Autotelic Immersion - Interdependence of the Experience and Autotelic Engagement

Mirosław Mikicin (✉ miroslaw.mikicin@awf.edu.pl)

Józef Piłsudski University of Physical Education in Warsaw

Research Article

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Abstract

The aim of this study is to explore the relationships between experienced immersion and autotelic engagement in computer gamers. As the tendency to act for the sake of acting or not, autotelic v/s exotelic engagement makes the gamer more or less susceptible to experiencing immersion. The interdependence of experiencing immersion and the sense of autotelic engagement corresponds to the level of autotelic immersion. Students from different university majors (N=87) participated in the study. They completed 2 questionnaires: The Immersiveness Inventory (ING) and the Engagement Questionnaire (FLOW). The results of this study indicate that the experience of autotelic immersion is enhanced by autotelic engagement, manifesting autotelic cognitive properties during computer game playing. In such cases, Interaction with the environment, Sensory Engagement, Sense of Control, balance between ability level and challenge, intrinsic rewarding, concentrating and focusing, control, feedback, and action awareness merging intertwine with each other. Strong positive correlations of interaction with the virtual environment and sense of control were observed with all dimensions of autotelic engagement: the balance between ability level and challenge, loss of the feeling of self-consciousness, clear goals, intrinsic rewarding, concentrating and focusing, control, and autotelic experience. There is a strong directly proportional relationship between autotelicity and immersion.

Introduction

People vary greatly in their ability to engage in a variety of work, play, and leisure activities such as watching videos, playing sports, and computer games (Norman, 2010). These differences relate to the ability to focus attention and consciously control the surrounding reality. In the context of computer games, they refer to mental processes and objective mental properties related to brain processes (Toschi, 2017), favoring or not favoring mental functioning in virtual reality. Virtual reality can remodel the frame of reference from an exocentric (from the outside) to egocentric (from within the phenomenon) view (Shin, 2019), which can lead to a more physical and concrete experience. This property, having a genetically determined basis (Harwood et al., 2015, Britton, 2012), is an important component of personality that has been described as an exotelic - autotelic factor (Csikszentmihalyi, 2020, Mao et al., 2016; Nakamura & Csikszentmihalyi, 2014; Asakawa, 2004). In Greek, the word 'autotelic' stems from 'auto', meaning the 'self' oriented towards a person themselves, and telos, meaning 'goal', whereas exotelic means its opposite. Autotelic engagement absorbs the gamer's attention to the extent that they feel real emotions and affection, even if they are induced by fictional objects. Autotelic activities, which have the purpose in themselves, are performed only for themselves, while exotelic activities are directed towards external goals. Autotelicity vs. exotelicity in computer games can also be thought of as an emotional dimension of the gamer's attitude towards his or her activities in virtual reality. It reflects identification with the performed activity, sets a measure of loyalty to playing itself, and determines the level of satisfaction and sense of emotional attachment (Mikicin, 2013). The essence of autotelic v/s exotelic engagement in computer games is the flow of attention required to become interested in the action of the game and experience immersion. It encompasses a state of mental engagement that can be perceived as "being here and now" despite the lack of realism.

Furthermore, people with an autotelic type of personality are involved in computer games just for playing itself, whereas people with an exotelic type play for another reward. As measurable states of mind associated with gamer engagement, autotelicity and immersion are not subjectively experienced as effort because they allow

attention to be automated. The concepts of autotelicity and immersion define the dimensions of action that allow for the determination of the level of integration with an action not to achieve distant goals but for itself. Autotelic v/s exotelic engagement in computer games can manifest in a variety of ways, where even when the hardware conditions are met, it induces various levels of experienced immersion (Norman, 2010). For example, sensory engagement refers to how the senses interact (Toschi et al., 2017; Uesaki and Ashida, 2015; Brown, 2004) to engage a person in a game. These are visual and auditory interconnections that represent feedback, triggering visual and auditory perception to create a realistic (Uesaki and Ashida, 2015), three-dimensional message. Furthermore, the preconditions for inducing immersive experiences in computer games (McMahan, 2003) are consistent with those necessary for autotelic engagement (Wefald and Downey, 2009): the game convention must meet the user's expectations, it must be meaningful to the gamer, and there must be a "coherent game world". The level of autotelicity and conducive technology is then expected to result in deep immersion. Autotelicity and immersion are therefore expressions of identification with the activity, and also determine the level of satisfaction and sense of emotional attachment (Csikszentmihalyi and Larson, 2014). Affective feelings, interactive regulation, and unconscious relational transactions in attachment (Schoe and Schoe 2008) are processes necessary for experiencing joy in action, but autotelic action, which readily converts the perception of potential threats into inner harmony, can reinforce this attachment. These aspects are also taken into consideration in the model proposed by Macey and Schneider (2008), who distinguished the characteristics of autotelic action: behavior (visible reactions, typical of a specific role, proactivity, adaptability); states (reflecting feelings of enthusiasm, pride, being a combination of constructs such as satisfaction, attachment, and identification), and traits (conscientiousness and emotional equilibrium) that are likely to enhance and deepen immersion in the gamer's autotelic action. Ermi and Mäyrä (2005) developed a three-component model of immersion that included: sensory immersion relating to the quality of the graphics, the size of the three-dimensional screen, the visual and auditory experience; challenge-based autotelic engagement relating to a satisfactory balance of challenges and skills; problem-solving and strategy; imagination-related immersion, and identification with signs. As the tendency to act for the sake of acting or not, autotelic v/s exotelic engagement makes the gamer more or less susceptible to immersion. Engagement is naturally manifested in the feedback from the person experiencing immersion and the autotelic or exotelic nature of the activity being performed. Assuming that a computer gamer with a high level of these properties is easily emotionally attached, he or she can infiltrate virtual reality. Bearing this in mind, one may become convinced that a high level of autotelic involvement in computer gamers allows them to experience deep immersion while playing. Later in the study, this assumption is further supported by the results of research showing that the interdependence of experiencing immersion with the sense of autotelic engagement corresponds to the level of autotelic immersion.

The focus of the analysis was on the correlation between immersion experienced in computer games and autotelic engagement. The analysis revealed that the relationships between immersion experience in computer games and autotelic engagement are related to the dimensions of immersion and autotelic vs. exotelic engagement. They engage the attention to such an extent that the gamer may or may not have a borderline experience as a transition between everyday experience, which he or she treats as external to himself, and the fantasies of his or her mind. The results of this study indicate that the experience of autotelic immersion is enhanced by autotelic engagement, manifesting autotelic cognitive properties during computer game playing. In such cases, *Interaction with the environment, Sensory Engagement, Sense of Control, balance between*

ability level and challenge, intrinsic rewarding, concentrating and focusing, control, feedback, and action awareness merging intertwine with each other (Fig. 1).

Material And Method

Participation in the study was anonymous. Study participants were students from multiple university majors (N = 87) and played computer games several days a week. Participation in the study was anonymous. All participants gave informed consent to participate in the experiment. All procedures were approved in accordance with the standards of the Senate's Research Bioethics Commission and the standards specified by the Declaration of Helsinki. The most common gaming platform used by participants was a computer, web browsers, mobile phones, Xbox, and PlayStation. Participants played a variety of game genres (action, racing, fighting, and sports games). The number of years of playing also varied widely, from zero to 12 years. In general, the average time of playing per day can be estimated at four hours. Computer games varied from simple games projected onto a 17-inch screen, to those played on consoles in a dimly lit room.

The respondents completed 2 questionnaires:

ING Questionnaire (Norman, 2010). The Immersiveness of Games Questionnaire (ING) was proposed by L. Kent Norman and was translated from English. It is used to measure subjectively perceived immersion, with particular emphasis on the characteristics of the parameters of the computer-generated environment. The psychometric values of the questionnaire, collected during the procedure using virtual reality seem promising, but it is necessary to evaluate the tool's accuracy. Taking into account the results of the factor analysis conducted during the experiments based on the use of virtual reality, the interface awareness scale was integrated with the environment awareness scale, thus obtaining a stable structure. The questionnaire consists of 27 items divided into two main scales: positive, which includes four dimensions: *Interaction with the environment (IE)*, *Sense of Control (SC)*, *Auditory Presence (AP)*, *Sensory Presence (SE)*, and negative scale, concerning *Awareness of the Real World (AW)*, with its high score indicating a low level of immersion. A high score achieved on the positive scale indicates a high level of experienced immersion. To assess the equivalence of the adapted questionnaire, the guidelines proposed by Drwal were used to compare it with the original version, with particular attention paid to reproducing the questionnaires as closely as possible based on five categories of equivalence: façade, psychometric, functional, translation, and reconstruction equivalence (Brzyski, 2012). The study examined a group of individuals (N = 146) aged between 18 and 35 years (M = 22.36 SD = 2.72), both female (N=63) and male (N = 83). They were mainly psychology and cognitive science students, adult education students, and employed and non-employed individuals. The ING questionnaire is characterized by high reliability: Cronbach's $\alpha = 0.92$. Furthermore, the following Cronbach's α values were obtained for individual subscales: 0.88 for Interaction with the Environment, 0.70 for the Auditory Presence, 0.80 for the Sensory Presence, 0.84 for the Sense of Control, and 0.69 for Awareness of the Real World. Items 8, 9, 22, 25 were removed from the ING questionnaire due to their low association with the total questionnaire score (item correlation with ING score ranging from 0.08 to 0.18).

FLOW State Scale-2 FSS-2 (Engagement Questionnaire) Csikszentmihalyi & Larson, 2014; Kwabata, 2008. The test is used for evaluation of subjective feelings of the state of engagement. There are nine dimensions of this state on a scale of 1 to 5. Each scale has four statements assigned. The individual dimensions are: 1.

Challenge-Skill Balance (balance between ability level and challenge – BA) – adjustment of your own abilities to the challenge. 2. Merging of Action and Awareness (loss of the feeling of self-consciousness – LF) – deep engagement in action so that it becomes spontaneous and automated. 3. Clear Goals (clear definition of goals – CG) – and tasks that rises no doubts. 4. Unambiguous Feedback (unequivocal understanding information, intrinsic rewarding – IR) – the information provided is clear to an individual and allows for evaluation of the highest possible goals and achievements. 5. Concentration on the Task at Hand (concentration and focusing – CF) – on current tasks or signal in order to exclude insignificant tasks. 6. Sense of Control (potential ability of control – C) – during experiencing the state of engagement, the individual knows that the control is possible and has a feeling of potential control and effect on your own activities. 7. Loss of Self-Consciousness (lack of confusion feedback – F) – the task performed engages the attention of the individual so that they cannot think of the future or accept other disturbing stimuli. 8. Transformation of Time (distorted sense of time – DS) – objective, external time flow becomes insignificant compared to the rhythm of a particular activity. 9. Autotelic Experience (action awareness merging – AA) – experiencing flow as a state which is satisfactory in itself so that performing the task becomes a reward and positive reinforcement. The raw results on each scale equals the number of points from individual statements (4 to 20).

Procedure

The study attempted to establish relationships between the dimensions of autotelicity and immersion in a group of 87 computer gamers. After signing the consent form, participants completed an online demographic questionnaire (age, gender, education, experience, gaming activity), and then they completed 2 questionnaires: the Immersiveness of Games (ING) and the Engagement Questionnaire (FLOW). All questionnaires were completed in a web browser window on a flat computer screen.

Methods of analysis and preparation of the results

Based on the parameters entered, a computer program (implemented into an Excel spreadsheet) assigns the individual participants so that each group contains the same number of people with the set parameters. Analytical tests (mean, standard deviation, variance, skewness, kurtosis, sum, and Cohen's $d = (M_2 - M_1) / SD_{\text{pooled}}$ where: $SD_{\text{pooled}} = \sqrt{((SD_1^2 + SD_2^2) / 2)}$) were conducted using Statistica software, version 13. Next, correlation coefficients were calculated using the non-parametric Spearman's rank-order test. The research problem was verified with the one-way ANOVA analysis of variance. The analysis showed the expected Lambda Wilks marginal means, significance coefficient p, eta squared and alpha power of the variables studied.

Results

Table 1 shows the results describing the level of normality of the distribution of variables (mean, standard deviation, variance, skewness, kurtosis, and sum) for the dimensions of autotelic engagement and immersion experience of computer gamers. Large variation was observed in the results describing all dimensions. As a measure of variability, the standard deviation of the mean value M allows for the estimation of the accuracy of determining the variation in the level of autotelicity and the level of immersion. Skewness (a measure of the asymmetry of the distribution) is clearly different from 0, which means that the distribution is asymmetric. Kurtosis (a measure of the slenderness of the distribution) is less than 0, which means that the mean is

smaller than the median and the distribution has a flatter peak for the mean than a normal distribution with the same mean and standard deviation. These statistics relate to the level of the dimensions of the sense of autotelic engagement: balance between ability level and challenge (BA), loss of the feeling of self-consciousness (LF), clear goals (CG), intrinsic rewarding (IR), concentrating and focusing (CF), control (C), feedback (F), distorted sense of time (DS), action awareness merging (AA), Interaction with the environment (IE), Awareness of the Real World (AW), Auditory Presence (AP), Sensory Engagement (SE), Sense of Control (SC).

Table 1
Descriptive statistics (mean, standard deviation, variance, skewness, kurtosis, and sum) of autotelic engagement dimensions and immersion experience of computer gamers. N = 87

Variables	M	SD	Variance	Skewness	Kurtosis	Total
BA	16.00	3.07	9.395	-0.238	-1.037	1392.0
LF	15.26	3.66	13.429	-0.189	-0.808	1328.0
CG	16.18	3.15	9.896	-0.424	-0.813	1408.0
IR	15.84	3.47	12.067	-0.512	-0.380	1378.0
CF	16.64	2.80	7.813	-0.300	-0.961	1448.0
C	15.47	3.15	9.950	-0.615	0.027	1346.0
F	14.64	3.37	11.372	-0.319	-0.241	1274.0
DS	14.38	4.67	21.820	-0.753	-0.359	1251.0
AA	16.60	3.01	9.034	-0.294	-1.366	1444.0
IE	35.62	6.16	37.889	0.132	-0.768	3099.0
AP	15.76	3.78	14.255	-0.515	0.331	1371.0
SE	23.78	5.01	25.056	0.162	-0.052	2069.0
SC	36.52	6.60	43.508	0.093	-1.009	3177.0
AW	17.32	6.98	48.779	0.183	-0.617	1507.0

The correlation coefficients calculated using the non-parametric Spearman's rank-order test revealed (Table 2) strong directly proportional correlations between: *Interaction with the environment* (IE) and *Sense of Control* (SC) and all dimensions of autotelic engagement. *Balance between ability level and challenge* (BA), *loss of the feeling of self-consciousness* (LF), *clear goals* (CG), *intrinsic rewarding* (IR), *concentrating and focusing* (CF), *control* (C), and *action awareness merging* (AA) were significantly associated with immersion dimensions with $p < .010$. It was also found that *feedback* (F) and *distorted sense of time* (DS) were ($p < .050$) associated with immersion. *Auditory Presence* (AP) and *Sensory Engagement* (SE) were positively associated ($p < .050$) with almost all dimensions of autotelic engagement. Only awareness of the real environment (AW) is indicative of low levels of immersion experienced and is inversely proportionally related ($p < .050$) to most dimensions of autotelic engagement.

Table 2

Spearman rank-order correlation coefficients, showing the relationship between the sense of immersion and the sense of autotelicity. N = 87

Variables	BA	LF	CG	IR	CF	C	F	DS	AA
IE	0.598**	0.570**	0.674**	0.681**	0.718**	0.575**	0.418*	0.232*	0.609**
AP	0.369*	0.326*	0.461*	0.460*	0.571**	0.424*	0.349*	0.217*	0.379*
SE	0.309*	0.224*	0.312*	0.375*	0.357*	0.384*	0.130	0.113	0.244*
SC	0.751**	0.602**	0.816**	0.808**	0.680**	0.720**	0.375	0.212	0.775**
AW	-0.345*	-0.143	-0.488*	-0.381*	-0.358*	-0.260*	0.003	0.310*	-0.398*
**correlation coefficients significant at $p < .010$, *correlation coefficients significant at $p < .050$.									

Figure 2 shows fifteen strong correlations between dimensions of autotelicity and dimensions of the immersion experience. The directly proportional correlation between these dimensions indicates that Interaction with the environment (IE) and Sense of Control (C) are significantly ($p < .010$) correlated with balance between ability level and challenge (BA), loss of the feeling of self-consciousness (LF), clear goals (CG), intrinsic rewarding (IR), concentrating and focusing (CF), control (C) and action awareness merging (AA).

The one-way ANOVA for the autotelic survival dimension (Fig. 3) in relation to two dimensions of immersion: *Interaction with the environment* (IE) and *Sense of Control* (SC). The expected Lambda Wilks marginal means (Lambda Wilks = .366; $F(18, 152) = 5.499$; $p = .000$; eta square = 0.394; alpha power = 1), shows the degree of autotelic immersion. Interaction with the environment and sense of control increases proportionally with autotelic experience.

Factor analysis of the eight dimensions of autotelic engagement revealed the exotelicity-autotelicity factor (Wilks' Lambda = .127; $F(72, 433) = 2.426$; $p = .000$; eta squared = .287; alpha power = 1), against which a Kolmogorov-Smirnov (Table 3) difference analysis was performed. This analysis showed that all dimensions are significantly different at $p < .001$.

Table 3
Kolmogorov-Smirnov analysis of differences and Cohen's d effect size
for the dimensions of autotelic commitment against the exotelicity-
autotelicity factor

Variables	Exotelicity n = 42		Autotelicity n = 45		p	d
	M	SD	M	SD		
BA	13.79	2.44	18.07	1.94	.001	1.94
LF	13.24	2.68	17.16	3.46	.001	1.26
CG	14.14	2.43	18.09	2.48	.001	1.60
IR	13.55	3.01	17.98	2.33	.001	1.64
CF	14.81	2.52	18.36	1.77	.001	1.63
C	13.69	2.73	17.13	2.58	.001	1.29
F	13.05	2.78	16.13	3.21	.001	1.02
DS	12.95	4.19	15.71	4.75	.001	0.61
AA	13.83	1.62	19.18	1.05	.001	3.91

A one-way ANOVA for the exotelicity-autotelicity factor (Fig. 4), with exotelicity denoted (0) and autotelicity denoted (1), showed that all dimensions of immersion experience (Wilks' Lambda = .481; $F(5, 81) = 17.417$; $p = .000$; eta squared = .518; alpha power = 1) are strongly correlated with this factor. It also revealed the degree of autotelic immersion. *Interaction with the environment* (IE), *Sense of control* (SC), *Auditory Presence* (AP), and *Sensory Engagement* (SE) occur with autotelicity (1), while *Awareness of the Real World* (AW) occurs with exotelicity (0).

Discussion

This is in line with the report of Macey and Schneider (2008), who identified four main psychological properties that determine the occurrence of autotelicity in action, which, as can be easily seen, the gamer shows during the immersion experience. These are proactive personality and autotelic personality. For immersion and autotelicity during playing the game to intertwine with each other, the gamer must meet basic conditions: knowing the purpose and interface of the game (clear goals), knowing how to use the controller (balance between ability level and challenge), and knowing how to interpret the information received (intrinsic rewarding) and autotelic experience (Talyor, 2002; Asakawa, 2004; Kwabata, 2008; Mikicin, 2013). Grodal (2003) also argues that for an immersive experience, the gamer must develop certain skills, both motor and cognitive, and then engage them in the game.

The hardware displaying the computer game may or may not be conducive to the immersive experience to varying degrees, but a high level of autotelic personality can unconditionally “merge” the gamer into the virtual activity. Therefore, computer screens induce lower levels of immersion than VR headset (Saposnik et al., 2019; Stasieńko and Sarzyńska-Długosz, 2016; Colomer et al., 2016), because, in addition to the image of the virtual

world, the gamer sees the real environment around him or her. However, this mainly applies to a gamer with exotelic personality, for whom the goal of the game is external. In VR headset, he or she would only see an image of the virtual world and, being maximally isolated from the real world (Nalivaiko et al. 2015, Shafer et al. 2019; Felipe and Hunnicutt, 2020), it would probably be easier for them to experience immersion independently of autotelicity. Following this observation, it should be assumed that also sounds and sensory experiences, which offer the possibility to perceive and analyze the game by involving the senses of hearing and touch (Ferche et al., 2015; Stanney et al., 2003), can also differentiate the level of immersion experienced. Witmer and Singer (1998) defined immersion as a mental state characterized by the person's perception of himself or herself as surrounded, included, and interacting with the environment that provides a continuous stream of stimuli and experiences. They found that when people feel fully immersed, they feel as if they are able to directly interact with the virtual environment. It is therefore believed that this sensation of immersion depends on how well users respond psychologically to the stimuli of the virtual environment (immersive response), rather than to the novelty and multisensory capabilities of the technology used.

The data concerning autotelic immersion indicate that these are two phenomena combined in the same area of psychology. Further research should be conducted to see if the relationships presented here are plausible. It is also worth noting the psychological dimensions used in this research to measure the processes studied, but given the high complexity of these processes, their role may be ambiguous. Given that autotelic immersion consists of complex processes of analysis and synthesis occurring in the brain, the analysis of neuronal brain activity should be included in the research. Such an analysis would allow for the verification of the results that are unavailable using the psychological tools used here. With the complex relationship between biological and psychological measures, they should be carefully selected and empirically tested. Some selected psychological dimensions may be less reliable in correlation with certain brain structures because the relationships between behavior and biology are sometimes less stable than one might expect.

Several limitations of the present study should also be indicated. Firstly, the sample of university students limits the generalizability of the findings, which may not be applicable to the general population or other age groups. Despite its limitations, this study can inspire a lot of research related to immersion, especially autotelic immersion.

Conclusion

There is a strong directly proportional relationship between the immersive experience and autotelic engagement in playing computer games.

Declarations

Statement for the human experiments done in the study.

All participants gave written informed consent to participate in the experiment. All procedures were approved in accordance with the standards of the Senate's Research Ethics Commission of the University of Physical Education in Warsaw and the standards specified by the Declaration of Helsinki.

Consent for publication

Not applicable

Availability of data and material

<https://data.mendeley.com/drafts/hs6hx56rpz?folder=f07e29f2-77cb-4df9-af71-4a1d449a9b6b>

Competing interests

The author declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

These data have not been published before and are not submitted elsewhere.

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Authors' contributions

M.M created the research project, performed the statistical evaluation and the interpretation of data. Wrote the manuscript draft, which was critically revised and finally approved.

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Figures

Figure 1

Autotelic immersion as the interdependence of the dimensions of immersion and autotelicity

Figure 2

Significant and directly proportional correlations between dimensions of sense of autotelic engagement with immersion dimensions N=87

Figure 3

The interdependence of Interaction with the environment (IE) and Sense of Control (SC) with autotelic experience (AA)

Figure 4

One-way ANOVA analysis of variance for the exotelicity-autotelicity factor in relation to dimensions of immersion experience