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# UPEQ: Ubisoft Perceived Experience Questionnaire

A self-determination evaluation tool for video games

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## Abstract

In order to appeal to a growing market, game developers are offering a wide variety of activities. It is becoming necessary to understand which psychological need each activity caters for. The purpose of this paper is to demonstrate the development and evaluation of an instrument to assess which basic psychological needs are satisfied by different video games. This work is part of a growing effort in HCI to develop surveys able to capture subtle nuances of the player experience. This model, UPEQ, was developed by transforming a self-determination theory questionnaire into a video game specific survey. UPEQ consists of three subscale of Autonomy, Competence and Relatedness, which, through two studies focusing on development and validation of the model showed significant correlations with other self-reported

## 1 Introduction

Video game consumption has grown significantly over the past years and even surpassed movie and music industry in revenue generation [14]. According to Entertainment Software Association, expansion of video game consumers has reached 65% of American households [8]. While most studies deal with negative effects of video games on consumer subjects -namely violent video games exposure [1, 10, 11, 15], few have investigated personality traits and motivations behind attraction to video games [5, 16, 20, 22, 23] in order to unravel the extensive outreach of this medium.

The growing commercial success of open-world games reflects a

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measures of sense of transportation to the game as well as enjoyment of and engagement with the game. Regression with in-game behavior of players tracked by game engine also confirmed that each subscale of UPEQ independently predicts playtime, money spent on the game and playing as a group.

## CCS Concepts

CCS → Human-centered computing → Human computer interaction (HCI) → HCI design and evaluation methods → User models.

## KEYWORDS

Player profiling, self-determination theory, player experience, data driven modeling

shift in players' preferences. Namely, players want to decide how characters grow, which activities to undertake and which areas to explore. [24] The amount and the variety of activities offered by open world and sandbox games has brought forth the need to invest into understanding players and their motivations. Partially because it is not sufficient just to know if players are engaged or having fun, but it is necessary to infer which activities they prefer and why. This need for more granular evaluation of different aspects of these game worlds entails the ability to connect activities offered by games with players' needs, motivations and desires. One approach to achieve this goal is to survey player identification as a gamer and asking them about motivations behind engagement with this particular medium. This approach will help game developers evaluate their products during and after development and compare design intentions with player satisfaction. Ultimately, developers will have a framework to adjust gameplay features to specific needs of their defined demographic. In that regard, it is necessary to tailor game titles based on players' perceived experience. This has led Ubisoft, a developer and publisher of mostly open world video games, to develop UPEQ –a 21-item survey- to gauge need satisfaction of players based on self-determination theory (SDT) [6, 17]. Self-determination theory assumes that akin to nutriment needs for physical development and functioning, certain conditions are

	Number of survey items	Theoretical Background	Development method	Significance (correlates)	Validation	Main Limitation(s)
UPEQ	21	Self Determination Theory	transformation of existing SDT based surveys in other fields	Subscales independently correlate with enjoyment, game recommendation and rating, as well as tracked behaviors like playtime, money spent on game and group playtime	Two Large scale study (N=563 & 7697) internal consistency, PCA, Regression	Semantic overlap of constructs
GEQ	19	Presence + Flow + Absorption + Dissociation	Focus groups, behavior observation [9]	Quantification of tendency for game engagement, correlates with Dissociative Experience scale and Aggression Questionnaire (tendency to engage in violent video games)	Internal consistency by Rasch rating scale model and Classical Test theory (N=153) [4]	Subject oriented, tenuous and overlapping theory, ad hoc development
Brainhex	21 (+ additional 7)	Inspired by implications of neurobiology + interim player typology [3, 13]	hypothetical expressions of neurobiological research with observational case studies of players	some skewness with Myers-Briggs Types, complimentary to other player type models	inconclusive Psychometrics	lack of theoretical framework and validation, poor scientific credibility of MBTI
PENS	22 (also reported 9)	Self Determination Theory (no relatedness) + Presence + Intuitive controls	not available	Autonomy and Competence Correlates with self-reported game enjoyment, preferences and change in well-being. All three needs correlate with self-reported enjoyment and future gameplay in MMOs.	Four Studies (N=89, 50, 58, 730) Classical Test Theory [18]	Limited availability, small validation sample, semantic overlap of constructs

**Table 1. Summary of characteristics of some existing game surveys**

necessary for the growth and well-being of people's personalities and cognitive structure. In theory, these universal needs are identified as needs for Autonomy, Competence and Relatedness [6, 25].

## 2 Existing work

Numerous other behavioral, physiological and subjective experience evaluation tools have been developed and used to measure different aspects of player experience (see [7] for a review). In this section, theoretical background and formulation of three prominent models, namely Game Engagement Questionnaire (GEQ), BrainHex and Player Experience of Need Satisfaction (PENS) is being reviewed. (See [table 1](#) for a summary).

Beside video games' outstanding market outreach, they provide unique conditions for attention modulation and involvement of the player. This increased involvement and attention leads to reduced awareness of the self and the surroundings. It is an essential task to examine both the physiological and psychological processes that subjects undergo during an instance of inhabitation in video games. At the same time it is also imperative to investigate what are the characteristics of a game that provides conditions for experience of absorption. (for an analysis of definitions and varying degrees of this phenomenon see [26]). Much of existing game evaluation tools are concerned only with quality of subjects' experience (marked in table.1 as "subject oriented", e.g. all underlying theories of GEQ [4] and PENS Presence [18]). However, as Calleja suggests, a more comprehensive approach

would entail simultaneous study of player assimilation into the game world as well as systemic acknowledgement and representation of player by the game [26].

As a theoretically established alternative, Self-determination theory argues that players are intrinsically motivated to engage in an activity that satisfies their inherent tendency for psychological growth and well-being. SDT assumes that these *basic psychological needs* and their pursuit is universal and independent of culture and developmental stage. [25] Need satisfaction therefore, refers to the perceived degree of satisfaction of the basic needs for autonomy competence and relatedness. SDT has been applied to a variety of academic and industrial fields including video games [18]. Deci and Ryan have shown how the self-perception of satisfaction of the needs identified by SDT, is a correlate of performance, self-esteem and general well-being [6]. In context of video games, Ryan showed that enjoyment and future gameplay are correlates of satisfaction of autonomy, and competence in development of PENS survey [18]. These findings suggests that subjective perception of need satisfaction could be used as a game-oriented alternative to subject-oriented measures. In that, instead of surveying players about fleeting idea of fun or retrospective investigation of player's situational awareness, satisfaction of basic psychological needs is being evaluated. This evaluation is applicable not only to the game as a whole but also each activity within the game as its own agent of need satisfaction.

Other game-oriented measures (BrainHex [13] and Yee [20]) provide a taxonomy of gameplay features that a player have experienced in other games and is likely to perform in the future. Instead of a list of preferred features, evaluation of need

satisfaction also leaves room for a more creative approach for improving already existing game elements.

Additionally, a prevalent limitation of existing models often includes a small and specific sampling of validation population in the developmental stages of the model (often the sample is limited to few classes of graduate students). Small and specific samples are a significant threat to the external validity of these models; for this reason game developers are skeptical in adopting existing framework and models.

Finally, due to the fact that the identified needs of Autonomy, Competence and Relatedness are broadly defined (as discussed in the following section), there is a certain interconnection between the three constructs. This is perhaps the reason why the evaluation of need satisfaction in video games is often accompanied by other metrics such as intuitive controls, presence, immersion and measures of extrinsic motivation [18].

### 3 Theoretical Framework (SDT)

Introduced as a metatheory, self-determination theory primarily assumes there are individual tendencies toward a unified sense of self, and that these tendencies are by nature constructive. It also argues that there are social-contextual factors that support or thwart this innate tendency [25]. Therefore, the theory introduces three universal and basic psychological needs that are essential for psychological well-being. Several measures of positive affect and mental-health have been used as evidence for eudemonic well-being [27].

According to self-determination theory, the need for *Autonomy* refers to the experience of volition, through providing choices or anticipation of opportunities, whether illusory or real, that are perceived fair and equally potent. In an Open-world simulation, the sense of autonomy could be described as control over which type of activities to engage with and agency to perform them in one's preferred playstyle as well as game's differentiated and emancipating support for these choices. The second need, *Competence*, emphasizes the need to feel capable and effective while constantly improving oneself through challenges. In a video game, competence can be induced by progression through repetition. In other words, activities that requires skillful performance of combinatory logic of the game and is usually reinforced by empowering feedback cues (e.g. an explosion as audio/visual feedback to shooting) are competence inducing. Finally, *Relatedness* is the concept of social belonging and being hailed as a social construct. In context of open-world games, positive relatedness includes any interaction with other players or Non-player characters that promotes autonomy and/or competence of the player [18].

These psychological needs are defined as parallel to physical needs, hence psychological needs are distinguished from motivations and desires. While desires and motivations fueled by these needs not always complement psychological well-being and growth, SDT argues that the three basic needs naturally presuppose a positive outcome [25]. At the same time, being self-determined means that these needs function at an individual level and are closely tied to one's perception of their satisfaction.

Effects of subject's sensitivity to each of the differentiated needs as well as a factor of importance or priority for them is another theoretical challenge of SDT [6].

On the other hand, as mentioned by Deci and Ryan [18], one activity can cover more than one need but it could also satisfy one need and thwart another. For example in context of video games, acquiring a superior tool or weapon is expected to satisfy the need for competence but it could, by making other options practically obsolete, thwart the need for autonomy. The definitions of the three basic psychological needs, as already explained, is rather broad. This inclusivity presents both an opportunity and a challenge: it is in fact possible to address the definitions creatively but it also leads to pointless discussions on the confines of the definitions. Therefore, the semantic overlap of the constructs of SDT is both logical and lexical, and it refers to (1) the subjectivity of the perception of priority and importance of needs and (2) interconnection of meaning between needs.

### 4 Overview of current study

In this article, we present the development of a concise SDT based questionnaire specific to the evaluation of video games. This model, UPEQ, includes only basic needs of autonomy, competence and relatedness. These constructs regardless of their limitations, are correlates of sustainable positive interaction with the game. Hence, they could benefit game developers in offering them feedback that is not only game-oriented and actionable but also does not hinder the creative process of game development.

Through two large-scale studies we have investigated the internal consistency of the model, demographic and individual effects and correlates of need satisfaction, and sense of physical transportation into the game. The first study examines the development and internal consistency evaluation of survey items applied to more than 20 popular video game titles released by November 2015. The second study investigates the coherence of self-reported need satisfaction of players with their recorded in-game behavior such as playtime and money spent in a particular multiplayer online game. It also investigates the feeling of physical transportation into the game and its relation with need satisfaction. In conjunction, these studies aim to present a reliable alternative for video-game evaluation, which is not only theoretically well established but also effective in practice.

### 5 Development study

The development of UPEQ went through a four-stage process: item construction, language refinement, internal consistency validation and data analysis.

**Item construction:** Several surveys of need satisfaction were reviewed and repurposed to fit to the context of activities within video games. For example the item: "There is not much opportunity for me to decide for myself how to do things in my daily life" was rephrased into "I could decide for myself how I wanted to play" (See Table 2 for a full list of items). Specifically we focused on the items from "Basic Need Satisfaction Scale – In General" [21].

**Language refinement:** an iterative approach was used to fine tune both language and intent. Through five interviews with game development professionals and habitual gamers we honed in and specified even more the underlying constructs. Specifically in terms of relatedness, the contextualization of this construct went beyond reinforcement of sociality between players, often a feature of massively multiplayer online games (MMOs) or other forms of social interaction with other players) to sociality involving non-player-characters (NPCs).

**Data collection:** We collected data through an on-line survey deployed to PC and console players; they were asked to evaluate a game that they recently have played using the UPEQ scale; we also collected other demographic information and other control questions.

**Data analysis and internal consistency validation:** we validated the internal consistency and factorial structure of the model through principal component analysis and categorization of sampled games based on their UPEQ score.

Factor	Item	within factor
Autonomy	I was free to decide how I wanted to [play].	.715
	I could approach [the game] in my own way.	.722
	The game allowed me to [play] the way I wanted to.	.694
	I had important decisions to make when [playing].	.777
	The choices I made while [playing] influenced what happened.	.798
	My actions had an impact on the [game].	.722
Competence	With time, I became better at [playing].	.655
	My [gaming] abilities have improved since the beginning.	.645
	My mastery of the [game] improved with practice.	.655
	I was good at [playing].	.683
	I felt competent at [playing].	.660
	I felt very capable and effective when [playing].	.684
Relatedness	I really like the people I play with.	.601
	I consider players I regularly interact with to be my friends.	.546
	Other players are friendly towards me.	.531
	What other players did in the game had an impact on my actions.	.737
	I had to adapt my actions to other players' actions.	.808
	I was paying attention to other players' actions.	.831
	I felt close to some of the characters.	.625
	I was bonding with some of the characters.	.636
	I cared about what happens to some of the characters.	.539

Table.2 Factorial structure of UPEQ items

## 5.1 Survey Instrument

The online survey was sent out to a random sample of registered Ubisoft PC and console players across the globe. Additionally we collected information regarding age, gender, location (country) and native language (to evaluate English proficiency as a potential risk to the consistency of the model).

In the main section of the survey, participants were asked to identify a game that they are currently playing, the system that they played it on, self-reported number of hours played, days since last played (to disqualify respondents in risk of memory bias) and finally, the body of UPEQ to be answered based on the experience with the selected game. There were no limitations in selection of the targeted games and as a result, around 20 popular game titles were most frequently present in our data collection process.

## 5.2 Participants

Five hundred and sixty three respondents volunteered to participate in answering our online survey distributed in November 2015. Fifty-nine participants identified as female and the five hundred and nine others as male (N=563). Respondents were aged 16-55 (M= 26.87, SD=7.94) and most participants were from Canada 52%, France 28%, United States 17%. Sample also included respondents from Belgium, Brazil, Dominican Republic, India, Mexico and United Kingdom. Self-reported English language proficiency of all participants was acceptable and further analysis showed no significant differences based on native language of the respondents.

## 5.3 Analytical procedure

Analysis of this study was done in two steps. The first step included scale reliability tests and the definition of the factorial structure of the model; and second step involved a correlational analysis with self-reported number of hours of gameplay, game appreciation (evaluation of the game in a 5 point Likert scale) and playing frequency in general.

## 5.4 Results

Cronbach's alpha and Rasch reliability test, as two measures of assessment of scale reliability, were used [2, 19]. Cronbach's alpha for all items of UPEQ (21 items, alpha= .91) as well as each of the three subscales of Autonomy (6 items, alpha=.86),

Competence (6 items,  $\alpha=.82$ ) and Relatedness (9 items,  $\alpha=.84$ ) was calculated. Additionally Rasch model yielded 0.94 item reliability.

In the next step, we examined the correlations amongst the 21 UPEQ items so that coherent factors could be identified. Several well-recognized criteria for the factorability of a correlation were used. Firstly, it was observed that all 21 items correlated at least .5 with at least one other item, suggesting reasonable and acceptable factorability (see [table 2](#)). Secondly, the Kaiser-Meyer-Olkin, a measure of sampling adequacy for factor analysis, was .87, above the commonly recommended value of .6. Bartlett's test of sphericity, used to verify homogeneity of variances, was significant ( $\chi^2(563) = 3239.2, p < .001$ ). The diagonals of the anti-image correlation matrix were also all above .5. Finally, the communalities were all above .4, further confirming that each item shared some common variance with other items but not showing an excessive overlap. Given these overall indicators, factor analysis was deemed suitable with all 21 items.

Principal components analysis was used and initial Eigen values indicated that the first three factors explained 35.5%, 10.6%, and 8.5% of the variance respectively. The fourth and fifth factors had Eigen values just over one, and explained 8% and 6% of the variance respectively. Solutions for three, four and five factors were each examined using varimax rotation of the factor-loading matrix. The three-factor solution, which explained 55% of the variance, was preferred because of: (a) its previous theoretical support; (b) the 'leveling off' of Eigen values on the scree plot after three factors; and (c) the insufficient number of primary loadings and difficulty of interpreting the fourth factor and subsequent factors.

Correlates of UPEQ's Autonomy, Competence and Relatedness were examined using Kendall's tau, and it was shown that self-reported hours spent in the game correlated with UPEQ's measures of Competence and Relatedness independently. All subscales of UPEQ significantly predicted game the likelihood of the players recommending a game (Autonomy:  $\tau=.299, p<.01$ ; Competence:  $\tau=.307, p<.01$ ; Relatedness:  $\tau=.268, p<.01$ ) and players purchasing the game (Autonomy:  $\tau=.193, p<.01$ ; Competence:  $\tau=.235, p<.01$ ; Relatedness:  $\tau=.195, p<.01$ ) as well as players appreciating the game in a 5 point scale (Autonomy:  $\tau=.364, p<.01$ ; Competence:  $\tau=.374, p<.01$ ; Relatedness:  $\tau=.316, p<.01$ ).

## 6 Validation Study

In a second study, UPEQ scores of a large number of players of Tom Clancy's the Division [28], an online multiplayer game, was tested against behavioral data collected from the game online database. We performed this analysis in order to examine if UPEQ's scales of Autonomy, Competence and Relatedness are predictors of in-game behavior. We anticipated that higher scores of UPEQ subscales would correlate with indices of behavioral data that show more engagement with the game. Additional three questions were also asked to measure the degree to which players felt transported to the game. This addition was an attempt to test the hypothesis of Calleja that:

“A player who assimilates [a] game world into the gaming experience as a metaphorically habitable environment can be thought of as being *transported* [italic in the original text] to that world.”[26]

We expected to see an induced sense of transportation (coded as physical presence) with higher scores in perceived need satisfaction. Our Physical presence scale has consists of the following items:

- When playing the game, I feel transported to another time and place.
- Exploring the game world feels like taking an actual trip to a new place.
- When moving through the game world I feel as if I am actually there.

## 6.1 Participants

Players of Tom Clancy's the Division [28] an online multiplayer open-world game released in early 2016 were asked to fill in a survey including UPEQ among other questions. Players who chose to respond to this survey and had valid answers ( $N=7697$ ) were anonymously cross referenced with the game's in-game behavior tracking engine through confidential access to this data. Some measures of gameplay behavior such as days of gameplay was extracted for the purpose of this study.

Most participants were located in North America and Europe (33% US, 16% UK and 5% Germany) however, a noticeable margin of players were from South America, Asia and Africa. Respondents also indicated their age ( $M=29.43, SD=8.72$ ) and gender identity (3% female).

## 6.2 Analytical procedure

Data collected from the survey was anonymously cross referenced with each participants' in game behavior through a unique computer-generated identification number. This procedure was done under respondents consent. Next step was to reevaluate internal consistency of the model through Cronbach's alpha of individual items and subscales. Correlation and regression with extracted behavioral measures and a self-reported rating of the game was the final step in our analytical procedure in this study.

## 6.3 Results

We calculated Cronbach's alpha for all items of UPEQ (21 items,  $\alpha=.901$ ) and each of the three subscales of Autonomy (6 items,  $\alpha=.87$ ), Competence (6 items,  $\alpha=.81$ ) and Relatedness (9 items,  $\alpha=.79$ ) as reliability measures. Additionally, Cronbach's alpha for three items of Physical presence was also reported at .85.

The next step was to explore correlates of subscales of UPEQ and physical presence with other measures of game evaluation and behavioral tracking. It was found that UPEQ's Autonomy, Competence and Relatedness are significant correlates of Physical Presence ( $\tau=.373, .324, .409$  respectively with  $p<0.01$ ), Self-reported rating of the game ( $\tau=.386, .288, .289$  respectively with  $p<0.01$ ) as well as in-game measures such as number of days that the player has played the game ( $\tau=.028, .093, .101$  respectively

with  $p < 0.01$ ), money spent on the game ( $\tau = .045, .034, .089$  respectively with  $p < 0.01$ ) and group playtime percent ( $\tau = .03, .038, .07$  respectively with  $p < 0.01$ ). Physical presence also showed significant correlations at  $p < 0.01$  with the rating of the game, number of days played and money spent on the game ( $\tau = .259, .030, .048$  respectively).

Regression analysis of UPEQ subscales with self-reported rating and in-game behavior indices was done individually. [Table 3](#) demonstrates significant beta coefficients observed in this procedure.

It is worth noting that the significance of testing null hypothesis for expenditure (amount of money spent by player on the game) is influenced by the nature of pricing strategies adopted. The game comes at a fixed retail price, but players can purchase certain added content later on, which explains variance of this variable.

	F	p	R Squared	B	sig.
<b>Rating (self-reported)</b>	<b>979.96</b>	<b>0.05</b>	<b>0.276</b>		
UPEQ-Autonomy				<b>0.381</b>	<b>0</b>
UPEQ-Competence				<b>0.167</b>	<b>0</b>
UPEQ-Relatedness				<b>0.057</b>	<b>0</b>
<b>Days played (recorded by game)</b>	<b>104.86</b>	<b>0.05</b>	<b>0.039</b>		
UPEQ-Autonomy				<b>0.119</b>	<b>0</b>
UPEQ-Competence				<b>0.127</b>	<b>0</b>
UPEQ-Relatedness				<b>0.163</b>	<b>0</b>
<b>Expenditure (recorded )</b>	<b>26.53</b>	<b>0.05</b>	<b>0.012</b>		
UPEQ-Autonomy				<b>0.011</b>	<b>0.508</b>
UPEQ-Competence				<b>0.024</b>	<b>0.098</b>
UPEQ-Relatedness				<b>0.127</b>	<b>0</b>
<b>Group playtime percent (recorded)</b>	<b>93.43</b>	<b>0.05</b>	<b>0.042</b>		
UPEQ-Autonomy				<b>0.244</b>	<b>0</b>
UPEQ-Competence				<b>0.028</b>	<b>0.068</b>
UPEQ-Relatedness				<b>0.249</b>	<b>0</b>
<b>Physical Presence</b>	<b>1558.4</b>	<b>0.05</b>	<b>0.378</b>		
UPEQ-Autonomy				<b>0.236</b>	<b>0</b>
UPEQ-Competence				<b>0.226</b>	<b>0</b>
UPEQ-Relatedness				<b>0.519</b>	<b>0</b>

**Table 3. Regression analysis of UPEQ subscales (N=7697)**

## 7 Discussion

Ubisoft Perceived Experience Questionnaire, UPEQ, was developed as a game assessment tool that is theoretically founded and gives game developers a sensible idea of how the virtual worlds created by them accounts for players sense of agency and expression of sociality through constant acknowledgement of player competency.

An initial study was used to evaluate internal consistency of UPEQ items and its subscales as an actionable alternative to existing player experience questionnaires. As results suggests, regardless of the game chosen, UPEQ could be a reliable and consistent model of game assessment at least compared to other self-reporting measures, and it provided more granular feedback on players' appreciation.

The goal of the second study was to reaffirm internal consistency of the model in a larger and game specific sample and to examine significant correlates of UPEQ as a predictor of recorded in-game behavior. Our analysis confirms our hypothesis that, each subscale of UPEQ independently predicts measures of engagement in game and are a reliable alternative for direct rating of player experience, which does not specify nuances of need satisfaction and games' success in accomplishing them. It also partially supports measurements such as days and money spent in the game which are usually metrics used to gauge player engagement with the game. We were also able to exhibit successfully that need satisfaction is indeed related to feeling of being transported to the game world and being incorporated therein.

Consequently, UPEQ has been used on several game titles within Ubisoft to evaluate state of the game and compare it to competition in terms of need satisfaction. It could also be beneficial to set production goals based on UPEQ scores in different iterations of the game during development phase.

## 8 Limitations

As mentioned earlier incorporating a self-determination theory survey for evaluation of video games is not free of limitations. Beside theoretical limitations and assumptions of the theory [26], samples in both of our studies were targeting volunteer online respondents, which risks surveying of only a particularly vocal set of video game audiences, for example an insufficient number of females took part in the study. Second study only included players of one particular game and the majority of respondents represented men who are residents of specific geographical regions skewing data toward their preferences. Second study also examines measures of in-game behavior, which has the risk of showing a shared platform (or online account) among multiple players who may be different from the survey respondent.

## 9 Future Lines of Research

Additional testing is required to target regional and gender diverse groups.

## Ubisoft Perceived Experience Questionnaire

On theoretical side, further investigation into overlap in definition and perception of constructs such as Autonomy, Competence, Relatedness and Physical Presence would be useful not only to have a better sense of identifying hindrances in need satisfaction of the player but also to clearly guide game developers on how to resolve those issues and enhance the experience of game assimilation.

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