Know Thy Player: An Integrated Model of Player Experience for Digital Games Research

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13.1 INTRODUCTION

Digital games are among the most complex forms of media entertainment. They contain a large variety of multimodal sensory stimuli, from vivid three-dimensional graphics to engaging sound effects and background music, elaborate narratives, and absorbing virtual worlds. However, games are also highly dynamic, meaning that they usually do not follow a linear structure. Moreover, the games are also influenced substantially by their players, in that many games allow to be played differently according to the player’s skills or preferences [1]. This can include different available solutions to the same specific in-game problem, but also a great number of entire game modes. Another layer of complexity is added by the presence of coplayers. Many games provide options to play them in single-player and multiplayer modes, either online or colocated. However, there are also virtual worlds that only exist because several thousand people log on to them daily and play in a shared game experience with others. Due to the nature of digital games as dynamic, interactive, and complex media, studying the experiences of their users is a nontrivial undertaking. The many layers of contextual features, game characteristics, and player variables make the step from asking a general research question to enunciating a suitable hypothesis as difficult as finding the right research methods and appropriate stimuli.

Many contributions have been made to improve the understanding of player experience in digital games [2-8]. Some scholars aim for a holistic approach, trying to define a broad concept of player experience that covers a large number of variables. Others point out the specific characteristics of individual player experiences, for example, for children [9], game genres, such as serious games or virtual learning environments [10, 11], the cultural background of players [8], or the immediate social context of the playing situation [12]. Evidently, player experience is a highly interdependent, multilayered construct that, depending on its conceptualization and operationalization, can be measured with a large variety of instruments. Before being able to study player experience, however, it is crucial to have a comprehensive model of the many dimensions (emotional, cognitive, and behavioral) that constitute it. In order to define the abstract concept of player experience, we propose the integrated model of player experience (IMP) that distinguishes between the pregame (choice, use), and postgame (effects) phases and accounts for personal (player traits and states), media (game characteristics), and contextual (setting and social environment) variables. Based on this model, we want to give a “guided tour” through the multiplicity of different empirical approaches that can be and have been used to scrutinize the large variety of components that comprise player experience. We suggest the IMP as a framework for empirical game researchers with different methodological backgrounds, providing a rough guideline to categorize and understand methodological and theoretical approaches to the uses, effects, and contexts of digital games.

13.2 INTEGRATED MODEL OF PLAYER EXPERIENCE

The IMP distinguishes between three main elements comprising the gaming experience: context, player, and game (see Figure 13.1). Effects and influences of these levels occur in three consecutive phases: The pregame phase includes anything that occurs before the actual use of a game. Important variables in this phase are, for example, the cultural background, personality traits, and the current games market. The selection of a specific game leads to the game phase, which describes the actual playing situation and all of its modalities, such as the number of coplayers, specific game contents, and resulting experiential outcomes. The postgame phase contains all effects of a singular episode or repeated game playing, both on the internal states and behavior of the players, as well as their social environment. Effects in the postgame phase can result in a feedback loop influencing the parameters that determine the next gaming episode.

13.2.1 Pregame Phase

13.2.1.1 Context

The context layer in the pregame phase is defined by cultural parameters that (directly and indirectly) affect the player’s choice of games. A general frame for the choice of digital games is set by cultural norms that impact not only the player’s
13.2.1.2 Player

The player level in the IMP's pregame phase includes all characteristics of the player as an individual, the most basic being biological and demographical variables such as age, gender, or ethnicity. These can be of particular interest when evaluating the generalizability of a sample, as gamer demographics are quite diverse and stereotypical gamer profiles have been debunked repeatedly in the past [23–25]. Gender can be an important factor in each phase of the IMP, as there are differences between male and female players in identification with the hobby [26], genre preferences [27, 28], gaming motivations [29], playing habits [30–32], and in-game behavior [33] as well as postgame effects [34, 35].

The second type of player parameters are personological variables. Stable variables, such as personality traits, have a strong impact on preferences and game selection processes [36], such as the preference for violent games among adolescents with a higher trait aggressiveness [19, 37]. Scholars have also tried to map personality factors onto player types and motivation clusters, although Bateman, Lowenhaupt, and Nacke [38] argue that this has proven inadequate and instead suggest a trait theory of playing preferences. Nevertheless, personality traits are expressed in virtual worlds through behavior of avatars [39]. Moreover, certain specifications of personality traits can be a resilience/risk factor [40] and a strong moderator [41] of adversarial effects of game playing. While player states also heavily influence all of the aforementioned aspects of digital game playing, they are a temporary dimension of psychological personality factors and, thus, show an unsteady pattern. While player traits usually produce intersubjective differences that are stable over time, states cause short-term intra-individual changes. Psychological states can be a strong source of motivation to play games (e.g., for the purpose of escapism or to maintain or alter a mood [42]). Pregame states can also moderate the outcomes of digital game playing. In a study by Denzler, Häfner, and Förster [43], for example, playing a violent game increased the accessibility of aggressive thoughts, unless they were played with the goal to vent anger, in which case they had the opposite effect.

A third dimension of the pregame player level are experiential variables, such as the previous exposure to digital games and gaming skills. These variables can be interesting for sampling procedures when comparing playing experience or postgame effects for groups with different levels of gaming expertise or as a control variable when investigating effects of game contents and mechanisms. Disparities in previous experience in a study sample might also necessitate the adaption of difficulty levels in the stimulus material [44]. The exposure to digital games in
general or to particular types of content is also a variable commonly used for cross-sectional and longitudinal studies investigating the relation between gaming and aggressiveness [19] or school performance [45]. However, common measures for violent game exposure (such as the VVGE scale [46]) that simply ask players to rate the frequency and violent content of their favorite games are inaccurate and might spuriously confound effect sizes [47]. Measuring media content exposure is not as trivial as it might sound, as self-reports are biased by issues such as the respondents’ memories or social desirability. On the other hand, automatic observations (e.g., logging tools) entail a lot of effort, demand continuous monitoring, and raise ethical issues, for example, when recording multiple activities on private devices. For an overview of the challenges of measuring game-playing frequencies see [48].

### 13.2.1.3 Game

The third dimension in the IMP’s pregame phase is the game level that mainly consists of the current availability and the specific attraction factors of the digital games on the market. For game researchers, this is particularly important because it determines which games they should use for their research on player experience. Even considering the delay between conducting a study and having the results published, game research is often done with games that are heavily outdated (see, e.g., [35]). However, insights about the experience of today’s games from studies on games that in extreme cases are older than the participants in the respective research samples are limited. Innovations in sound and graphics can drastically change key variables of player experience, such as presence, involvement, immersion, and physiological arousal [49]. For a full review of media choice models and theories, see Reference [50].

### 13.2.2 Game Phase

#### 13.2.2.1 Context

The context dimension in the game phase covers environmental aspects, such as the device the game is played on and the location where the game is played. These factors should also be considered by researchers planning and conducting experimental studies as their participants will play in an unfamiliar and often also unnatural situation in the laboratory. In order to avoid possible confounds due to the gaming environment in the laboratory, scholars are advised to design the playing situation in their laboratory to be as naturalistic as possible.

Gaming platforms and input devices are technical context factors that strongly shape the player experience. Obviously, playing a motion-controlled game on a television screen using the Xbox Kinect is vastly different from sitting in an office chair in front of a computer screen and playing a game with keyboard and mouse. The differences between these situations have to be considered when designing, conducting, and interpreting studies on digital games. For instance, when recording autonomic physiological arousal during game play, it is possible that the effects of being physically active interfere with those of the actual game content (see Section 13.3.3.2). Other findings on the impact of input devices suggest that realistic controllers (such as gun replicas) can also elicit a greater sense of immersion in digital games [51], while motion-based controls can also contribute to a greater enjoyment and perceived realism of a game’s graphics and sound [52].

One of the most important contextual variables in the playing phase is the (physical or mediated) presence of other players. As de Kort and Jusselteijn [12] point out, the social context is frequently neglected in research, despite its importance for the overall game experience. For example, games from the genre of first-person shooters (FPSs) are often played in a multiplayer mode (mostly online). However, most laboratory situations are focused on an isolated playing experience against computer-controlled bots, thus limiting the generalizability to the users’ actual experience of everyday digital game playing. A majority of gamers play with or against others [13], be it mediated or colocated. This alters the overall experience of a game and is thus likely to affect some of the commonly measured variables in games research. Previous research has, for example, shown that playing against human opponents can increase positive affect and feelings of competence [53] and physiological arousal [54] but can also be a source of frustration [55]. There is evidence that playing cooperatively with others can increase cooperative behavior [56] and helping behavior and decrease aggressive feelings [57]. For a review of the issues entailed by a perspective that isolates players, especially in media violence research, see Reference [58].

#### 13.2.2.2 Player

The player level in the game phase is characterized by the sum of psychological processes and behaviors that occur during the activity of playing. It should be noted, however, that many of the states described here are experienced simultaneously and, thus, are highly interdependent.

Probably one of the most obvious variables to study is game enjoyment, as it represents the primary purpose of all entertainment games. However, enjoyment is a vague concept with many contributing factors and determinants. There are many different experiences that can both increase or decrease enjoyment, such as suspense [59], competitiveness [60], control over in-game actions and self-efficacy [61, 62], and satisfactory performance [61, 63]. In games with a focus on narrative, identification with the protagonist is another important factor [64], as well as the moral evaluation of characters and their behavior [65]. Choices in game design mechanisms are also an important determinant, such as the option of customizable controls [66]. See also Vorderer, Klimmt, and Ritterfeld’s [67] model of media enjoyment based on prerequisites of the individual media user and the given media product. For a theoretical approach describing game enjoyment as a transportation into narrative worlds, see [68].

Another term frequently found in research on virtual worlds is telepresence. The term originated in research on virtual realities and describes the experience of “being there” in a virtual space [69], requiring specific characteristics of the medium.
interactivity, vividness) and the user (including both traits and states [70]). Lombard and Ditton point out the primary characteristic of presence to be the "perceptual illusion of non-mediation" [71]. Digital games have a strong ability to elicit presence in players, as more and more realistic graphics, haptic feedback, and rich virtual environments fulfill the criteria of vividness and interactivity more than any other entertainment medium. Many expected the recent rise of games presented in stereoscopic 3D to have an even stronger effect on presence due to the possibility to present game contents spatially, although this mechanisms seems to be more complex than anticipated [72, 73]. There are numerous factors influencing and influenced by presence, such as hostility [74, 75] or physiological arousal [76]. In collocated playing situations, the (mis-)match of player genders can create a complex effect on perceived presence [77].

While presence is related to the virtual space itself, the concept of flow is concerned with the match between the abilities of a player and the challenges in a game. Csikszentmihalyi [78] defined flow as a state of completely focusing one’s attention on a task, if the difficulty of that task perfectly matches the skills of the person performing that task. When the challenges offered by a game are mastered repeatedly, the positive feedback can put the player into a “flow spiral.” Continuous negative feedback (the game being too hard), on the other hand, leads to feelings of frustration or, in extreme cases, to fear or shame. If a game is too easy, players might get bored, which can also lead to the termination of the playing activity. In the flow state, the cardinal symptom is “forgetting time.” Experiencing flow can have many determinants, such as games’ social characteristics [79] or spatial and self-presence [80]. Different approaches to flow have been developed: Sherry [81] theorizes flow as a predictor of media enjoyment through the balance of individuals’ cognitive abilities and media’s message challenges. Weber et al.’s [82] concept of flow is a cognitive synchronization of specific attentional and reward networks. (See [83] for a detailed review of flow in research on digital games.)

13.2.2.3 Game

In addition to playing context and relevant playing experience variables, the game layer includes all contents and mechanisms of the game being played. Game contents are at the center of media effects research, with many researchers looking into adversarial effects of displayed violence on thoughts, emotions, and behavior (see [84]). Other factors that influence the player experience and may also have an impact on the effects of game characteristics are difficulty [44], frame rate and resolution [85], and retention mechanisms [86], to name a few. Other research approaches shift from focusing on the player experience to identifying narrative elements [87], categorizing avatars [88], or analyzing militarism and the realism of war depictions [89]. Important for all these contents and mechanisms is, however, that games are a highly interactive nonlinear medium. Some games only allow little variation and ways to be played (successfully), others offer a multitude of solutions to in-game problems, or even different narratives evolving around the same background story. This entails that two players never see the exact same content when they play a game, but also that one person can play a game repeatedly and still have a different experience.

13.2.3 Postgame Phase

13.2.3.1 Context

On the contextual level the postgame phase of player experience comprises all forms of communication directly caused or inspired by the playing phase. Coplayers or opponents might discuss recent games or matches, reflect on their performance, or talk about games in general, sharing hints, or recommending new games. Another form of postgame communication can be forum posts or the exchange with other players via community websites. Gaming as a shared activity or a topic for communication can also affect the social networks of players outside the game itself [90]. These effects on social contacts, however, are not necessarily positive. Unpleasant game outcomes or provocations by other players can lead to trash talking or flaming [91] and supposed or actual negative effects of playing, such as neglecting other activities, can cause disputes with friends and family.

13.2.3.2 Player

Postgame effects of digital game playing, desired or undesired, probably make up the main body of the present social science research on digital games. Media effects and the corresponding research can be divided into two major categories: First, there are short-term effects. Those are mostly investigated in laboratory and field experiments and look into temporary changes in thoughts, feelings, and behavior right after the exposure to digital games. There have been numerous investigations into the effects of violent game content on the accessibility of aggression-related thoughts [77], increases in hostile expectations [92], and aggressive behavior [93] in laboratory environments. Another undesired effect on social behavior that has been studied is the proliferation of sexism and stereotypical views by misogynist or racist content in games [94]. There has also been some research in the opposite direction, looking at socially desirable effects of prosocial game contents [95]. A series of experiments has investigated whether repeated playing of digital games improves cognitive functions, such as spatial-cognitive abilities [96], or memory and executive control [97]. Other examples of short-term effects include studies on the impact of in-game advertisements [98] or the role of content labels and age recommendations in the attractiveness of games for adolescents [17].

The second category covers long-term effects that refer to the consequences of repeated episodes of game playing. As with short-term effects, many researchers are concerned about effects of violent game playing on aggressive tendencies and delinquent behavior [e.g., 99], but there is also research on how prosocial games can facilitate prosocial behavior in the long run [100]. On a more general level, there are also studies investigating the ability of pervasive games to effect (long-term) social change [101]. Another branch of longitudinal studies is concerned with the
13.3 GAMES RESEARCH METHODS

There are many different ways to categorize the methods used in social science to study digital games. One may, for example, distinguish between quantitative and qualitative methods. While the former focus on quantifiable outcomes and include quite diverse measures, such as questionnaires, psychophysiology, or game metrics, the latter focus on the individual construction of meaning, and examples of those are interviews, focus groups, and discourse analysis. Research methods can also be organized along the temporal dimension, similar to the pregame, game, and postgame phases. According to this, the categories would be online, quasi-online, and offline measures. Online measures are those taken during the actual playing phase and, ideally, without interrupting the user experience. Measurements of this type are, for example, psychophysiology, eye tracking, or video recordings of players. Quasi-online measures are those that are taken in the game phase but interrupt the player experience. Examples include secondary task paradigms or short in-game questionnaires. Finally, offline measures are taken before and/or after playing, that is, in the pre- or postgame phase. The most prominent example of a typical offline measure is the questionnaire. Others are interviews or focus group discussions.

Most of the dimensions of player experience described above can be assessed with more than one method. A clear mapping of methods onto experiences is therefore not feasible. For most research questions it is also advisable to combine different methods, for example, qualitative and quantitative. In the following section we will discuss the advantages and limitations of different research designs and instruments. For the categorization of instruments we chose the relatively rough distinction between subjective and objective measures. While subjective measures require the player to actively reflect on her or his playing experience, objective measures often tap into automatic or unconscious processes and rely on technical devices rather than the player as a source of information. Or to put it differently, subjective measures get information from the player, whereas objective measures collect data about the player.

13.3.1 Research Designs

13.3.1.1 Experiments

Experiments make up the core of psychological media effects research. Most experiments in this area consist of measuring differences in an outcome variable (e.g., aggression) between two or more groups based on variations of certain game contents (e.g., violence) or player variables (e.g., gender). Experiments can be set up rather easily, are cost-efficient, and, if conducted soundly, yield results on the causal relation between the variables of interest. Within the IMP, experiments allow making claims about causality or the direction of effects of particular media contents or context variables.

States (cognitive and emotional) belong to the most commonly examined variables in experimental research on media effects, and one must ensure that all potentially relevant variables are either experimentally controlled or assessed to avoid measurement errors or misattributions of obtained results to experimental manipulations. When doing experiments on the effects of certain content types, it is paramount that only these game characteristics are manipulated (e.g., violence), and all others are held constant for all participants (e.g., difficulty). Especially aggression research suffers from a lack of proper manipulation, as participants usually play two completely different games (e.g., Tetris and Grand Theft Auto: Vice City [111]) instead of a violent and a nonviolent version of the same game (as, e.g., in [112]). It is also important to measure a baseline of key state variables, ideally in a pre-post design. Valadez and Ferguson [113] point out that this has been neglected in many studies investigating the games-aggression link and that it is therefore possible that researchers mistakenly interpret differences in the postgame reduction of aggression as an increase in one of the experimental groups. Short-term experiments can be and have been conducted in many different ways, yet usually they only have a limited situational generalizability for behavior outside the experimental setup (as most people, apart from researchers, do not spend a lot of time in laboratories). Researchers also have to be careful when using the results of experiments to infer long-term consequences, as there are many conflicting influences that cannot be taken into account in a laboratory setting. Therefore, experiments can provide interesting insights about effects and mechanisms in a controlled environment but can only be used tentatively to infer on the player experience in everyday life.

13.3.1.2 Field Studies

Field studies are the next logical step to test whether effects eventually obtained in laboratories show the same pattern in naturalistic environments. Contrary to the attempt of laboratory research to remove as much context as possible from players and games for the sake of better control, the approach of field studies is concerned with learning how players experience games in their normal environments. Field research on games (experimentally or otherwise) is therefore embedded in the context of people's lives, be it the family, friends, or work. Depending on the purpose
of the games researchers are interested in, they are required to enter different fields. Therefore, field studies are particularly suitable when context and environmental variables as described in the IMP are important to the research question.

Findings of common laboratory experiments, such as the effects of game playing on physiological arousal, can be replicated in a naturalistic setting like the participants' homes [114]. Researchers concerned with serious games, for instance, might enter educational institutions or workplaces where games are used for learning, such as classrooms [105]. These studies can offer great insights on how, for example, teachers embed games for learning in the standard curriculum, but also on contextual use of games for learning by students (e.g., whether they use them at home or at school, alone or in groups). Other examples of field studies are those that are concerned with the observation of situations in which play typically occurs, such as social interaction and group dynamics during local area network (LAN) events [115]. While the aim of field studies is to exercise the least possible experimental control over the playing situation, it is still important for the researcher to be aware of (and maybe even measure) relevant co-occurring influences or variables. This helps us to understand the interplay of variables and can also point to interesting variables to look at in future (laboratory or field) studies.

### 13.3.1.3 Cross-Sectional Correlational Studies

The majority of cross-sectional correlational studies in the field of research on digital games are surveys. Studies using other sources, such as publicly available statistical data or sales figures, are comparatively scarce in social science research on games [e.g., 116]. Many studies on gaming addiction are based on correlational survey data [117–119], but correlational designs are also used in other contexts, for example, to assess player motivations and genre preferences [120]. While cross-sectional correlational studies can help to detect patterns of co-occurrence, their data alone cannot be used to make causal claims. Using the example of digital games and aggression, cross-sectional survey data cannot answer the question of whether the use of violent games causes an increase in aggression or whether more aggressive individuals prefer violent games. In both cases the correlation between aggressive behavior and the use of violent games would be strong. Accordingly, cross-sectional correlational studies are not suitable to assess the short-term and long-term effects described in the IMP.

What they can be used for, however, is the assessment of general player traits and their relationship with playing styles and preferences. Cross-sectional surveys can be an appropriate tool to gather descriptive data on gamers. If such descriptive data are supposed to be generalizable for the whole population in question (e.g., gamers in a specific country or region), researchers have to be aware of their sampling. Representative samples [121] whose composition reflects the distribution of key variables of the general population, such as sociodemographics, provide the highest degree of generalizability. Self-selected convenience samples, such as players of a specific game recruited from a forum which the researcher is involved in, typically provide the least generalizable data. In the case of research on digital games, differences between player populations can lead to vastly different findings. Cultural aspects and technical infrastructures, for example, can have a substantial impact on the popularity of individual games, game genres, or gaming in general. Although there are a few survey studies that use data from different countries and continents [122, 123], the number of comparative studies in games research is still very small. Comparisons of cross-sectional data from different populations can help in understanding differential media uses and effects and answer questions about the generalizability of findings. Another distinction that is important for surveys of gamers is that between genres and platforms. Players of different computer game genres often differ with respect to major sociodemographic variables that in many cases are better predictors of attitudes and behavior than the use of particular digital games. However, to make causal claims in any direction survey data need to be longitudinal. Metaphorically speaking, cross-sectional studies provide a snapshot of the surveyed players, while longitudinal data, consisting of a series of pictures, combine into a moving picture (movie).

### 13.3.1.4 Longitudinal Studies

Unlike cross-sectional studies, longitudinal designs allow to answer questions of causality. Compared to cross-sectional correlational studies and experiments, there are relatively few longitudinal studies on the uses and effects of digital games. Again, most of the longitudinal studies are concerned with the topics of aggression [19, 124, 125] and addiction [102, 103, 126]. Although pre-post designs and repeated measurement (within-subject) designs in experimental studies, in part, follow a similar logic, the term longitudinal is mostly applied to survey studies (similar to the terms correlational and cross-sectional). The most basic longitudinal design is a cross-lagged study that features two time-lagged phases of measurement using the same sample and, typically, also the same instruments (see following section on measures). In research on digital games, cross-lagged designs are, for example, used to compare the effects hypothesis and the selection hypothesis for the relationship between digital games and aggression. Of course, longitudinal studies can include more than two phases. Due to the high requirements in terms of costs and effort, however, longitudinal studies with more than three phases or waves are very uncommon. Longitudinal studies are also ideal to study trends and changes over longer time spans. For the case of playing habits and preferences, a repeated survey of players could, for example, reveal differences between weekdays and weekends, times of the year, or phases of life. Within the IMP longitudinal studies are especially useful to investigate the long-term effects of games on player behavior or traits.

### 13.3.2 Subjective Measures

#### 13.3.2.1 Questionnaires

Since questionnaires and scales are easy to administer and to analyze, they are arguably one of the most efficient ways to gather subjective data on the users' experience
of digital games. Measuring experiential variables like enjoyment, presence, and flow online is cumbersome as the attention and motor capacities of the players are limited by the demands of the rich virtual environments and input devices. Therefore, these variables are usually measured with the means of self-report questionnaires after exposure to the stimulus. Using quantitative introspective measures can be very informative and useful to the researcher. However, they must be applied with due care, as self-report data are not appropriate for all experiential variables, especially when there are relevant unconscious processes involved or the reliability of the data might suffer from confounds like social desirability. Particularly when assessing behaviors, it is recommendable to combine self-report data with at least one other data source, either observational methods of the respective behavior or, if that is not feasible, an assessment by others (possibly on the same scale).

Experiences that consist of mainly internal, yet conscious processes are best assessed with standardized, validated scales; emotions, for example, are frequently measured with PANAS [127] (when rating states, e.g., in experiments) or the survey questionnaire of Fang et al. [128] (for a general assessment of what players enjoy in games). As presence is a psychological state that suffers from unclear behavioral, physiological, and neuronal correlates, it can be very hard to observe. Accordingly, there is no way to directly measure presence during game play and researchers usually rely on ex-post self-report measures of presence. Although there are validated questionnaires to assess presence, such as the ITC-SOP [129], those were mostly developed for other media and have to be adapted for computer and video games. For a full review of the available methods to measure presence, see [130].

Measuring flow online or quasi-online is particularly problematic as any stimulus that is not part of the playing experience (such as a questionnaire) would, by definition, simply “break the spell” (see [4]). Unfortunately, it can be equally hard to evaluate one’s own flow in retrospect as, by definition, players are focused on the tasks presented in the game and not on reflecting on their own experience. To overcome this issue, there have been attempts to measure flow online with objective methods recently, for example neurobiological correlates [131]. Nevertheless, questionnaires and scales are a particularly suitable method when self-reports have to be assessed quickly and in a standardized way.

13.3.2.2 Interviews and Focus Groups

Interviews and focus groups are qualitative methods aiming at a deeper understanding of the individual player perspective. Typically, the units of analysis in interview and focus group studies are the individual players and not groups of players. Instead of dealing with numeric values and group averages, interviews and focus group discussions can be used to investigate how individual players experience a game and why they like it or dislike it. These methods can be used not only to answer research questions but also to generate questions and hypotheses that can be tested in addition to analogical studies (e.g., surveys or experiments) based on the statements of the informants. A common example of this process would be the generation of categories for a scale. In digital games research, focus groups have been used to investigate typologies of player motivations [11] or reasons for the excessive use of games [132]. Qualitative methods, such as interviews and focus groups, are especially helpful for more explorative studies as they do not necessitate explicit a priori hypotheses.

Another area for which interviews and focus groups are an ideal method is the analysis of media biographies of gamers to investigate how people started playing, how their habits and preferences changed over time, and why they use games the way they do now [133, 134]. Both focus groups and interviews are also common in usability research to get a more detailed feedback from the players and maybe even obtain recommendations, for example, for the development of a serious game. In comparison to quantitative methods that typically aim for a maximum of generalizability and internal validity, interviews and focus groups can provide more detailed data about a very specific group of players or even individual players. Qualitative methods are also a very powerful means to study topics that are very difficult to assess with quantitative instruments. The social environment or setting of playing activities would be one example. Another level of the IMP which interviews and focus groups are especially suitable for are more complex player characteristics, such as their biographical or cultural background. In addition, qualitative approaches are often more conducive to theory building than quantitative methods.

13.3.3 Objective Measures

13.3.3.1 Observation

Observational studies on digital games can be done in both the laboratory and the field. Observations in a lab setting require recording devices for player video and audio and game content. User behavior in games can occur on two levels: in the game and in front of the screen. In a laboratory it is possible to record both, whereas the recording of player behavior in the physical world can be quite challenging in field studies. Accordingly, there are only a few field studies that recorded player behavior outside the game [115]. There are, however, several studies that observe in-game player behavior in online games [135, 136]. Most of these studies were participatory observations in which the researcher is a part of the player group that is observed. Some studies combine data mining or game metrics (see Section 13.3.3.3) with observations to gather additional information about players or the game world [137]. In the structure of the IMP observational studies would mostly be located on the level of the actual playing phase (use). A number of studies on digital games and aggression, however, also use observations to assess short-term effects in the postplaying phase [138, 139]. What all types of observational data have in common is that they have to be coded before they can be analyzed. This coding is often done manually but can also be automatic. Examples of automatic coding include the use of game logs for information on in-game behavior (see Section 13.3.3.3) or software for the automatic analysis of facial expressions. The recording and analysis of facial expressions also indicate that observational studies can also
be a way to investigate short-term effects on player states, especially on emotions. Thus, observations of player behavior can be used to support or enrich other measures of player states, such as psychophysiology.

### 13.3.3.2 Psychophysiology

Physiological reactions to digital games contain objective information about the development of emotional experiences and can reflect variations in psychological states. Psychophysiological data contain only little information about the valence of the arousal, that is, whether it is negative (e.g., aggressiveness) or positive (e.g., happiness), but can reveal underlying processes [76]. However, parameters and indicators for physiological arousal can be selectively used to assess certain emotional spectrums, and they differ in their susceptibility to other influences [140]. Physiological arousal is mostly measured through parameters of the autonomic nervous system, such as blood pressure, heart rate, and galvanic skin response. Recently, there have been some approaches that focus on behavioral expressions of arousal, such as the pressure exerted on input devices or postural changes [112, 141]. Although it is not at the core of psychophysiological games research, another method that also measures biological correlates of gaming is neuroimaging [131, 142, 143]. Some researchers tried to connect dimensions of arousal with specific psychological states, such as presence [144] or aggressiveness [145]. In most cases, however, arousal is mainly used as the physiological equivalent to the psychological concept of excitement. To obtain more specific information, arousal data should be cross-referenced with other measures, such as self-reports. Moreover, with games being highly dynamic stimuli, it can be difficult to link changes in arousal to specific contents (e.g., displays of violence, competitiveness), as many different causes for excitement can occur simultaneously (a very simple example would be the co-occurrence of visuals and sound). Within the IMP, psychophysiological data are most useful when player states are assessed during playing activities in the game phase.

Scholars interested in using arousal for game experience research need a good control over their stimulus material in order to be able to attribute changes in arousal to the correct causes. In order to attribute changes in arousal to a particular stimulus, it can be advisable to combine the methods of psychophysiology and content analysis. This makes it possible to record physiological reactions to specifically coded in-game events (phasic arousal), instead of mean values for arousal over a longer period of playing (tonic arousal). Another issue is the application of measurement electrodes (or other devices), as games usually need both of their hands to play games. Applying measurement electrodes to the foot or the forehead can be a solution, as well as integrating them into the input devices (e.g., for pressure detection). Novel input devices also have methodological merits for research, as they can be turned into a measurement device for affective states and behavioral expressions of arousal. Such measurements can include postural patterns and body movement measured by a Nintendo Wii Balance Board [112, 141], applied pressure with pressure sensors on mouse and keyboard [112, 141] or a touchpad [146]. See also Ravaja’s [147] and Kivikangas et al.’s [140] reviews and recommendations for psychophysiological data in media effects research.

### 13.3.3.3 Game Metrics

Game metrics are mainly used for two different aspects of digital games research. Automatically created logfiles with distinctively coded events and other in-game information of player–game interactions can be easily and effectively used as a basis for content analyses (see below). However, game metrics also contain information about player experience that is expressed through means of in-game behavior. This can cover fractional behaviors, for example, performance through button presses (accuracy and reaction times), but also problem-solving abilities and creativity (puzzles), player skills (scores and/or succeeded difficulty levels), narrative decision-making processes (e.g., choices in role-playing games), or social dimensions of playing (use of in-game messages or voice chat). Many games have an automatic log file output or store key player–game interaction in save files. Others, particularly first-person shooters, allow the use of plug-ins to record a large variety of in-game actions. While providing enriching insights on their own, time-tracked game metrics allow the combination with simultaneous data sources, for example, psychophysiological reactions or observational data, such as video recordings of the player. Within the IMP, game metrics contain information relevant to the user state and the player–game interaction in the game phase. For a full review of game metrics in usability and user experience research see [148].

### 13.3.3.4 Content Analysis

Unlike the other methods discussed in this chapter, content analyses are more concerned with the game than with the player experience. Nonetheless, content analyses of digital games are a valuable tool for a full understanding of player experience. If we want to study how digital games affect their players, we need to know what contents there are that can actually have an effect. Similar to research on the players, content analyses of games can have different levels of abstraction. On the microlevel, a content analysis can look at an individual game and provide in-depth data on its storyline, characters, or mechanisms. Analyses of individual games can, for example, be used for the phasic analysis of psychophysiology [143] or the coding of in-game behavior in observational studies. On a mesolevel, content analyses can include several games that are chosen based on specific criteria, such as sales figures, age ratings, or genres. The majority of the content analyses of digital games use a sample of games to investigate, for example, gender role portrayals [149, 150] or violence [149, 151]. As modern games require a lot of time to play through, most content analyses only use excerpts of games (e.g., the first mission, one level or hour of game play). Instead of a time-based sampling, game content could also be sampled based on themes, such as plot elements [152]. A macrolevel content analysis of digital games would feature a whole (sub-)genre and may also include older games. A diachronic approach can help to understand how a genre developed over time [89].
Within the framework of the IMP, content analyses are clearly targeted at the game contents and mechanisms. When combined with other methods, such as observations or psychophysiology, content analyses can, however, also serve to get a more detailed picture of the player experience and the causes of potential effects on the players. The idea of a “biometric storybook” that links game contents with psychophysiological user data is a good example of such a combination [153].

13.4 CONCLUSION

This chapter was meant to give an overview of research on player experience and its different methodological approaches. We suggested the IMP as a framework to describe the dimensions of player experience and to organize the research that investigates it. As the IMP and the methodological overview illustrate, player experience is a complex phenomenon that can be approached in very different ways. Due to the variety of topics and methods, studying player experience can be a difficult task. In order to arrive at sound results, it is important to ask the appropriate questions and make the right decisions. Although it is impossible to become an expert on all the methods presented in this chapter, we want to conclude by giving some general recommendations on how to approach player experience.

1. Formulate a Clear Goal for Your Research before Collecting Any Data. The first and most important choice is that of a research question. The aims or questions you formulate for your research should guide all your decisions in the process. The IMP can serve as a rough guideline for formulating the research questions or hypotheses. Before picking any method, you should be clear about what it is exactly that you want to investigate: What dimension(s) of player experience are you interested in? Which processes or effects do you want to study? Which variables are good indicators or operationalizations of the phenomena you are researching? The clearer your research questions and relevant variables, the easier are all subsequent decisions in the IMP’s research framework.

2. Choose the Appropriate Methods. Based on your research interest you need to decide what methods to choose. Ideally, you combine methods, but no method should be used that does not help in answering your research question. For instance, you should not measure psychophysiological data only because you own the sensors. Again, the IMP and the overview in this chapter can serve as an initial guideline for finding suitable methods. Cross-sectional surveys can, for example, not be used to answer questions of causality and laboratory experiments are not the best choice to study long-term effects. Of course, the choice of methods also has to take into account the resources available to a researcher (budget, staff, equipment), but the main guideline for all methodological decisions should be the research questions or hypotheses. Another thing that needs to be considered is that the methods used to study player experience should not interfere with that experience. Some psychophysiological measurement devices might disturb the player and obstructive recordings of player behavior or in-game questionnaires may reduce the attention paid to the game. Especially with measurements that are taken while playing, great care is necessary to avoid any negative impacts on the playing experience itself.

3. Pick the Right Stimulus Material. While this might sound trivial, Williams [154] criticized an apparent unfamiliarity with digital games in some areas of the field. This concerns specific contents and mechanisms of games but also how and in which contexts they are used by committed players. Having a profound knowledge of digital games certainly helps refining theoretical and methodological approaches to relevant research questions, but it also has practical implications especially for experimental study designs. Experiments typically follow a certain pattern in their design: Participants play one of two games that differ in the amount or type of a content variable (e.g., violence), after which outcome variables are measured with questionnaires or behavioral tests. However, complex interactive stimuli like games usually differ on more than just one dimension. To be able to attribute differences in measured outcome variables to specific game characteristics, it is vital to manipulate the variable(s) a researcher is interested in and control other game characteristics that might confound the measurements (e.g., through means of game modeling). For further recommendations on using games in experimental studies, see References 58 and 155. Another aspect relevant to all aspects of digital games experience research is stimulus novelty. In order to investigate player experience, it is relevant that the games used by researchers are the same as the ones enjoyed in the “real world.” This is also true for the playing situation and social context as well as the modes of playing.

4. Be Aware of the Limitations of Your Study. Even if a study is planned meticulously and conducted soundly, it will still have limitations. As mentioned before, the generalizability of all research on digital games has clear boundaries. It is likely to obtain different results if different samples, stimulus materials, or methods are used. Many of the results found in even the best studies cannot be easily generalized to other player populations, cultures, or genres. The medium of the digital game and its players are simply too diverse to make general statements that are valid for every game and player. The large number of games, genres, and platforms and the rapid technological change add to the problem of limited generalizability. A lot of the findings from the early years of digital games might simply be outdated nowadays and the same is likely to be true for the current research in a few decades.

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