentioned only once, Fear of Missing Out only three times, and Nostalgia seven times. However, the number of mentions was not taken to be a criterion for identifying a potential motive category, and therefore, also the categories of Power, Fear of Missing Out, and Nostalgia were retained in the scale development process.

Some motive categories appear to apply only to specific types of games. For instance, Competition and Social Interaction might seem relevant solely to multiplayer games. However, the category of Social Interaction is broader, as it can also encompass playing single-player games socially, such as sharing the experience with others. Additionally, playing single-player games to engage with social media discussions about the game's lore is another example. Similarly, playing for competition does not necessarily preclude single-player games; for instance, players might take turns in a single-player platformer, transforming it into a competitive activity even if the game does not directly support this mode. Moreover, qualitative content analysis is inherently influenced by researchers' interpretations. Decisions to combine categories

**Table 2** The 18 thematic motive categories and three additional categories of player preferences, example descriptions, and the number of mentions of each category in the data of 1,648 open-ended sentences

| | Motive category | Examples | N |
|---|---|---|---|
| 1 | Affective Engagement | "… for the fun", "… because it is exciting" | 355 |
| 2 | Boredom | "… it cures boredom", "…to kill time" | 191 |
| 3 | Mood Management | "… to unwind for a while", "… because it is comforting" | 174 |
| 4 | Escapism / Diversion | "… as a means of escape", "… because I can't sleep" | 170 |
| 5 | Social Interaction | "… because I can play with others", "… to connect with friends" | 158 |
| 6 | Imaginative Immersion | "… to experience another world", "… to engage with stories" | 113 |
| 7 | Competence / Mastery | "… they challenge me", "… to get good at playing them" | 111 |
| 8 | Utility | "… to train my brain", "… to learn new things" | 69 |
| 9 | Achievement / Accomplishment | "… I like completing tasks", "…to beat the game" | 48 |
| 10 | Autonomy | "… I get to feel in control", "… to express myself in them" | 46 |
| 11 | Convenience | "… because it is convenient", "…because it is easy" | 37 |
| 12 | Competition | "… to compete against others", "… because of winning" | 30 |
| 13 | Self-identity/Habit | "…I have always played", "…because it is aligned with my values" | 22 |
| 14 | Playfulness / Curiosity | "… to see what happens next", "… they help me to be creative" | 20 |
| 15 | Addiction | "… because I am addicted", "… because I feel like I need to" | 12 |
| 16 | Nostalgia | "…because they bring back memories", "…it reminds me of my youth" | 7 |
| 17 | Fear of missing out | "… I do not want to miss out", "… to know what everyone's talking about" | 3 |
| 18 | Power | "… it allows me to be powerful" | 1 |
| 19 | Aesthetic Preferences | "… because of smart level design", "… I enjoy incredible graphics" | 33 |
| 20 | Challenge Preferences | "… because of the puzzles", "… I enjoy strategizing" | 25 |
| 21 | Gameplay Preferences | "… to build things", "… I like driving" | 23 |

like escapism with diversion, competence with mastery, achievement with accomplishment, self-identity with habit, and playfulness with curiosity were guided by our theoretical framework and previous research on gaming motives and human motivation. For example, we merged self-identity and habit into a single category, because habitual gaming can significantly influence, and be influenced by self-identity. For instance, persons who habitually play videogames and engage with gaming cultures might begin to see themselves as players or gamers, which becomes a part of their self-identity.

### 3.2 Item pool generation of the initial MAP scale

We followed a scale development procedure as presented by Phan et al. (2016). These steps include preliminary item pool generation, expert review of the item pool, at least one exploratory factor analysis, and a theory-based confirmatory factor analysis.

The open-ended motive descriptions were treated as potential inventory items. Items that described reasons to play videogames in a very similar manner were merged, and duplicate descriptions were removed. When necessary, items were reworded and rephrased to ensure each item clearly answered the question, "Why do you play videogames? I play videogames because…" This process resulted in an initial item pool of 310 motives for playing videogames.

To refine the item pool of 310- items into a more manageable form for survey deployment and exploratory factor analysis (EFA), we then systematically reduced it to a 90-item version. This reduction was achieved by meticulously selecting items that robustly represented each of the 18 identified motive categories identified in the qualitative content analysis (Table 2), ensuring a broad and versatile coverage of each category. In constructing the 90-item Motive Analysis Pool (MAP) inventory, we adhered to a principle of retaining at least four items per hypothesized motive to facilitate robust factor identification in the EFA. This decision was guided by best practices in psychometrics, which suggest that a minimum of three items is required to reliably represent a factor (Brown 2015). However, to enhance the robustness of our analysis and accommodate the preliminary nature of our motive categorization, we opted to include at least one additional item per factor. For specific dimensions such as Power, we developed four additional items based on relevant literature descriptions of power motivation (Busch 2018). Similarly, for the Fear of Missing Out dimension, we developed two additional items to ensure comprehensive coverage of this factor. This strategic approach allowed us to balance the breadth and depth of the motive dimensions, facilitating a nuanced exploration of gaming motives that extends beyond mere frequency of mention in the initial data collection.

The 90 items were reviewed by five experts during a focus group meeting—an important method for ensuring content validity in scale development studies (Jensen 2003; Worthington and Whittaker 2006; Cabrera-Nguyen 2010). The experts, representing diverse fields within game research such as psychology and ethnography, with two also affiliated with the game industry, brought a broad perspective to the review process. Three of the experts had previous experience in scale development and inventory item generation. Informed about their task, the experts reviewed the items

to ensure they were suitable for various gaming contexts, including single-player, multiplayer, mobile games, and games across many genres such as action, puzzle, role-playing, and strategy. The focus group suggested minor improvements to the item wordings and supported retaining the hypothesized motive categories of Power and Fear of missing out, despite limited mentions in the open-ended data. They also recommended developing a few additional items for the eighteen hypothesized motive dimensions, guided by the open-ended data and existing research literature on similar motive categories. The process resulted in a preliminary 101-item MAP inventory that consisted of a total of 18 hypothesized motive categories: Affective Engagement (AF), Boredom (BO), Mood Management (MO), Escapism/Diversion (ES), Social Interaction (SO), Imaginative Immersion (IM), Competence/Mastery (MA), Utility (UT), Achievement/Accomplishment (AC), Autonomy (AU), Convenience (CN), Competition (CO), Self-Identity/Habit (HA), Playfulness/Curiosity (PL), Addiction (AD), Nostalgia (NO), Fear of missing out (FO), and Power (PO). The initial MAP inventory was intentionally kept extensive, since it is a recommended procedure in EFAs that aim to cover as many aspects of the analyzed phenomenon as possible (Matsunaga 2010).

## 4 Data collection procedure for factor analyses

### 4.1 Survey participants and procedure

Two additional survey samples were subsequently collected to conduct the exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) for the initial 101-MAP. The samples were gathered in the UK (Sample 1, N = 600) and in the USA (Sample 2, N = 600), with respondents recruited through Prolific's online panels. Of the UK sample, only 16 participants had responded to the earlier survey and thereby provided their open-ended videogame motive descriptions. The questionnaires used for these two web-based surveys were identical. In addition to the 101-MAP, survey participants were also asked about their age, gender, weekly play hours (on computer, console, and mobile), gameplay preferences, and their habits of playing different game types. This last aspect was explored through a short inventory on gaming habits, which consisted of five questions regarding the frequency with which survey participants played different game types (rated from 1 = Not at all to 5 = Very much). The game types included single-player computer or console games (mean 3.50), multiplayer computer or console games (mean 2.86), single-player mobile games (mean 2.95), multiplayer mobile games (mean 1.85), and esports games (mean 1.96).

In both countries, surveys were targeted to 18–70 years old Prolific panelists who were at least occasionally interested in playing videogames on computer, on console, or on mobile. The data collection processes in both countries were designed to be balanced between female and male players by applying Prolific's option of balancing the sample between genders. All participants provided their written informed consent to participate in this study.

On the average, it took 18 min from a respondent to take the survey with a computer or a smartphone. In both countries, the respondent compensation level was set

according to the Prolific guidelines (approximately $7.5/hour), meaning that each respondent received the compensation of $2.25 for taking the survey. Prior approving the responses, each submission was studied for identifying those participants who took the survey too quickly. The samples were next investigated for participants who showed content nonresponsivity by responding with the same value to every item in the 101-MAP. This practice is especially recommended in scale development studies (Meade and Craig 2012). As a result, nine participants were removed from the UK sample and eighteen from the US sample.

A series of pairwise t-tests revealed significant statistical differences between the samples in terms of mean age, the habit of playing single-player games, and weekly playtime on computer platforms. However, no significant differences were found in gender or any other variables describing play habits or weekly playtime. Since we made 12 independent t-tests in these comparisons, we calculated Bonferroni correction for a statistically significant difference in mean value to be $p < 0.0042$. Descriptive statistics for both samples are reported in Table 3.

### 4.2 Other measures and instruments

To demonstrate the usefulness of the MAP inventory in game research and for investigating discriminant validity of the MAP model, we decided to include a measure that assesses game enjoyment factors. We have previously outlined that the MAP model does not cover game type-specific aspects but rather focuses on identifying the underlying propositional motives that inform us about the general reasons why videogames are played. As we have delineated, motivational factors encompass the reasons or drivers that lead individuals to initiate or continue engagement with videogames, whereas enjoyment factors pertain to the elements within a game that contribute to the enjoyment experienced by an individual while engaging with the game.

As a model for assessing enjoyment factors, we applied the Gameplay Activity Inventory (GAIN), a cross-culturally validated 15-item instrument for measuring gameplay activity type preferences (Vahlo et al. 2018). This instrument assesses five factors in gameplay preferences, rated from 1 (Strongly dislike) to 5 (Strongly like), and demonstrated the following reliability and internal consistency in the combined data of this study (N = 1,173), as measured by Cronbach's alpha (α) and its confidence intervals (CI), along with McDonald's omega (ω): Aggression (e.g., sniping, killing) $\alpha = 0.83$ (CI 0.82 to 0.85), $\omega = 0.84$; Exploration (e.g., character development, game world exploration) $\alpha = 0.75$ (CI 0.72 to 0.77), $\omega = 0.75$; Caretaking (e.g., dressing up, gardening) $\alpha = 0.73$ (CI 0.70 to 0.76), $\omega = 0.74$; Management (e.g., trading, resource management) $\alpha = 0.65$ (CI 0.62 to 0.68), $\omega = 0.69$; and Coordination (performing in sports, running and evading) $\alpha = 0.65$ (CI 0.61 to 0.68), $\omega = 0.67$. The GAIN model exemplifies studies on gameplay preferences, and we will thus apply it in demonstrating the usefulness of the Motives of Autonomous Players (MAP) instrument as well as in discussing its construct validity.

**Table 3** Descriptive statistics for the samples collected in the UK and in the USA, reporting pairwise t-test comparisons with Bonferroni correction. * $p < 0.0042$, ** $p < 0.0008$, *** $p < 0.00008$

| | Sample 1 | | Sample 2 | | |
|---|---|---|---|---|---|
| *N* | 591 | | 582 | | t-test |
| Country | UK | | USA | | value |
| | Value | Std. dev | Value | Std. dev | |
| Mean age | 32.9 | 10.62 | 29.2 | 10.52 | 6.19*** |
| Female respondents | 291 (49.2%) | 0.50 | 275 (47.3%) | 0.50 | 0.57 |
| Male respondents | 290 (49.1%) | 0.50 | 285 (49.0%) | 0.50 | 0.06 |
| Non-binary respondents | 10 (1.7%) | 0.02 | 20 (3.4%) | 0.17 | − 1.69 |
| Not disclosed | 0 | | 2 | | |
| Mean weekly play hours | | | | | |
| On computer | 5.11 | 11.66 | 7.60 | 12.94 | − 3.32* |
| On console | 4.27 | 8.07 | 3.56 | 7.54 | 1.38 |
| On mobile | 4.10 | 7.83 | 3.25 | 5.27 | 2.60 |
| Mean game type play habits | | | | | |
| Single-player computer/console games | 3.44 | 1.43 | 3.55 | 1.38 | − 1.42 |
| Multiplayer computer/console games | 2.78 | 1.47 | 2.95 | 1.42 | − 1.91 |
| Single-player mobile games | 3.07 | 1.53 | 2.84 | 1.49 | 2.73 |
| Multiplayer mobile games | 1.87 | 1.21 | 1.83 | 1.14 | 0.58 |
| Esports | 2.01 | 1.40 | 1.90 | 1.31 | 1.68 |

### 4.3 Exploratory factor analysis on the 101-item MAP inventory

An exploratory factor analysis (EFA) was carried out using Stata/SE 17.1 to assess the suitability of the MAP inventory for factor analysis with the UK sample (N = 591). The Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy was 0.966, and the Bartlett's test of sphericity yielded a Chi-square of 40,051.778, df = 5050, p = 0.000, indicating that the inventory was suitable for factor analysis. Consequently, we proceeded to determine the number of factors to extract for the 101-MAP.

The number of factors was identified through a parallel analysis (PA) test (Henson and Roberts 2006), which, after 100 iterations, suggested a nine-factor solution. An EFA with these nine factors was conducted using promax rotation, chosen over

orthogonal methods like varimax, because promax allows for the correlation between factors (Matsunaga 2010). This decision aligns with the theoretical assumption that motive categories within the MAP model, which aim to understand how players make sense of their gaming behavior and decision-making from various perspectives, are interrelated. The use of promax rotation is predicated on the theory that individuals hold multiple motives for their actions, which are not necessarily independent or orthogonal. This is furthermore supported by our content analysis procedure in which survey respondents typically reported several motives for the videogame play. This stance recognizes the complexity of human motives, suggesting that they often interact and influence each other, reflecting the interconnected nature of approach motives in autonomous individuals.

We used a factor loading of over 0.40 as a criterion to determine whether an item significantly loaded on a factor. In the first iteration, 16 items with loadings under 0.40 were excluded from the EFA process, meaning that we did another EFA based on an item pool from which these items were first omitted. These items included two designed to measure Self-Identity/Habit, three for Competence/Mastery, one for Escapism/Diversion, one for Imaginative Immersion, one for Mood Management, one for Playfulness/Curiosity, two for Achievement/Accomplishment, four for Fear of Missing Out, and one for Convenience. After removing these 16 items from the inventory, another PA test was conducted on the now 85-item inventory. The PA test still suggested a nine-factor solution, where an additional five items had loadings under 0.4, including one from Achievement/Accomplishment, two from Convenience, and two from Competence/Mastery. After removing these items, in the third iteration, the PA test continued to suggest a nine-factor solution. In this third and final solution, all items had a loading of over 0.4 on a factor. To determine the variance explained by the nine-factor solution, we calculated the mean communality for the 80 variables included in the solution. In this initial phase of scale development, the model accounted for 57% of the common variance, which means the factors on average explained this proportion of variance for the inventory items. This exceeds the typical acceptable communality threshold of 40% for principal factor EFA solutions, demonstrating the robustness of our model (Beavers et al. 2013; Knekta et al. 2019). The full factor loadings of these items are reported in Table 4.

Table 4 reports how items developed for measuring the hypothesized motive categories as identified in the content analysis process loaded on the nine-factor solution. The acronyms refer to these categories as follows: AF = Affective Engagement, BO = Boredom, MO = Mood Management, ES = Escapism, SO = Social Interaction, IM = Imaginative Immersion, MA = Competence/Mastery, UT = Utility, AC = Achievement/Accomplishment, AU = Autonomy, CN = Convenience, CO = Competition, HA = Self-Identity/Habit, PL = Playfulness/Curiosity, AD = Addiction, NO = Nostalgia, FO = Fear of Missing Out, and PO = Power. In the following, we describe each of the nine factors based on those items that loaded on these dimensions with loadings over 0.50. Similarly, the mean values, standard deviations, and Cronbach's alphas are calculated based on items that showed loadings over 0.50. This was done as the items with loadings over 0.50 can be considered to better represent and describe each factor, although the threshold of 0.4 in EFA is generally considered to be acceptable for retaining an item in the model.

**Table 4** Loadings for the nine MAP factors. Reporting the hypothesized dimensions based on the content analysis, item loadings on each of nine factors, and uniqueness values for each item

| Factor | Factor 1 Immersive agency | Factor 2 Competitive mastery | Factor 3 Affective engagement | Factor 4 Nostalgia | Factor 5 Utility | Factor 6 Social interaction | Factor 7 Addiction | Factor 8 Escapism | Factor 9 Boredom | Uniqueness | # Item description |
|---|---|---|---|---|---|---|---|---|---|---|---|
| IM | **0.83** | −0.06 | 0.01 | 0.03 | −0.12 | 0.07 | −0.08 | −0.02 | 0.02 | 0.42 | 1 To interact with game characters |
| IM | **0.81** | −0.10 | −0.11 | 0.05 | −0.06 | 0.00 | −0.01 | 0.06 | 0.02 | 0.45 | 2 Because I want to identify with the game characters |
| IM | **0.78** | −0.09 | 0.08 | 0.06 | −0.10 | −0.07 | −0.09 | 0.11 | 0.01 | 0.44 | 3 Because I can enter a fantasy world |
| AU | **0.75** | −0.14 | 0.01 | −0.11 | 0.12 | 0.16 | 0.00 | 0.05 | −0.02 | 0.38 | 4 Because I can express myself in them |
| IM | **0.75** | −0.13 | 0.11 | 0.08 | 0.02 | 0.01 | −0.07 | −0.05 | −0.05 | 0.43 | 5 To engage with deep stories |

**Table 4** (continued)

| Factor | Factor 1<br>Immersive agency | Factor 2<br>Competitive mastery | Factor 3<br>Affective engagement | Factor 4<br>Nostalgia | Factor 5<br>Utility | Factor 6<br>Social interaction | Factor 7<br>Addiction | Factor 8<br>Escapism | Factor 9<br>Boredom | Uniqueness | # Item description |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AU | **0.74** | 0.07 | −0.09 | −0.01 | 0.01 | 0.00 | 0.00 | −0.01 | −0.03 | 0.44 | 6 Because I can make meaningful choices in them |
| AU | **0.71** | 0.10 | −0.03 | −0.07 | −0.02 | −0.04 | −0.13 | 0.15 | 0.02 | 0.52 | 7 Because I can make my own decisions in them |
| AU | **0.67** | 0.16 | −0.09 | −0.07 | −0.10 | −0.02 | −0.04 | 0.19 | 0.03 | 0.49 | 8 Because I can be in control in them |
| AU | **0.65** | 0.09 | −0.16 | −0.06 | 0.05 | 0.03 | 0.05 | 0.06 | −0.02 | 0.50 | 9 Because I can make a difference with my actions in them |

**Table 4** (continued)

| Factor | Factor 1 Immersive agency | Factor 2 Competitive mastery | Factor 3 Affective engagement | Factor 4 Nostalgia | Factor 5 Utility | Factor 6 Social interaction | Factor 7 Addiction | Factor 8 Escapism | Factor 9 Boredom | Uniqueness | # Item description |
|---|---|---|---|---|---|---|---|---|---|---|---|
| IM | **0.61** | 0.06 | 0.09 | 0.10 | −0.04 | −0.01 | 0.05 | −0.01 | −0.01 | 0.45 | 10 To put myself in the game |
| PL | **0.61** | −0.14 | 0.16 | 0.09 | 0.13 | 0.05 | −0.13 | −0.02 | 0.02 | 0.45 | 11 Because it taps into my imagination |
| PO | **0.60** | 0.22 | −0.07 | −0.11 | −0.03 | 0.05 | 0.08 | 0.19 | −0.09 | 0.40 | 12 Because I feel strong in them |
| IM | **0.57** | 0.03 | 0.12 | 0.04 | −0.03 | 0.09 | 0.08 | −0.04 | −0.09 | 0.49 | 13 Because I want to be part of the gameworld and its events |
| FO | **0.57** | 0.05 | 0.05 | 0.08 | 0.10 | −0.16 | 0.08 | −0.13 | 0.10 | 0.51 | 14 Because I need to know what happens in them |

**Table 4** (continued)

| Factor | Factor 1<br>Immersive agency | Factor 2<br>Competitive mastery | Factor 3<br>Affective engagement | Factor 4<br>Nostalgia | Factor 5<br>Utility | Factor 6<br>Social interaction | Factor 7<br>Addiction | Factor 8<br>Escapism | Factor 9<br>Boredom | Uniqueness | # Item description |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PL | **0.57** | −0.03 | 0.16 | 0.09 | 0.18 | 0.00 | −0.08 | −0.13 | 0.05 | 0.44 | 15 To explore and discover something new |
| AU | **0.56** | 0.00 | 0.09 | 0.02 | −0.05 | 0.05 | 0.00 | 0.20 | −0.07 | 0.51 | 16 Because they give me a sense of freedom |
| HA | **0.54** | −0.03 | −0.01 | 0.06 | 0.13 | 0.07 | 0.08 | −0.07 | −0.03 | 0.53 | 17 Because it is aligned with my personal values |
| PO | **0.53** | 0.06 | 0.00 | 0.03 | −0.11 | 0.00 | 0.12 | 0.07 | 0.09 | 0.58 | 18 Because I can do anything in them without consequences |

**Table 4** (continued)

| Factor | Factor 1 Immersive agency | Factor 2 Competitive mastery | Factor 3 Affective engagement | Factor 4 Nostalgia | Factor 5 Utility | Factor 6 Social interaction | Factor 7 Addiction | Factor 8 Escapism | Factor 9 Boredom | Uniqueness | # Item description |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PL | **0.52** | −0.07 | 0.17 | 0.04 | 0.20 | 0.06 | −0.05 | −0.06 | 0.05 | 0.46 | 19 Because it feeds my curiosity |
| IM | **0.49** | 0.12 | 0.12 | −0.03 | −0.01 | 0.12 | 0.12 | 0.00 | −0.15 | 0.50 | 20 Because game events raise emotions |
| HA | **0.46** | −0.05 | 0.25 | 0.09 | −0.02 | 0.04 | 0.31 | −0.06 | −0.17 | 0.38 | 21 Because it means a lot to me |
| PO | **0.44** | 0.34 | −0.20 | 0.08 | −0.06 | 0.02 | 0.11 | 0.09 | −0.09 | 0.46 | 22 To become powerful |
| AC | **0.43** | 0.33 | 0.01 | −0.09 | 0.01 | −0.03 | 0.13 | 0.09 | −0.03 | 0.49 | 23 To get experiences of being successful |
| CO | −0.10 | **0.80** | 0.00 | 0.05 | −0.01 | 0.14 | 0.01 | −0.03 | −0.04 | 0.32 | 24 To be better than my opponents |

**Table 4** (continued)

| Factor | Factor 1<br>Immersive agency | Factor 2<br>Competitive mastery | Factor 3<br>Affective engagement | Factor 4<br>Nostalgia | Factor 5<br>Utility | Factor 6<br>Social interaction | Factor 7<br>Addiction | Factor 8<br>Escapism | Factor 9<br>Boredom | Uniqueness | # Item description |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO | −0.06 | **0.70** | −0.11 | 0.11 | −0.01 | 0.27 | −0.05 | 0.04 | 0.00 | 0.35 | 25 To win my rivals |
| CO | −0.10 | **0.69** | 0.04 | 0.07 | −0.09 | 0.27 | 0.04 | 0.03 | 0.01 | 0.35 | 26 Because I can defeat other players |
| CO | −0.09 | **0.69** | −0.07 | 0.06 | 0.08 | 0.11 | 0.06 | 0.04 | −0.07 | 0.44 | 27 To climb a competitive ladder |
| MA | 0.11 | **0.62** | 0.24 | −0.03 | 0.06 | −0.11 | −0.01 | −0.09 | 0.02 | 0.44 | 28 To keep on trying to get better in them although it might take long |
| MA | 0.05 | **0.61** | 0.22 | −0.02 | 0.10 | −0.15 | 0.13 | −0.12 | −0.07 | 0.44 | 29 To work hard until I master them |

**Table 4** (continued)

| Factor | Factor 1 Immersive agency | Factor 2 Competitive mastery | Factor 3 Affective engagement | Factor 4 Nostalgia | Factor 5 Utility | Factor 6 Social interaction | Factor 7 Addiction | Factor 8 Escapism | Factor 9 Boredom | Uniqueness | # Item description |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PO | 0.06 | **0.60** | −0.11 | 0.06 | 0.10 | 0.04 | 0.12 | 0.05 | −0.05 | 0.43 | 30 To be the best at something |
| AC | −0.12 | **0.56** | 0.02 | 0.01 | 0.21 | −0.01 | −0.10 | 0.00 | 0.15 | 0.60 | 31 To beat my high score |
| MA | 0.17 | **0.56** | 0.18 | −0.06 | 0.13 | −0.07 | −0.06 | −0.14 | 0.00 | 0.49 | 32 To get better through practice |
| CO | −0.19 | **0.55** | 0.09 | −0.02 | 0.02 | 0.55 | −0.04 | 0.00 | −0.04 | 0.29 | 33 To play against others |
| PO | 0.06 | **0.54** | −0.18 | 0.07 | −0.03 | 0.19 | 0.18 | 0.06 | −0.06 | 0.42 | 34 To dominate others |
| MA | 0.02 | **0.52** | 0.29 | −0.10 | 0.22 | −0.03 | −0.10 | −0.01 | −0.03 | 0.50 | 35 Because of the challenge |
| MA | 0.21 | **0.48** | 0.15 | −0.05 | 0.15 | −0.08 | 0.08 | −0.13 | 0.06 | 0.43 | 36 To try again and again until I really know how to play them |

**Table 4** (continued)

| Factor | Factor 1 Immersive agency | Factor 2 Competitive mastery | Factor 3 Affective engagement | Factor 4 Nostalgia | Factor 5 Utility | Factor 6 Social interaction | Factor 7 Addiction | Factor 8 Escapism | Factor 9 Boredom | Uniqueness | # Item description |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AF | 0.03 | 0.06 | **0.78** | −0.10 | −0.08 | 0.01 | −0.03 | 0.10 | 0.02 | 0.39 | 37 Because it is enjoyable |
| AF | 0.06 | 0.07 | **0.76** | −0.05 | −0.11 | 0.05 | −0.01 | 0.04 | 0.05 | 0.38 | 38 Because it is entertaining |
| AF | 0.02 | 0.07 | **0.76** | 0.02 | −0.14 | 0.12 | −0.06 | 0.02 | 0.01 | 0.39 | 39 Because it is fun |
| HA | 0.17 | −0.03 | **0.60** | 0.13 | −0.01 | 0.05 | 0.10 | −0.04 | −0.06 | 0.42 | 40 Because I am interested in them |
| MO | −0.18 | 0.01 | **0.58** | 0.06 | −0.01 | −0.03 | 0.04 | 0.30 | 0.04 | 0.53 | 41 To unwind for a while |
| AF | 0.21 | 0.16 | **0.56** | 0.09 | −0.09 | 0.08 | 0.05 | −0.05 | −0.08 | 0.40 | 42 Because it is exciting |
| MO | −0.10 | −0.15 | **0.51** | −0.01 | 0.19 | −0.01 | 0.09 | 0.39 | −0.06 | 0.46 | 43 Because it helps me to relax |

**Table 4** (continued)

| Factor | Factor 1 Immersive agency | Factor 2 Competitive mastery | Factor 3 Affective engagement | Factor 4 Nostalgia | Factor 5 Utility | Factor 6 Social interaction | Factor 7 Addiction | Factor 8 Escapism | Factor 9 Boredom | Uniqueness | # Item description |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AF | 0.13 | −0.07 | **0.47** | 0.11 | 0.07 | 0.04 | 0.10 | 0.12 | −0.03 | 0.51 | 44 Because it puts me in a good mood |
| BO | −0.07 | 0.03 | **0.47** | 0.08 | −0.09 | −0.04 | −0.13 | 0.16 | 0.31 | 0.56 | 45 As a downtime activity |
| IM | 0.24 | 0.07 | **0.44** | 0.00 | −0.07 | 0.02 | 0.10 | 0.01 | 0.17 | 0.54 | 46 Because it grabs my attention |
| NO | 0.02 | 0.03 | −0.03 | **0.83** | 0.01 | 0.02 | −0.04 | 0.02 | 0.08 | 0.28 | 47 Because it brings up memories |
| NO | 0.10 | 0.08 | 0.02 | **0.74** | −0.06 | −0.09 | −0.06 | 0.05 | 0.04 | 0.41 | 48 Because it feels nostalgic |

**Table 4** (continued)

| Factor | Factor 1 Immersive agency | Factor 2 Competitive mastery | Factor 3 Affective engagement | Factor 4 Nostalgia | Factor 5 Utility | Factor 6 Social interaction | Factor 7 Addiction | Factor 8 Escapism | Factor 9 Boredom | Uniqueness | # Item description |
|---|---|---|---|---|---|---|---|---|---|---|---|
| NO | 0.16 | 0.07 | −0.02 | **0.68** | 0.01 | 0.03 | −0.01 | 0.07 | −0.05 | 0.31 | 49 Because it reminds me of good moments in my life |
| NO | 0.13 | 0.03 | 0.19 | **0.65** | 0.04 | −0.05 | 0.00 | −0.04 | −0.03 | 0.31 | 50 Because I have fond memories about games |
| NO | 0.26 | 0.05 | −0.05 | **0.53** | 0.00 | 0.00 | 0.08 | −0.01 | 0.04 | 0.46 | 51 To relive my earlier experiences |
| UT | −0.10 | 0.21 | −0.06 | −0.02 | **0.78** | 0.00 | −0.03 | 0.02 | 0.04 | 0.34 | 52 To train my brain |
| UT | 0.01 | 0.14 | −0.21 | 0.06 | **0.74** | −0.01 | −0.05 | 0.13 | 0.02 | 0.41 | 53 To enhance my memory |
| UT | −0.02 | 0.18 | −0.02 | −0.06 | **0.74** | 0.02 | −0.03 | 0.09 | 0.00 | 0.36 | 54 To keep my mind sharp |

**Table 4** (continued)

| Factor | Factor 1 Immersive agency | Factor 2 Competitive mastery | Factor 3 Affective engagement | Factor 4 Nostalgia | Factor 5 Utility | Factor 6 Social interaction | Factor 7 Addiction | Factor 8 Escapism | Factor 9 Boredom | Uniqueness | # Item description |
|---|---|---|---|---|---|---|---|---|---|---|---|
| UT | 0.32 | 0.05 | −0.10 | 0.02 | **0.52** | 0.05 | 0.02 | −0.09 | 0.04 | 0.42 | 55 To learn something useful |
| PL | 0.38 | −0.12 | −0.04 | 0.10 | **0.44** | 0.12 | −0.08 | −0.03 | 0.01 | 0.49 | 56 To increase my creativity |
| SO | 0.16 | 0.07 | 0.04 | −0.06 | −0.01 | **0.80** | −0.03 | −0.01 | 0.04 | 0.21 | 57 To connect with others |
| SO | 0.06 | 0.16 | 0.05 | −0.04 | 0.05 | **0.72** | 0.00 | 0.00 | −0.03 | 0.29 | 58 Because I enjoy interacting with other players |
| SO | 0.06 | 0.05 | 0.05 | −0.01 | −0.05 | **0.68** | −0.01 | −0.07 | 0.18 | 0.46 | 59 Because my friends play |
| SO | 0.20 | 0.07 | −0.01 | −0.01 | 0.05 | **0.67** | 0.00 | 0.01 | 0.02 | 0.31 | 60 Because it brings me closer to other people |

**Table 4** (continued)

| Factor | Factor 1 Immersive agency | Factor 2 Competitive mastery | Factor 3 Affective engagement | Factor 4 Nostalgia | Factor 5 Utility | Factor 6 Social interaction | Factor 7 Addiction | Factor 8 Escapism | Factor 9 Boredom | Uniqueness | # Item description |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SO | 0.04 | 0.11 | 0.19 | 0.04 | 0.01 | **0.64** | 0.00 | −0.04 | 0.05 | 0.35 | 61 Because I enjoy playing together |
| AD | −0.07 | 0.01 | 0.13 | −0.02 | −0.10 | −0.05 | **0.87** | −0.04 | 0.08 | 0.32 | 62 Because I cannot stop playing |
| AD | −0.14 | 0.05 | 0.11 | −0.04 | −0.06 | −0.02 | **0.84** | 0.06 | 0.08 | 0.32 | 63 Because I am addicted |
| AD | 0.02 | 0.00 | −0.11 | 0.00 | 0.06 | 0.03 | **0.74** | 0.00 | 0.05 | 0.39 | 64 Although I have a tough time controlling my need to play them |
| AD | 0.13 | 0.01 | 0.07 | −0.04 | −0.01 | 0.00 | **0.71** | −0.05 | 0.03 | 0.41 | 65 Because I cannot stop thinking about playing them |

**Table 4** (continued)

| Factor | Factor 1 Immersive agency | Factor 2 Competitive mastery | Factor 3 Affective engagement | Factor 4 Nostalgia | Factor 5 Utility | Factor 6 Social interaction | Factor 7 Addiction | Factor 8 Escapism | Factor 9 Boredom | Uniqueness | # Item description |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AD | 0.17 | 0.10 | −0.04 | 0.04 | −0.03 | 0.03 | **0.54** | −0.01 | 0.00 | 0.50 | 66 Because I feel bad if I am not able to play |
| AD | 0.17 | 0.11 | −0.15 | 0.07 | 0.07 | −0.01 | **0.52** | 0.01 | 0.04 | 0.47 | 67 Because I feel like I need to play them to feel good about myself |
| AD | −0.09 | 0.14 | −0.19 | −0.08 | −0.01 | −0.10 | **0.46** | 0.03 | 0.13 | 0.68 | 68 Although I think it would be better to quit playing |
| ES | 0.09 | 0.06 | 0.10 | 0.10 | −0.01 | −0.01 | −0.16 | **0.61** | 0.10 | 0.47 | 69 Because it helps me disconnect from everyday routine |

**Table 4** (continued)

| Factor | Factor 1 Immersive agency | Factor 2 Competitive mastery | Factor 3 Affective engagement | Factor 4 Nostalgia | Factor 5 Utility | Factor 6 Social interaction | Factor 7 Addiction | Factor 8 Escapism | Factor 9 Boredom | Uniqueness | # Item description |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ES | 0.32 | −0.03 | −0.01 | −0.01 | −0.06 | −0.04 | −0.03 | **0.60** | 0.07 | 0.46 | 70 To forget the world around me |
| ES | −0.02 | −0.02 | 0.20 | −0.01 | 0.07 | 0.03 | −0.03 | **0.60** | 0.12 | 0.46 | 71 To take my mind off things |
| ES | 0.15 | 0.09 | 0.13 | 0.00 | −0.08 | −0.11 | 0.04 | **0.54** | 0.10 | 0.51 | 72 Because it distracts me from real life |
| MO | −0.05 | −0.19 | 0.26 | −0.01 | 0.26 | 0.08 | 0.12 | **0.53** | −0.10 | 0.47 | 73 Because it eases stress |
| MO | 0.00 | −0.09 | 0.29 | 0.04 | 0.20 | −0.04 | 0.20 | **0.47** | −0.15 | 0.47 | 74 Because it calms me down |
| BO | −0.04 | −0.07 | 0.03 | 0.04 | −0.05 | 0.08 | 0.07 | 0.04 | **0.69** | 0.50 | 75 Because I am bored |
| BO | −0.10 | −0.10 | −0.18 | 0.07 | 0.06 | 0.04 | 0.24 | −0.01 | **0.65** | 0.52 | 76 Because I have nothing else to do |

**Table 4** (continued)

| Factor | Factor 1 Immersive agency | Factor 2 Competitive mastery | Factor 3 Affective engagement | Factor 4 Nostalgia | Factor 5 Utility | Factor 6 Social interaction | Factor 7 Addiction | Factor 8 Escapism | Factor 9 Boredom | Uniqueness | # Item description |
|---|---|---|---|---|---|---|---|---|---|---|---|
| BO | −0.21 | −0.04 | 0.20 | 0.01 | 0.04 | 0.01 | 0.07 | 0.10 | **0.64** | 0.48 | 77 To pass time |
| BO | 0.12 | −0.14 | −0.07 | −0.04 | 0.05 | 0.09 | 0.38 | −0.07 | **0.49** | 0.57 | 78 Because I have too much free time |
| CN | 0.19 | 0.17 | 0.11 | −0.10 | 0.03 | −0.02 | −0.03 | 0.10 | **0.43** | 0.59 | 79 Because it is always easily available |
| CN | 0.21 | 0.16 | 0.10 | −0.02 | 0.11 | −0.04 | −0.10 | 0.08 | **0.41** | 0.58 | 80 Because it is accessible |
| Mean | 3.88 | 3.78 | 5.73 | 4.06 | 3.95 | 3.91 | 2.44 | 5.21 | 4.67 | | |
| STD | 1.27 | 1.29 | 0.92 | 1.51 | 1.48 | 1.65 | 1.29 | 1.15 | 1.29 | | |
| Alpha | 0.95 | 0.92 | 0.87 | 0.89 | 0.85 | 0.91 | 0.89 | 0.82 | 0.74 | | |

Loadings over 0.4 on the corresponding factor are bolded

A total of 19 items loaded on the first factor with a loading over 0.50. With the exception of the item "Because it grabs my attention", all items developed for assessing Imaginative Immersion and Autonomy had their highest loadings on this factor. Additionally, three items designed to assess Playfulness/Curiosity and two intended for measuring Power also loaded on this factor with relatively high loadings. Given that Immersion and Autonomy form the core of this factor, we have named it *Immersive Agency*.

The second factor had 12 items that loaded on it with a loading over 0.50. All items that were designed to measure the Competition motive loaded on this factor with high loadings. Also, four items that we designed for measuring Competence/Mastery had relatively high loadings on this factor. Similarly to the first factor, two items that were constructed to measure Power also loaded on this factor. Furthermore, an item developed for assessing Achievement/Accomplished, "To beat my high score" also loaded on this factor. We call the factor *Competitive Mastery*.

Seven items loaded on the third factor with a loading over 0.50, four of which were generated to measure Affective Engagement, and two to assess Mood Management. Additionally, one item for Self-identity/Habit, "Because I am interested in them", also loaded on this factor. As all items on this factor denote positive affective experiences and good mood, we named it *Affective Engagement*.

Five items that loaded on the fourth factor with loading over 0.50 were all developed for measuring *Nostalgia*, leading us to label this factor accordingly. Four items that loaded on the fifth factor with similar loadings all measured *Utility*, hence also this name was retained. Similarly to the previous factors, all items developed for measuring the Social Interaction motive loaded on the sixth factor which we therefore call *Social*. Very similar results were found regarding *Addiction*, *Escapism*, and *Boredom* all of which formed their own factors. Thus, we retained all of these motive category names for factors seven, eight, and nine.

The *Affective Engagement* factor had the highest mean sum of the nine factors, indicating that positive *Affective Engagement* is the most significant reason for playing video games across different player segments. *Escapism* had the second highest mean sum of the nine motive categories, followed by *Boredom* and *Nostalgia*.

### 4.4 Confirmatory factor analysis for the MAP model

The empirical evidence from the EFA with the UK sample (Table 4) provides support for conducting a confirmatory factor analysis (CFA) on the 9-factor MAP model. Our aim with the MAP model is to address a twofold research gap in the current literature on motives to play video games. First, earlier models typically focus on motives in relation to specific games or game types, or they adopt a theory-driven framework. We seek to enrich these discussions with an open-ended approach that covers multiple player preference types across various game genres. The second gap pertains to how existing models often analyze motivational and enjoyment factors without distinguishing how general reasons to play differ from what makes playing a specific game enjoyable for an individual. In the MAP model, we have focused on developing an instrument to measure particular motivational factors.

The MAP inventory items were screened before conducting a CFA (Fig. 2) with the sample collected in the US (N = 582). Following the procedures proposed by Matsunaga (2010) and Hair et al. (2014), we applied three criteria for item inclusion in the CFA. First, only items with a loading above 0.5 were advanced to the next screening phase to ensure that each item retained had sufficient factorial validity. Second, we examined the discrepancy between the highest and the second highest factor loadings for each item, retaining only those with a discrepancy greater than 0.20. This step was crucial to confirm that each item strongly related to one factor over others, minimizing cross-loading issues and ensuring clearer factor structure and construct validity of the MAP model. After these screening phases, 62 items remained in the MAP inventory. Considering that a 62-item inventory is still quite long and therefore not very practical for many survey-based studies, we aimed to shorten the scale while ensuring that at least three items per factor were retained to properly identify each factor (Brown 2015). Additionally, we ensured that none of the 62 items had a uniqueness above 0.6, as this indicates that the item variance is not satisfactorily explained by the model. Uniqueness, in this context, refers to the proportion of variance in an item that is not accounted for by the common factors. A high uniqueness value suggests that a significant portion of the item's variance is due to specific factors or error variance, rather than the common factors intended to be measured by the model (Costello and Osborne 2005).

We did not aim to merely validate a MAP model where each of the nine factors consisted of exactly three items. Instead, we sought to retain elements of the underlying structure identified during the initial item pool generation process. For example, since both Imaginative Immersion and Autonomy items demonstrated high loadings on the *Immersive Agency* factor, we decided to retain two items from each of these motivational traits. Similarly, four items were retained in the *Competitive Mastery* factor—two designed to measure Competition and two representing Competence/Mastery. Four items were retained also for measuring *Social*, *Nostalgia*, *Addiction*, *Affective Engagement*, and *Escapism* to encompass different facets of these factors, whereas three items were retained for both *Utility* and *Boredom*. As a result of the item screening process, 34 items were retained in the MAP model. Before conducting a CFA with the 34-item MAP, we reassessed the 34-item, nine-factor model with the UK data to determine how much variance this shortened scale version explained. The nine-factor solution for the 34-item version of the MAP explained 61% of the variance in the data. The shortened 34-item MAP version explained more of the common variance than the 80-item version (Table 4), because the shortened version retained items with higher factor loadings, which are more predictive of the underlying nine factors. Thus, even with fewer items, the model explained a greater proportion of the variance, and helped in achieving model parsimony, since the retained items were more central to the latent constructs.

CFA calculations for the nine-factor MAP model were subsequently conducted with the USA-based data using maximum likelihood estimation without missing values. The CFA model is depicted in Fig. 2, and descriptions of each included item can be found in Table 4 and Appendix. The validity of the nine-factor and 34-item Motives of Autonomous Players (MAP) model was then investigated. Construct validity was assessed by calculating the root mean squared error of approximation (RMSEA), the

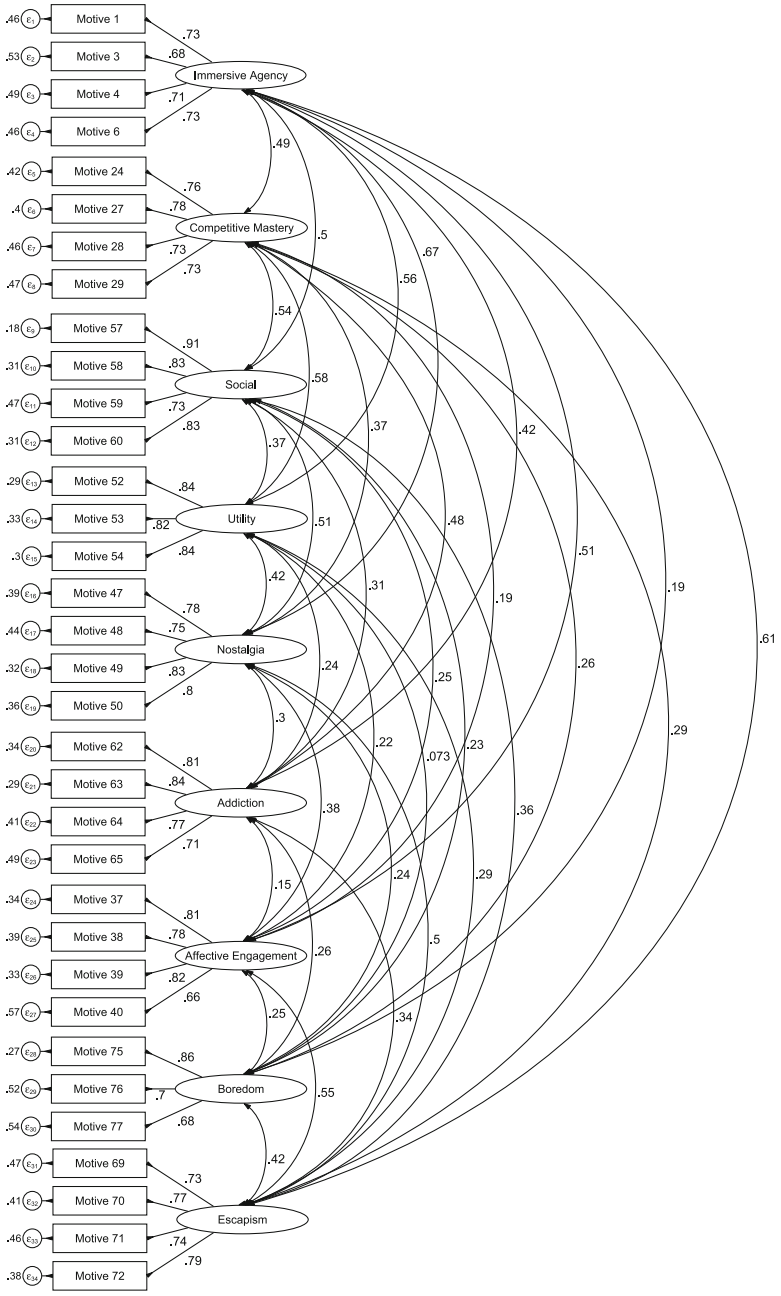


**Fig. 2** The CFA measurement model for the 34-MAP with the US sample (N = 582). All loadings and covariances are significant on the level of $p < 0.001$ with the exception of Utility < > Boredom ($p = 0.139$). Total variance explained by the CFA model is 61%. The motive numbers correspond with those reported in Table 4

comparative fit index (CFI), the Tucker Lewis Index (TLI), and the standardized root mean square residual score (SRMR), as suggested by the confirmatory factor analysis literature (Brown 2015; Kline 2010). Due to the limitations of the Chi-square test in CFA studies, particularly with large sample sizes (Russell 2002; Matsunaga 2010), this test was not utilized.

The RMSEA assesses the fit of the model per degree of freedom, thereby providing information about how well the model approximates the real data in the population. Lower values of RMSEA indicate a better fit, with values less than 0.05 often considered as indicating a close fit and values up to 0.08 representing an acceptable fit. The CFI compares the fit of the specified model to that of an independent (or null) model, which assumes no relationship among variables. A CFI value greater than 0.95 is typically considered to indicate a good fit to the data, whereas 0.90 is utilized as an indicator for acceptable fit. The TLI also compares the model fit to a baseline model. However, it penalizes for unnecessary complexity. Values close to 1, typically above 0.90, suggest an acceptable fit. Finally, the SRMR index represents the average discrepancy between the observed correlations and the model's predicted correlations. Lower values indicate a better fit, with a value less than 0.08 generally accepted as good. (Schreiber et al. 2006; Marsh et al. 2004; Hu and Bentler 1999).

In confirmatory factor analysis, studying different types of validity is crucial to ensure the robustness of the measurement model. Construct validity is concerned with whether the statistical model that includes all factors and their indicators fits the data well. It is assessed using overall model fit indices such as RMSEA, CFI, TLI, and SRMR. Good-fit indices suggest that the constructs are validly measured by their indicators and that the model as proposed adequately represents the data (Kline 2010; Brown 2015). Convergent validity assesses whether items that are theoretically related actually relate to each other in practice. It is typically confirmed when all items assigned to a specific factor correlate well with each other, suggesting that they measure the same construct. Measures used to assess convergent validity include Composite Reliability (CR) and Average Variance Extracted (AVE). Composite Reliability measures the reliability of the latent construct and is considered adequate if values are 0.7 or higher. Average Variance Extracted assesses the amount of variance captured by the construct in relation to the amount of variance due to measurement error. Values of 0.5 or higher suggest that more than half of the variance observed in the items is due to the construct, confirming good convergent validity (Zait and Bertea 2011). Discriminant validity assesses whether constructs that are supposed to be unrelated are, in fact, distinct. In CFA, discriminant validity can be established by demonstrating that the squared correlations between the factors are less than the AVE for each factor. This indicates that the constructs are more strongly related to their own measures than to other constructs, supporting their uniqueness and thus the discriminant validity of the model (Farrell 2009; Fornell and Larcker 1981).

The CFA model reported in Fig. 2 had the following goodness of fit to the US data: RMSEA 0.046 (*pclose* 0.952), CFI 0.941, TLI 0.933, SRMR 0.051. These values indicate that the model had an acceptable to good fit to the data, which provided support for the construct validity of the 9-factor MAP model (Brown 2015; Hu and Bentler 1999; Kline 2010; Marsh et al. 2004; Schreiber et al. 2006). We continued to analyze convergent validity of the MAP model by calculating composite reliability

(CR) and the average variance extracted (AVE) for each of the nine factors. We report the composite reliability test, and the average variance extracted tests in Table 5.

Both the CR and AVE values demonstrated convergent validity for the Motives of Autonomous Players model. The AVE procedure of comparing shared variances between factors furthermore supported discriminant validity for the model. These steps concluded discriminant and convergent validity tests, both of which the MAP model passed.

## 5 Further construct validation of the MAP model

The purpose of this section is to further investigate the construct validity of the Motives of Autonomous Players (MAP) model by demonstrating its applicability and relevance. Initially, we will examine how the motive factors of the MAP model correlate with existing motive models to position our work within the broader research landscape. This comparative analysis aims to show how the MAP model integrates with and expands upon current understandings of gaming motives. Subsequently, we will analyze how the nine motive factors of the MAP model predict specific gameplay preferences and habits across various gaming platforms, assessing the practical applicability of the MAP model in user-modeling. If certain motives are indicative of specific gameplay behaviors, it suggests that the MAP factors are both theoretically sound and empirically relevant, thereby enhancing the model's validity in designing player-centric game features and environments. Finally, we will explore how the MAP model correlates with gender differences in gaming motives, to determine if the model performs well across diverse user groups. Demonstrating that the MAP model accurately captures these differences will provide evidence of its sensitivity and specificity, which are crucial for developing personalized gaming experiences. The inclusion of these subsections and analyses thus serves to emphasize the robustness of the MAP model and its potential for application in user-modeling.

### 5.1 Comparing the MAP model to existing approaches on gaming motives

The nine factors of the Motives of Autonomous Players (MAP) model (Table 4) closely resembled those identified in the analysis of the open-ended data (Table 2). Six of the nine factors (Boredom, Escapism, Social, Nostalgia, Utility, Addiction) closely aligned with their counterparts from the open-ended data analysis, while the remaining three factors were essentially combinations of two or three categories identified in the qualitative content analysis. Notably, the dimensions of Achievement/Accomplishment and Playfulness/Curiosity did not form their own factors, as the items developed to assess these hypothesized factors cross-loaded across several of the nine factors.

Next, we explored how the results of the EFA and the CFA related to the findings of previous empirical studies on player motives. This comparison was made to examine how the validated MAP model, with its bottom-up motive dimensions of player-centric data, compared to existing accounts on the subject. It is worth noting that several prior models of gaming motives bundle together elements that we have separated into

**Table 5** The Composite Reliability (CR) values and the Average Variance Extracted (AVE) values for the nine MAP factors, and the squared correlations between the factors in the CFA model

| Motive factor | CR | AVE | Immersive agency | Competitive mastery | Social | Nostalgia | Addiction | Affective engagement | Escapism | Utility | Boredom |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Immersive agency | 0.81 | 0.510 | | | | | | | | | |
| Competitive mastery | 0.84 | 0.562 | 0.242 | | | | | | | | |
| Social | 0.89 | 0.681 | 0.253 | 0.294 | | | | | | | |
| Nostalgia | 0.87 | 0.621 | 0.444 | 0.140 | 0.261 | | | | | | |
| Addiction | 0.87 | 0.617 | 0.178 | 0.229 | 0.095 | 0.092 | | | | | |
| Affective engagement | 0.85 | 0.594 | 0.257 | 0.035 | 0.063 | 0.140 | 0.021 | | | | |
| Escapism | 0.84 | 0.573 | 0.376 | 0.083 | 0.129 | 0.256 | 0.118 | 0.297 | | | |
| Utility | 0.87 | 0.689 | 0.316 | 0.339 | 0.134 | 0.177 | 0.060 | 0.047 | 0.084 | | |
| Boredom | 0.79 | 0.565 | 0.036 | 0.067 | 0.050 | 0.059 | 0.069 | 0.060 | 0.182 | 0.005 | |

enjoyment factors and motivational factors, the latter of which are the focus of the MAP model. A recent example of a model developed to assess enjoyment factors, rather than more general motivational factors in gameplay, is an exploratory factor analysis conducted by Fritz and Stöckl (2022). In their approach, survey respondents were asked to specify *how much they enjoyed* a list of game elements and how important they considered these elements to be for their game experience.

Another example of the approach that combines motivational factors and enjoyment factors is a model developed by Király et al. (2022). In this example, the authors developed an initial item pool based on a systematic literature review of empirical studies on gaming motives. As a result of the review, they developed an item pool of 100 items covering 27 motives that combined both motivational and enjoyment factors. For instance, their model included dimensions such as graphics, story, fantasy, and destruction; all of which we consider to be enjoyment factors rather than general motivational factors. This is further highlighted by the fact that Király et al. (2022) applied two different question formats: "Why do you play video games?" and "What kind of gameplay do you prefer?" in their model. Thus, comparing our results to the earlier models required us to exclude the enjoyment factors of their models prior to making comparisons. Information about the comparisons made between the MAP model and earlier models of gaming motives is presented in Table 6.

In Table 6, we align the nine MAP factors with dimensions from earlier studies on player motives. For instance, Brockmyer et al. (2009) developed the Game Engagement Questionnaire (GEQ), identifying four factors—absorption, presence, immersion, and flow. The first three align with our MAP model's *Immersive Agency* as the research literature has often discussed absorption, immersion, presence, and agency to be closely related concepts (Pianzola et al. 2021; Skarbez et al. 2017), while flow relates more closely to *Competitive Mastery*, which Csíkszentmihályi (1990) described as aligning skills with environmental demands. Similarly, the Game User Experience Satisfaction Scale (GUESS) by Phan et al. (2016) includes dimensions like creative freedom which the authors describe as: "The extent to which the game fosters the player's creativity and curiosity and allows the player to freely express his or her individuality while playing the game", which matches the MAP's *Immersive Agency*, and social connectiveness, akin to the MAP's *Social* factor. However, GUESS's usability/playability, narratives, audio, and visual aesthetics, which focus on enjoyment factors, differ from the MAP's emphasis on general playing motives. While there are overlaps between prior models and the MAP model, such as those highlighted with the GUESS and GEQ models, these often reflect similarities in specific items rather than the factors themselves, illustrating that similar constructs in earlier models correspond to the detailed aspects of the MAP model, not always directly at the factor level.

Nick Yee's studies (2006; 2012) on online gaming motives are among the most oft-cited in the field of research. Yee constructed a 40-item inventory based on qualitative data from massively multiplayer online role-playing game (MMORPG) players and Richard Bartle's work (1996; 2003) on players' preferred behaviors in a multi-user dungeon (MUD) game environment. Following a series of two principal component analyses (PCA), Yee identified Achievement, Social, and Immersion as the three overarching motives for playing online games. Under the Achievement, he listed subfactors

**Table 6** A comparison of how the nine MAP factors relate to earlier models of assessing motives and motivation to play videogames

| MAP factors | Immer. Agen | Comp. Mast | Aff. Engag | Nostalgia | Utility | Social | Addiction | Escapism | Boredom | N/A |
|---|---|---|---|---|---|---|---|---|---|---|
| Brockmyer et al. 2009 | Absorption, Presence, Immersion | Flow | | | | | | | | |
| De Grove et al. 2017 | Agency | Performance | | | | Social | | Escapism | | Habit, Reactivity, Narrative, Pastime |
| Demetrovics et al. 2011 | Fantasy | Competition | Recreation | | Skill Developm | Social | | Escape, Coping | | |
| Fritz and Stöckl 2022 | Creation Exploration | Competition Challenge | | | | Social | | Escapism | | Role-playing, Power fantasy, Completion, Griefing |
| Fuster et al. 2012 | Exploration | | | | | Socialization | | Dissociation | | Achievement |
| Hamari and Tuunanen 2014 | Exploration and Immersion | Domination | | | | Sociability | | | | Achievement |
| Högberg et al. 2019 | Absorption Playfulness | Competition, Challenge | | | | Social | | | | Accomplishment, Guided |
| Kahn et al. 2015 | | Competitors | | | | Socializers | | Escapists | | Completionists, Smarty-pants, Story-driven |
| Király et al. 2022 | Immersion/Escapism | Competition | Stimulation | | | Social | | Immersion/Escapism | Habit/Boredom | |
| Meriläinen and Ruotsalainen 2024 | Immersion/ fantasy, creativity | Competition/ achievement | Fun, Relaxation | | Learning and development | Togetherness | | Escape | | Free to play, genre attributes |
| Myrseth et al. 2017 | | | Self-gratific., Enhancement | | | Social | | Coping | | |
| Park et al. 2011 | Adventure | | Relaxation | | | Relationships | | Escapism | | Achievement |
| Phan et al. 2016 | Creative Freedom | | Engrossment, Enjoyment, Personal Gratification | | | Social Connectivity | | | | Usability/Playability, Narratives, Audio Aesthetics, Visual Aesthetics |
| Ryan et al. 2006 | Autonomy, Presence | Competence | | | | Relatedness | | | | Intuitive Controls |
| Sherry et al. 2006 | Fantasy | Competition, Challenge | Arousal | | | Social interaction | | Diversion | | |
| Vahlo and Hamari 2019 | Autonomy, Immersion | Competence | Fun | | | Relatedness | | | | |

**Table 6** (continued)

| MAP factors | Immer. Agen | Comp. Mast | Aff. Engag | Nostalgia | Utility | Social | Addiction | Escapism | Boredom | N/A |
|---|---|---|---|---|---|---|---|---|---|---|
| Yee 2006; Yee et al. 2012 | Immersion | Competition | | | | Social | | Escapism | | Achievement |
| Zsila et al. 2018 | Fantasy | Competition | Recreation | Nostalgia | Skill Developm | Social | | Escape, Coping | Boredom | Outdoor activity |

of advancement, mechanics, and competition. The Social included subfactors of socializing, relationship, and teamwork, and the Immersion covered discovery, role-playing, customization, and escapism. Yee later continued this work with Nicolas Ducheneaut and Les Nelson (2012), reporting a confirmatory factor analysis on the model. From Table 6, we note that both Immersion and Social are among the most prevalent motive factors in the literature, and both were also present in the exploratory nine-factor MAP model. The Achievement factor, however, was identified in a few models but not in the MAP model as an independent motive factor. However, it is observable that the Achievement category in Yee's model encompasses competition, which co-constituted the Competitive Mastery factor in the MAP model.

In their meta-analysis on player types, Hamari and Tuunanen (2014) indeed concluded that most models of motives to play video games operate with some or all of the following dimensions of player orientation: Achievement and Domination, Exploration and Immersion, and Sociability. Achievement and Domination are described as motives focusing on making progress and feeling powerful and dominant. Exploration and Immersion refer to the player's curiosity and are oriented toward in-game fantasy. Sociability is a community-oriented prosocial motive to collaborate and provide support to others.

However, we would like to add that while competence/mastery-based achievement, social interaction, and immersion were also recurrent motives in our comparisons (Table 6), our findings regarding both earlier models and the 9-factor MAP (Table 4) clearly indicate that immersion can be approached in two ways: as an escapist tendency or as a desire for self-expression and the realization of one's agency. This has also been observed in a few earlier studies, including a recent investigation by Meriläinen and Ruotsalainen (2024), which analyzed open-ended survey responses from young Finnish players to explore their digital gaming relationships and the dimensionality of these relationships based on how gaming manifests in their daily lives.

In their mixed-method study on video game users and their gratifications, Sherry et al. (2006) identified six motive dimensions for video game use: Arousal, Challenge, Competition, Diversion, Fantasy, and Social Interaction. All of these dimensions were also identified in the exploratory MAP model, albeit Competition and Challenge both loaded on the *Competitive Mastery* factor. De Grove et al. (2017) based their model on social cognitive theory (SCT), combining dimensions of habit, moral self-reflection, agency, narrative, escapism, pastime, performance, and social interaction. Of these dimensions, agency, escapism, social interaction, and performance measure similar dimensions to their counterparts in the MAP model. There are also several other noteworthy models, such as the 7-factor MOGQ inventory by Demetrovics et al. (2011), which measures social, escape, competition, coping, skill development, fantasy, and recreation motives, all of which closely resemble the MAP factors.

The studies mentioned above exemplify well-established contextual motivational approaches to playing video games, presenting models that consider contextual and situational incentives. In contrast, Ryan et al. (2006) argue from a Self-Determination Theory (SDT) framework that research on gaming motives should focus on psychological theories of human needs and their satisfaction, rather than the specific characteristics of gaming situations. According to SDT theorists, games provide

experiences that satisfy the human needs for autonomy, competence, and relatedness. Consequently, players are intrinsically motivated to play, often describing the experience as fun, entertaining, and interesting. The exploratory MAP model shares profound similarities with SDT-based motivational models: it includes the *Immersive Agency* factor, which encompasses all items developed to assess the hypothesized autonomy dimension. Items developed for measuring competence are similarly loaded on the *Competitive Mastery* factor, and the model also includes a *Social* factor, closely resembling how relatedness is conceptualized in the SDT.

The prior inventories and scales on gaming motives had significant overlap with the motive factors and categories identified in the current study. The open-ended development of the MAP model thus appears to substantiate the factors of earlier models. However, in terms of model comprehensiveness, it is notable that we were unable to find an existing model that identified the exact same motive factors as those we discovered in our player-centric and bottom-up EFA on motives to play video games. Additionally, we found only two prior models that assessed the *Utility* motive and one that identified the *Nostalgia* motive. Similarly, only two models included *Boredom* in their approach, which is surprising as boredom was found to be the second most important motive for gaming in our study. *Addiction* was not accounted for in the earlier models. These gaps are understandable as most prior models were theory-based or focused on specific types of games, such as multiplayer online games.

Table 6 also lists dimensions from earlier models that do not have a direct corresponding factor in the MAP model. Among these dimensions, factors such as narrative, audio aesthetics, visual aesthetics, controls, and usability/playability were not the focus of this study, as these are considered enjoyment factors rather than general motivational factors. Notably absent from the MAP model is the dimension of achievement. The absence of achievement in our model, despite its inclusion in several previous studies, can be attributed to two main reasons. Firstly, overlap with the related constructs may cause features of achievement to be integrated within broader factors, thereby diluting its distinctiveness. Secondly, the multidimensionality of the construct suggests that achievement encompasses a range of behaviors, orientations, and attitudes that could be dispersed across various factors, preventing it from forming a single coherent factor. For instance, the motive item developed for assessing achievement: "To get experiences of being successful"' could relate to any other factor assessing accomplishment. In the MAP model, this item cross-loaded between the *Immersive Agency* and *Competitive Mastery* factors, indicating that these factors are most closely related to players' perceptions of success in its various forms. Furthermore, the item "To beat my high score", also developed for measuring achievement, loaded on the *Competitive Mastery* factor, suggesting that achievements related to high scores are typically modeled in game environments that support competition or other mastery-based engagements. Thus, achievement is present in the nine-factor MAP model, but our results also imply that achievement could be understood as a construct closely related to multiple gaming motives instead of being a standalone motive.

### 5.2 How the MAP model informs us about enjoyment factors and player behavior?

To demonstrate the usefulness of the 34-MAP construct, we investigated next how the motive factors were related to what Crawford (1984) called enjoyment factors in gameplay, namely to gameplay type preferences, and to a habit of playing single-player games or multiplayer games on different platforms. Both of these tests were done also for further construct validation of the MAP model.

We decided to analyze the associations between the MAP model and player preferences and gaming habits by using combined data from the UK and the US. This decision was supported by the similarity in sample sizes and modest differences in demographic variables and player behavior (Table 3). To further justify combining the datasets, we estimated the model and recalculated the CFA fit indices first for the UK data and then for the pooled data (N = 1,173). The goodness-of-fit values for the UK sample were: RMSEA = 0.046 (pclose = 0.947), CFI = 0.942, TLI = 0.934, SRMR = 0.051. For the pooled data, the values were RMSEA = 0.044 (pclose = 1.000), CFI = 0.947, TLI = 0.940, SRMR = 0.046. These results indicated configural invariance and demonstrated a good model fit for the combined UK and US data.

We also conducted a metric invariance test (Milfont & Fischer 2010) to determine whether the MAP items showed the same factor loadings across the UK and US samples. To assess metric invariance, we initially constrained the factor pattern coefficients of the CFA model. The test for metric invariance, which evaluates whether different groups respond similarly to the items, did not support full metric invariance, as three items failed the test. These items were motive 37: "Because it is enjoyable" and motive 38: "Because it is entertaining", both measuring Affective Engagement, and motive 77: "To pass time." After relaxing the constraints on these non-invariant loadings, partial invariance was achieved, allowing us to proceed with the analysis as the great majority of the CFA variables met the criteria for metric invariance (Milfont & Fischer 2010).

The CFA model (Fig. 2) with combined data from the UK and the US was utilized to construct a structural equation model (CB-SEM) for analyzing how the nine motives might predict enjoyment factors, specifically player preferences and gaming habits. Since the motives of the MAP model are relatively stable dispositions that players hold for initiating player–game interactions and engaging with videogames, it is plausible to expect that the MAP motives serve as precedents for game enjoyment factors, including 1) gameplay type preferences and 2) habits related to playing particular types of games. Therefore, if the MAP factors are found to be significant precedents for both player preferences and habits related to different game types, this result would provide additional support for the MAP model.

Player preferences were examined using the Gameplay Activity Inventory (GAIN), which consists of five gameplay preference factors: *Aggression*, *Exploration*, *Caretaking*, *Management*, and *Coordination*. In the SEM model, each latent construct of the GAIN model was specified as an outcome in turn, and the coefficients between the latent MAP motives and the GAIN factors were investigated (Table 7).

The *Immersive Agency* motive predicted clearly a higher preference for *Exploration*, but also for *Aggression*, *Caretaking*, and *Management*. It also was associated

**Table 7** Multiple regressions between the MAP factors and player preferences, as measured by the GAIN factors, reporting beta coefficient values

| | Aggression | Exploration | Caretaking | Management | Coordinate |
|---|---|---|---|---|---|
| Immersive agency | 0.227*** | 0.495*** | 0.304*** | 0.337*** | −0.212** |
| Competitive mastery | 0.267*** | −0.060 | −0.228*** | 0.038 | 0.271*** |
| Social | 0.087* | −0.041 | 0.034 | 0.057 | 0.052 |
| Utility | −0.198*** | 0.087* | 0.078 | 0.062 | 0.154** |
| Nostalgia | 0.069 | −0.009 | 0.049 | −0.051 | 0.184** |
| Addiction | 0.062 | −0.156*** | −0.134*** | −0.060 | −0.057 |
| Affective engagement | 0.208*** | 0.430*** | 0.003 | 0.088 | 0.165** |
| Boredom | −0.094* | −0.012 | 0.118* | −0.061 | −0.016 |
| Escapism | −0.008 | 0.019 | 0.110* | 0.062 | −0.050 |
| $R^2$ | 0.324 | 0.596 | 0.167 | 0.206 | 0.201 |

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

with a lower preference for *Coordinate*. Being motivated by *Competitive Mastery* predicted a lower preference for *Caretaking* and a higher for *Coordinate* and *Aggression*. The *Utility* motive was positively associated with *Coordinate*, and negatively with *Aggression*. The *Nostalgia* motive predicted a *Coordinate* preference, and *Addiction* was negatively associated with both *Exploration* and *Caretaking*. Finally, *Affective Engagement* was a precedent for *Exploration*, *Aggression*, and *Coordinate*.

The nine motive factors explained a varied amount of the variance of the five gameplay preference factors. For example the motives explained 59.6% of the variance of the Exploration preference but only 16.7% of the Caretaking preference. However, the goal of our analysis was to demonstrate the association between the MAP motives and preference factors, rather than to explain a large proportion of the variance in preferences. The R-squared values of Table 7 indicate that a notable portion of variance in the all GAIN factors is accounted for by the MAP motives. Even the lower end of this range (16.7%) represents a meaningful association, highlighting that the motives have a significant impact on preferences.

The results of these multiple regressions support the construct validity of the MAP model, as they demonstrate that the MAP factors are meaningful and relevant in explaining real-world player behavior. The findings also provide evidence of discriminant validity, as the motive factors predict gameplay preferences in distinct ways, showing that the MAP factors are meaningfully different from one another. This distinction is evident not only at the CFA measurement model level (Fig. 1) but also in their impact on player behavior. The results also indicate predictive validity, as the nine motive factors effectively predict various aspects of player preferences.

A similar SEM analysis was then conducted to examine the relationships between the nine MAP factors and five endogenous variables that measured how much (1 = Not at all, 5 = Very much) survey participants reported playing single-player games and multiplayer games on different platforms (Table 8). The habit of playing single-player computer or console games was predicted by the *Immersive Agency* motive, as

**Table 8** Multiple regressions between the nine motive categories and a habit to play single-player games, multiplayer games, and esports games

| | Single-player computer or console games | Multiplayer computer or console games | Single-player mobile games | Multiplayer mobile games | Esports games |
|---|---|---|---|---|---|
| Immersive Agency | 0.364*** | −0.126* | −0.158* | −0.107 | −0.150** |
| Competitive Mastery | 0.228*** | 0.052 | 0.085 | 0.024 | 0.298*** |
| Social | −0.182*** | 0.572*** | −0.118** | 0.134** | 0.260*** |
| Utility | 0.001 | −0.063 | 0.209*** | 0.135** | −0.041 |
| Nostalgia | 0.137** | 0.015 | −0.118* | −0.082 | −0.009 |
| Addiction | −0.022 | 0.088** | 0.003 | 0.063 | 0.127** |
| Affective Engagement | 0.300*** | 0.182*** | 0.060 | −0.052 | 0.106** |
| Boredom | −0.010 | −0.131*** | 0.171*** | 0.106** | −0.006 |
| Escapism | −0.091* | 0.016 | 0.046 | −0.009 | −0.098* |
| *R2* | 0.257 | 0.379 | 0.098 | 0.056 | 0.224 |

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$, reporting beta coefficient values

well as by *Affective Engagement*, *Competitive Mastery*, and *Nostalgia*. Conversely, the *Social* motive was negatively associated with this gaming habit. In contrast, *Social* was a strong predictor of a habit of playing multiplayer computer or console games. *Affective Engagement* also had a significant positive effect on this gaming habit, whereas *Boredom* predicted it negatively.

The habit of playing single-player mobile games was nearly the opposite of multiplayer computer and console gaming, with the *Social* motive predicting it negatively and *Boredom* and *Utility* predicting it positively. Along with *Social* and *Boredom*, the *Utility* motive was also a predictor for playing multiplayer mobile games, while *Competitive Mastery* and *Social* had the most significant effect on the habit of playing esports games. Furthermore, the *Addiction* motive had a significant effect on the habit of playing both esports games and multiplayer computer or console games.

The nine motive factors explained varied amounts of variance in players' habits of playing games on specific platforms. The motives accounted for 38% of the variance in playing multiplayer computer or console games, 26% of the variance in playing single-player computer or console games, and 22% of the variance in playing esports games. However, the motives only explained 10% of the variance in playing single-player mobile games, and 6% of the variance in playing multiplayer mobile games. This is understandable, as gameplay motives are also influenced by extrinsic factors, including the fact that the device is readily accessible across different situations, and that the activity can be seamlessly combined with other activities done on mobile phones, such as watching videos or engaging with social media applications. However, the purpose of these regressions was not to explain a large proportion of the variance in

the outcome variables, but rather to show that the motive dimensions of the MAP model were associated with platform play habits and that different motives were related to these dependent variables differently. All of these associations reported in Table 8 were plausible and provided additional support for the usability and validity of the MAP model.

### 5.3 How the MAP model informs us about the motives of player demographics?

We continued to study the usefulness of the MAP construct by comparing different player groups and their motives to play video games. Similarly to the previous analyses, we used the confirmed 34-item MAP version and its nine factors and combined data from the UK and the USA for these group comparisons. First, we compared motives between male (n = 576) and female players (n = 566). Non-binary participants were excluded from the analysis as only 30 individuals had self-identified as such. We calculated pairwise t-tests and Cohen's *d* effect size estimates for all nine standardized factor score variables between male and female players (Table 9). Standardization was performed by transforming the factor scores so that they had a mean of 0 and a standard deviation of 1. This was achieved by subtracting the mean factor score from each participant's score and then dividing by the standard deviation of the factor scores. Standardizing the data allowed us to compare average motive profiles for male and female players on a common scale. Thus, by performing t-tests on standardized scores, we compared the relative differences between genders in terms of standard deviations. With the exception of the *Escapism* and *Boredom* motives, male players reported higher motive scores than female players for their habit of playing video games. The most notable differences were found in the *Competitive Mastery* motive, which had a moderate effect size. Conversely, female players reported statistically significantly

**Table 9** Comparisons of motive factor scores between male and female players. Reporting *Cohen's d* effect sizes with confidence intervals for the *Cohen's d* at the 95% confidence level, and t-tests for Bonferroni corrected statistical significance of the effects: *$p < 0.006$, **$p < 0.001$, ***$p < 0.0001$

| | Male players | Female players | Effect sizes | |
|---|---|---|---|---|
| | Mean | Mean | Cohen's d | CI |
| *N* | 591 | 580 | | |
| Immersive agency | 4.34 | 3.90 | 0.36*** | 0.24–0.47 |
| Competitive mastery | 4.14 | 3.53 | 0.44*** | 0.33–0.56 |
| Affective engagement | 6–07 | 5.85 | 0.20** | 0.08–0.31 |
| Utility | 4.12 | 3.88 | 0.22* | 0.10–0.33 |
| Nostalgia | 4.39 | 4.03 | 0.24*** | 0.12–0.35 |
| Addiction | 2.79 | 2.35 | 0.32*** | 0.20–0.44 |
| Social | 4.25 | 3.70 | 0.34*** | 0.23–0.46 |
| Boredom | 4.71 | 4.94 | −0.15* | −0.26–0.04 |
| Escapism | 5.23 | 5.25 | 0.00 | −0.12–0.11 |

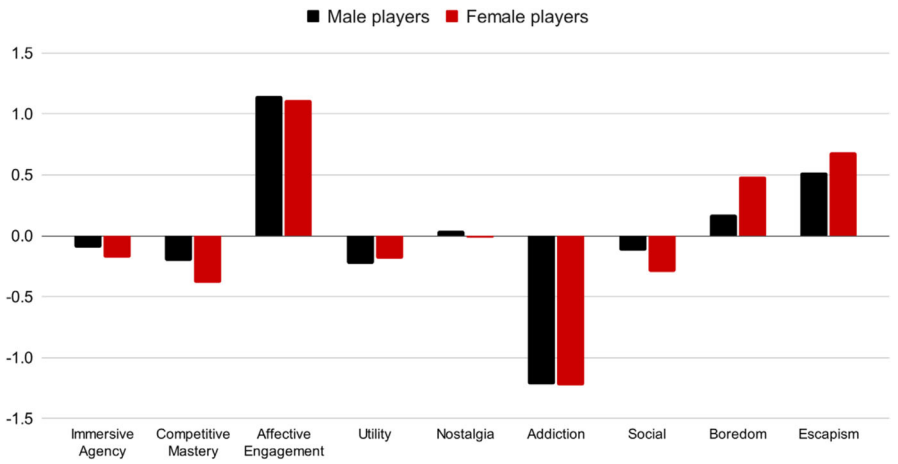


**Fig. 3** Motive profiles to play videogames among male (n = 576) and female (n = 566) players in the UK and in the US sample. Comparisons between standardized mean factor scores

higher scores for the *Boredom* motive compared to male players, although this effect was weak.

We then utilized the standardized factor score variables to study the motive profiles for male and female players (Fig. 3). For both genders, *Affective Engagement* and *Escapism* were identified as the two most significant motives for playing video games, as these factors had the highest relative values for both groups. In comparison with each group's motive mean value, *Escapism* and *Boredom* were relatively more important for female players than for male players, whereas the latter were relatively more motivated by *Competitive Mastery*, and *Social* than the former (Fig. 2).

A similar analysis was then made for studying how mobile game players', computer game players', and console game players' motive profiles differed from each other. A dummy variable for each of these groups was created based on whether they reported spending more weekly play hours in playing computer games ($n = 397$), console games ($n = 319$), or mobile games ($n = 359$). A total of 71 respondents reported to spend equally much time on an average week on playing at least two of the three types of games. These respondents were not included in the group comparisons. Table 10 reports results of the motive factor score comparison between these three player groups.

Pairwise t-tests and effect size analyses revealed that computer players differed from mobile players on all motive factors except for the *Boredom* motive. In all other motives, computer players exhibited higher levels of motivation compared to mobile players. The effects were most pronounced in the *Immersive Agency*, *Social*, and *Nostalgia* motives, each with strong effect sizes with Cohen's $d$ values greater than 0.60. Computer gamers also had statistically significantly higher motive scores than console gamers in the *Social*, *Addiction*, and *Immersive Agency* motives, though these effects were relatively weak. The comparison between console players and mobile players revealed results similar to those found in the comparison between computer players and mobile players. However, the differences between console players and mobile

**Table 10** Comparisons of motive factor scores between respondents who reported to play mostly computer games, console games, and mobile games. Reporting *Cohen's d* effect sizes with confidence intervals for the *Cohen's d* at the 95% confidence level, and t-tests for statistical significance of the effects: $*p < 0.05$, $**p < 0.01$, $***p < 0.001$

| | | Computer players | | Console players | |
|---|---|---|---|---|---|
| | | Cohen's d | CI | Cohen's d | CI |
| Immersive agency | Mobile players | 0.85*** | 0.70–1.00 | 0.61*** | 0.46–0.76 |
| | Console players | 0.22** | 0.07–0.37 | | |
| Competitive mastery | Mobile players | 0.35*** | 0.20–0.49 | 0.18* | 0.02–0.33 |
| | Console players | 0.17* | 0.02–0.32 | | |
| Affective engagement | Mobile players | 0.56*** | 0.41–0.70 | 0.68*** | 0.53–0.84 |
| | Console players | −0.10 | −0.25–0.05 | | |
| Utility | Mobile players | 0.25*** | 0.11–0.40 | 0.17* | 0.02–0.32 |
| | Console players | 0.08 | −0.07–0.23 | | |
| Nostalgia | Mobile players | 0.64*** | 0.49–0.78 | 0.66*** | 0.50–0.81 |
| | Console players | −0.02 | −0.17–0.12 | | |
| Addiction | Mobile players | 0.31*** | 0.17–0.46 | 0.08 | −0.07–0.23 |
| | Console players | 0.23** | 0.09–0.38 | | |
| Social | Mobile players | 0.69*** | 0.54–0.83 | 0.42*** | 0.27–0.57 |
| | Console players | 0.26*** | 0.11–0.40 | | |
| Boredom | Mobile players | −0.05 | −0.20–0.09 | −0.15* | −0.30–0.01 |
| | Console players | 0.09 | −0.06–0.24 | | |
| Escapism | Mobile players | 0.40*** | 0.26–0.55 | 0.31** | 0.15–0.46 |
| | Console players | 0.10 | −0.05–0.25 | | |

players were most pronounced for *Affective Engagement*, *Nostalgia*, and *Immersive Agency*, each showing strong effect sizes. In contrast, mobile players had a statistically significantly higher *Boredom* score than console players.

The effect size differences suggest a substantial difference in motivation levels between mobile and computer game players, and between mobile and console game players. Finally, we used the standardized motive factor sums for each of the three player groups to study motive profile comparisons (Fig. 4).

When examining the motive profiles reported in Fig. 4, it is apparent that mobile game players are relatively more motivated by *Boredom* compared to console and computer game players. Mobile game players also have relatively high values for *Escapism* but lower values for *Social*, *Immersive Agency*, and *Nostalgia*. Computer game players and console game players have similar motive profiles, but console players exhibit relatively higher scores in *Affective Engagement* and *Nostalgia*, and lower scores in *Addiction*. In contrast, computer game players have a flatter motive profile compared to mobile and console players. However, computer players show the highest relative value for *Immersive Agency* and the lowest for the *Utility* motive.

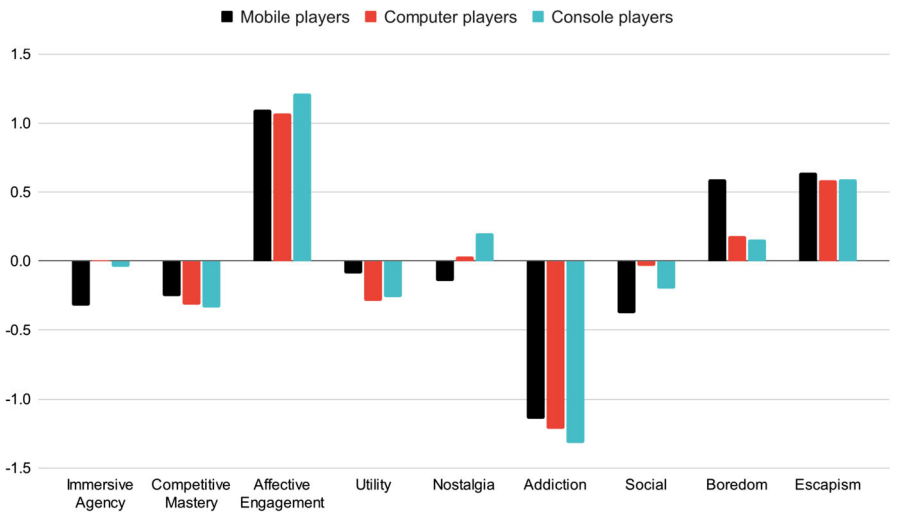


**Fig. 4** Comparison of motives to play videogames between computer game players (n = 397), console game players (n = 319), and mobile game players (n = 359). Comparisons between standardized mean factor scores that show the relative importance of each motive factor for the three player clusters

## 6 Discussion

### 6.1 Implications on user-modeling and user research

By adopting a bottom-up approach to identify prevalent motives for playing video games, this research has developed and cross-nationally validated a nine-factor model. The validated model includes the dimensions of *Immersive Agency*, *Competitive Mastery*, *Social*, *Utility*, *Nostalgia*, *Addiction*, *Affective Engagement*, *Boredom*, and *Escapism*. The MAP model was developed for the need to integrate the field of gaming motive research by adopting a player data-driven research attitude for analyzing Motives of Autonomous Players, that is, voluntary and general reasons to approach videogames and engage with them.

The nine motive dimensions have been shown to be associated with both gameplay type preferences and players' habits regarding specific game types. Importantly, the results regarding the linkages between motive factors and game enjoyment factors indicate that the MAP model not only sheds light on the general reasons for playing video games but can also be used to predict other player traits and patterns in gaming behavior. This research finding has significant practical implications for both future research on player modeling and game industry operators who are interested in better understanding their players' motivations, game choices, and in-game behaviors. For example, insights from our analysis suggest that a player segment motivated by *Immersive Agency* is particularly drawn to single-player games that feature elements enabling *Exploration*. Conversely, in comparison to other player segments, this segment may be less inclined to engage with multiplayer games that focus on activities related to the *Coordinate* factor. Thus, this study supports the view that motivation not

only helps identify different dispositions but also illustrates how motives are interrelated with each other and with environmental stimuli (Scheffer & Heckhausen 2018, pp. 69–75, 93).

Unlike models that center on specific gaming experiences, which are crucial for understanding users motives in relation to particular games or gamified applications, our approach emphasizes enduring and metaregulative motives that drive individuals' engagement with a broad range of games. By capturing the fundamental reasons players are drawn to games—such as the need for *Immersive Agency*, *Affective Engagement*, or *Nostalgia*—our model provides predictive insights into their lasting gaming behavior. This perspective allows for a deeper understanding of players beyond individual gaming situations, helping researchers and developers grasp players' game choices and preferences more holistically and understand how their preferences develop over time. As a result, our model facilitates the development of more nuanced user profiles that account for a player's "player personality", which can be leveraged to predict gaming behavior across different genres, platforms, and design traditions. This statement is supported by the study by Poeller et al. (2018) who showed that explicit motives are indeed associated not only with player behavior and playstyle but also with player personality.

We propose that the MAP model is a valuable, novel tool for modeling long-term user behaviors beyond the use of a particular game or other software application. Understanding the broader "player personality" or "the person that plays" can significantly benefit game companies and other businesses involved in the gaming industry. By capturing users' sustaining behaviors and preferences, the model can aid in strategic innovation processes, allowing companies to design new game types and features that resonate with both existing and emerging audiences. This deeper insight into players' autonomous motives supports the development of innovative gaming experiences that cater to diverse player profiles. Consequently, businesses can apply the model in their need to stay ahead of market trends, create more compelling game offerings, make strategic decisions about their product portfolios, and build stronger connections with their target audiences. The model can also be utilized by game publishers and marketers who need to understand users beyond gameplay. For instance, the model can help identify different use case profiles for gaming behavior and combine motive dimensions with demographic data or data on other application use, such as social media usage. These insights would aid publishers, developers, and marketers in understanding their audiences better and implementing strategies to reach them efficiently.

The MAP model offers valuable insights for user research, particularly in longitudinal studies and player segmentation. By tracking how players' core motives evolve over time, researchers can gain a deeper understanding of changes in gaming behavior and preferences, which further aids in developing predictive models for shifts in players' gaming behavior. Additionally, the model facilitates the segmentation of players into distinct profiles based on their general motives, providing nuanced insights into different player types and their interactions with games. This segmentation may enhance the precision of user research and support more targeted and personalized game development. In game development, the MAP model supports the integration of user feedback

for continuous improvement of games. By analyzing how well games align with players' core motives, developers can identify areas for refinement and enhancement. This ongoing feedback loop helps developers in ensuring that their games remain relevant and engaging to players, fostering a more responsive and adaptive development process.

Finally, beyond entertainment, the MAP model has potential applications in educational and training contexts. Educational games can be designed to address various motivational needs, potentially making learning experiences more engaging and effective. Similarly, training simulations can use the model to align experiences with participants' core motives, thereby improving engagement and outcomes. By incorporating motivational insights, educational and training games can better meet the needs of diverse learners and participants.

### 6.2 Discussing model development and academic implications

By highlighting the concept of the autonomous player in the model, we do not intend to suggest that autonomy should be viewed as a special case of gameplay. Instead, we aim to emphasize that gameplay, in general, can be considered a volitional activity. The identified motive dimensions reflect not only autonomy but also all three of the SDT's basic human needs: autonomy, competence, and relatedness. Associations with these basic needs are most evident in the dimensions of *Immersive Agency* and *Affective Engagement* (autonomy), *Competitive Mastery* (competence), and *Social* (relatedness). However, the relationship between motive dimensions and basic need satisfaction is not expected to be entirely clear-cut. Furthermore, the *Utility* motive can also be related to the basic need of competence, as utility involves playing games to develop skills and enhance one's abilities. Additionally, the *Affective Engagement* factor highlights intrinsic motivation, which the SDT theory posits can be achieved through the satisfaction of the three needs: autonomy, competence, and relatedness (Ryan & Deci 2000).

Interestingly, the MAP dimensions do not cover only motives that describe *approach motivation* but also constructs that could be described as amotivation (*Boredom*), avoidance motivation (*Escapism*), and perhaps even gaming disorder (*Addiction*). This probably should be considered as a logical consequence of an open-ended and comprehensive approach to motive development that MAP model has strived for. For example, in music psychology research (Boer and Fischer 2012) it has been found that the most prominent personal reasons to use music associate with self-regulation that usually similarly serves avoidance functions by improving the current state of mind (e.g., for relieving stress).

Although both *Escapism* and *Boredom* are associated with avoidance motivation and amotivation, they were identified as core reasons for playing video games, with mean factor sums ranking second and third highest among the nine factors. In contrast, the *Addiction* motive stood out as clearly different from the other factors, as its mean value was notably the lowest (Table 4). Therefore, it is worth considering to what extent *Addiction* can be regarded as an autonomous motive for playing video games, despite its clear identification in both the EFA and CFA of this study (Myrseth et al.

2017). Future research should explore the relationship between the *Addiction* motive and measures of gaming disorder, such as the Game Addiction Scale (Lemmens et al. 2009), the Internet Gaming Disorder Test (Király et al. 2017), and the Gaming Disorder Test (Pontes et al. 2021). If such a connection is found, the MAP model could enhance our understanding of problematic gaming as a phenomenon. While there are existing instruments specifically developed to assess problem gaming, the MAP model can contribute to explaining some of the variance in gaming disorder by illustrating how motives and addictive behavioral patterns are intertwined. Gaming motives are known to be an important predictor of playtime, and understanding the relationship between gaming motives and playtime may be crucial for building a more in-depth understanding of gaming disorder. In this context, the MAP model is valuable, as it incorporates *Addiction* as a motive dimension alongside eight other motives within a single motivational framework.

The item generation process for the MAP model involved analyzing open-ended motive descriptions to identify eighteen potential motive categories. However, only nine motive dimensions were identified in the exploratory factor analysis (EFA) conducted with UK data and later validated via confirmatory factor analysis (CFA) with US data. This means that nine of the hypothesized dimensions either merged with other categories or cross-loaded between several factors without a clear primary association. A closer examination of the results reported in Table 4 reveals that the hypothesized *Imaginative Immersion* dimension merged with *Autonomy*, while *Competition* and *Competence/Mastery* were combined. The *Power* motive cross-loaded between several other dimensions, and items developed to assess *Mood Management* primarily merged with *Affective Engagement* but also showed cross-loadings on the *Escapism* factor.

Surprisingly, items developed for assessing Playful/Exploration and Achievement did not form distinct factors nor merge with other factors. In the case of playfulness, this might be because it is conceptualized both as an individual's desire for playful engagement and as a structural way to organize experiences to be playful. A recent literature review by Masek and Stenros (2021) highlighted that these conceptualizations are related but distinguishable. Expectancy-value theories (Lewin 1936; Feather 1982; Wigfield & Eccles 2000) offer a possible framework for understanding the absence of achievement as a factor in the MAP model. These theories suggest that achievement underlies all motivation (Beckmann & Heckhausen 2018, p. 164; Rheinberg & Vollmeyer 2018). Cook and Artino (2016) compared expectancy-value theory with attribution theory, social cognitive theory, goal orientation theory, and self-determination theory, defining motivation as a process in which goal-oriented activities are initiated, sustained, and maintained. Thus, achievement might be better understood as an orientation rather than a distinct motive for playing video games within the MAP model. Additionally, the hypothesized factors of Convenience, Self-Identity/Habit, and Fear of Missing Out largely dissolved in the EFA.

Notably, the MAP model incorporates both *Immersive Agency* and *Escapism* as standalone and distinct motives, unlike previous models that included only one or described immersive motives more narrowly as "fantasy" or "narrative/story-driven." This suggests that immersion and escapism involve clearly different motivational dynamics, with *Immersive Agency* representing approach motivation and *Escapism*

representing avoidance motivation. This distinction is further supported by our analyses, which showed that *Escapism* had minimal association with outcome measures, while *Immersive Agency* was a significant predictor.

### 6.3 Limitations and future research

The open-ended approach of the MAP model is comprehensive but has limitations. The most significant limitation is that the open-ended motive descriptions were collected exclusively in the UK. Future studies could enhance the item pool by including open-ended motive descriptions from participants in multiple countries and cultural backgrounds. Additionally, since the UK and US data can be considered cross-national but not necessarily cross-cultural, the MAP model should be validated in an international study with data from various countries representing different gaming cultures.

The MAP model was developed and validated as a general instrument for studying motivational factors in video game play, ranging from hyper-casual mobile games to competitive esports. Following Crawford's (1984) demarcation, we excluded dimensions related to game enjoyment factors, such as gameplay type preferences, challenge type preferences, and aesthetic preferences, from the model development. Future research should investigate the dimensionality of the MAP model through case studies on game-user experiences with specific game applications. In such studies, the MAP model should be complemented with questions that consider how game-specific enjoyment factors may influence motivation and engagement, and how these elements relate to the general MAP motive dimensions. The potential inclusion of the MAP model in game-user experience case studies raises important questions about the dynamic development of motives during gameplay. Hence, to what extent motives to play are distinguishable from the gameplay experience, if motives are understood as metaregulative resources that develop in and through experiences, and if gratifying game experiences also direct our decisions, that is, reasons to continue to play?

### 6.4 Conclusion

We hope that the open-ended approach adopted in developing the MAP inventory, along with the distinction between motive factors and enjoyment factors, paves the way for exploring general, and possibly universal, features of gameplay motivation. This approach could be beneficial for understanding how human motivation to play games is constituted. To gain a deeper understanding of these linkages, further investigations into how the MAP dimensions relate to existing theories of human motivation are needed.

The alignment between the MAP model and user-modeling goals extends beyond merely enhancing game design to better fit users' needs. It also encompasses broader applications in gamified systems used in education, health, and business. In these domains, a clear understanding of autonomous motives can drive the creation of personalized experiences that are not only engaging but also effectively aligned with the outcome expectations of the user. By implementing the MAP model, user-modeling systems gain a strategic advantage: the ability to serve a wide array of industries

and user types with a single, cohesive motivational framework. This versatility underscores the practical utility of the model, making it a powerful tool for any user-modeling endeavor aiming to enhance user–system interactions across various digital platforms.

## Appendix

### The validated 34-Map and its nine dimensions

*Why do you play videogames? Read each statement and choose the option that applies to you the best. "I play videogames.."*

*1 = Strongly disagree, 2 = Disagree, 3 = Somewhat disagree, 4 = Neither agree nor disagree, 5 = Somewhat agree, 6 = Agree, 7 = Strongly agree*

| | | |
|---|---|---|
| 1 | Immersive Agency | To interact with game characters |
| 2 | Immersive Agency | Because I can enter a fantasy world |
| 3 | Immersive Agency | Because I can express myself in them |
| 4 | Immersive Agency | Because I can make meaningful choices in them |
| 5 | Competitive Mastery | To be better than my opponents |
| 6 | Competitive Mastery | To climb a competitive ladder |
| 7 | Competitive Mastery | To keep on trying to get better in them although it might take long |
| 8 | Competitive Mastery | To work hard until I master them |
| 9 | Social | To connect with others |
| 10 | Social | Because I enjoy interacting with other players |
| 11 | Social | Because my friends play |
| 12 | Social | Because it brings me closer to other people |
| 13 | Utility | To train my brain |
| 14 | Utility | To enhance my memory |
| 15 | Utility | To keep my mind sharp |
| 16 | Nostalgia | Because it brings up memories |
| 17 | Nostalgia | Because it feels nostalgic |
| 18 | Nostalgia | Because it reminds me of good moments in my life |
| 19 | Nostalgia | Because I have fond memories about games |
| 20 | Addiction | Because I cannot stop playing |

| 1 | Immersive Agency | To interact with game characters |
|---|---|---|
| 21 | Addiction | Because I am addicted |
| 22 | Addiction | Although I have a tough time controlling my need to play them |
| 23 | Addiction | Because I cannot stop thinking about playing them |
| 24 | Aff. Engagement | Because it is enjoyable |
| 25 | Aff. Engagement | Because it is entertaining |
| 26 | Aff. Engagement | Because it is fun |
| 27 | Aff. Engagement | Because I am interested in them |
| 28 | Boredom | Because I am bored |
| 29 | Boredom | Because I have nothing else to do |
| 30 | Boredom | To pass time |
| 31 | Escapism | Because it helps me disconnect from everyday routine |
| 32 | Escapism | To forget the world around me |
| 33 | Escapism | To take my mind off things |
| 34 | Escapism | Because it distracts me from real life |

The items from 1 to 4 assess the *Immersive Agency* motive, items from 5 to 8 measure the *Competitive Mastery*, and items from 9 to 12 target the *Social* motive. Items from 13 to 15 are developed for measuring the *Utility* motive, items from 16 to 19 for the *Nostalgia* motive, and items from 20 to 23 for the *Addiction* motive. Items from 24 to 27 assess the *Affective Engagement* motive, items from 28 to 30 the *Boredom* motive, and items from 31 to 34 measure the *Escapism* motive. Average sum scores for each motive can be calculated by summing the scores of the corresponding items and then dividing this total by the number of items in the factor.

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## Declarations

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