Polish Adaptation of the *Igroup Presence Questionnaire*

Polska adaptacja Kwestionariusza Presence Igroup

Paweł Strojny, Natalia Lipp, Agnieszka Strojny

Jagiellonian University
p.strojny@uj.edu.pl | ORCID: 0000-0002-6016-044X
natalia.lipp@doctoral.uj.edu.pl | ORCID: 0000-0002-5738-6771
agnieszka.strojny@uj.edu.pl | ORCID: 0000-0002-0625-383X

Abstract: Presence, defined as a psychological state of "being there", is experienced during an interaction with Immersive Virtual Environments, particularly with Virtual Reality – the most popular type of such environment. Measuring presence is crucial because its level determines the effectiveness of virtual environments. The authors conducted a translation and a study (n = 245) that aimed to provide a Polish version of the *Igroup Presence Questionnaire* (IPQ-PL). The structure of the questionnaire and relations with other constructs were tested. The results indicate that IPQ-PL may be considered a valid tool for measuring presence and may be used in studies conducted on Polish samples.

Keywords: presence, IPQ, validation, Virtual Environment, questionnaire, Virtual Reality

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1. Introduction

The development of new technologies has given rise to the use of Virtual Reality (VR) in many fields such as psychological therapy (e.g. Klinger et al., 2005), medical and military training (e.g., Alexander et al., 2005, Seymour et al., 2002), and social psychology studies (e.g. Dotsch & Wigboldus, 2008). Virtual Reality may be presented in the context of Immersive Virtual Environments (IVE), which are defined as computer-generated sensory stimuli that at some level mirror physical world (Blascovich et al., 2002). What distinguishes VR from other IVE is that it allows for complete disconnection from stimuli coming from outside VR (Parsons et al., 2017). The potential advantages have encouraged researchers to investigate the underlying mechanisms that determine the efficiency of VR. Recently it has been acknowledged that including the concept of presence in studies is crucial to this enquiry because of its influence on performance (Skarbez et al., 2017) and the efficiency of learning (So & Brush, 2008). Probably the most important fact is that presence allows VR to evoke emotions similar to those experienced in reality (Diemer et al., 2015). In other words, to ensure high VR efficiency, a user has to experience a high presence level and researchers should control it. Therefore, in this paper, presence measures are presented and discussed. Among them the *Igroup Presence Questionnaire* is introduced (IPQ; Schubert et al., 2001). The IPQ is, in the authors' opinion, one of the most valid tools as it allows to measure presence in the whole complexity of this construct. The main goal of this paper, therefore, is to provide the Polish adaptation of the IPQ and its psychometric validation.

1.1. Defining presence

Despite its relatively short research history, there are many approaches to presence in the literature. Lombard and Ditton (1997) indicate six distinct conceptualisations of presence: social richness, realism, transportation, immersion, social actors within the medium, and medium as social actor. Despite existing differences, these conceptualisations share the idea that presence is an impression of nonmediation, which is proposed as an early definition of presence (Lombard & Ditton, 1997). Sensory, cognitive, and affective processes cause the mediated environment to appear

unmediated. However, considering the complexity of the phenomenon, this aggregated definition seems to be insufficient to understand the functioning of presence.

Another approach is presented by Slater and Wilbur (1997), who distinguish between presence, treated as a psychological phenomenon, and immersion, which is an attribute of technology. Presence delineated as a "state of consciousness, the (psychological) sense of being in the virtual environment" (Slater & Wilbur, 1997, p. 605) is subjective and measurable by the user experiencing it. Moreover, sense of presence is a direct function of immersion, defined as the "extent to which computer displays are capable of delivering an inclusive, extensive, surrounding and vivid illusion of reality to the senses of a human participant" (Slater & Wilbur, 1997, p. 604). The four aspects of immersion are emphasised in the definition above: inclusivity, extensiveness, surrounding, and vividness. Firstly, inclusivity refers to feeling detached from the real world. Secondly, an extensive illusion means that immersion is multimodal. Thirdly, the surrounding indicates the wide panoramic view. Lastly, vividness contains "richness, information content, resolution and quality" (Slater & Wilbur, 1997, p. 604). A system that complies with these requirements should provide a high level of presence.

The relationship between presence and immersion is not as straightforward as might be assumed. In fact, there are studies in which no significant correlation between them has been found (Steed et al., 1999). Thus, Schubert and colleagues (2001), who are the creators of the IPQ, note that it is faulty to assume a one-way relation between presence and immersion and therefore ignore the moderating role of cognitive processes such as construction and suppression. One crucial cognitive process is attention regulation – users experiencing IVE are constantly exposed to conflicting stimuli from the real world that hinder the experience of presence. To maximise the experience of presence, attention should be confined to virtual stimuli and suppression of interruptions from the physical world should occur (Schubert et al., 2001). However, human attention is usually divided between activities. Therefore, achieving presence does not require full investment of attentional resources, but the more attention assigned, the higher the level of expected presence (Witmer & Singer, 1998). Because of above considerations presence

is defined by the IPQ's creators (Schubert et al., 2001) as a cognitive conscious process and as such should be measured using appropriate psychometric tools (e.g. Slater, 2009).

1.2. Approaches to presence measurement

The role of presence in using and, for example, acting in VR seems to be undeniable, but its many associations with other constructs are questionable. The inconclusiveness and discrepancy of results may stem from differences in the measurement of presence, which can be conducted using various instruments such as the *Presence Questionnaire* (PQ) developed by Witmer and Singer (1998), Kim and Biocca's two-dimensional presence questionnaire, the *ITC Sense of Presence Inventory* (ITC-SOPI) created by Lessiter and colleagues (2001), the *MEC Spatial Presence Questionnaire* (MEC-SPQ; Vorderer et al., 2004), and finally the *Igroup Presence Questionnaire* (IPQ; Schubert et al., 2001), which is the subject of this work. The list is not meant to be complete but rather to highlight that there was a trend to develop new presence measures at the turn of the 20th and 21st centuries. Schwind and colleagues note that there are more than 15 questionnaires (Schwind et al., 2019). Fortunately, this trend has stopped and now researchers use validated measures which are described below. This direction may be beneficial as it allows to compare study results.

The Presence Questionnaire (PQ) is based on the theoretical framework of Witmer and Singer (1998), who pay attention to involvement and immersion. However, their definition of immersion differs from the most popular one introduced by Slater and Wilbur (1997). According to Witmer and Singer (1998), immersion is not an attribute of technology but refers to the degree of being enveloped by VE. The questionnaire consists of control factors, sensory factors, distraction factors, and realism factors. The PQ and this approach are criticised for their lack of accuracy regarding how the level of presence can be increased (Slater, 1999); thus, they may be insufficient in applied aspects of games research.

Another instrument has been presented by Kim and Biocca (1997), who understand presence as a transportation. According to them, presence develops when a user experiences relocation in space. What is important is that this type of presence could be a result of three senses of place: physical, mediated, and imaginal. On the basis of these assumptions,

the authors developed a two-dimensional questionnaire. The first factor is defined as "the sense of being there" (arrival); the second relates to "the sense of not being here" (departure) (Kim & Biocca, 1997). However, the main goal of the authors has been to create an instrument for measuring presence in television, and so it may be not applicable in IVE studies.

The *ITC Sense of Presence Inventory* (ITC-SOPI), developed by Lessiter and colleagues (2001), is a tool with a wide range of applications. It might be used not only in IVE studies but also in other forms of media such as cinema or television. It measures four components of presence: physical space, engagement, naturalness, and negative effects such as dizziness and nausea, which are symptoms of cybersickness. It may be a premature conclusion to include negative effects as a factor of presence since no association between presence and cybersickness has yet been established. Single studies show positive and negative correlations between simulator sickness and presence (Lin et al., 2002; Witmer and Singer, 1998). A systematic review recently conducted indicates that there is a negative relation between presence and simulator sickness (Weech et al., 2019). It means that the higher the level of presence, the less intense the symptoms of the simulator sickness.

The *MEC Spatial Presence Questionnaire* (MEC-SPQ) developed by Vorderer and colleagues (2004) seems to have solid theoretical foundations. According to the authors of MEC-SPQ, spatial presence is a binary experience and occurrence requires a mental model of physical space to be generated. This mental representation provides perceptual hypotheses which are tested to confirm and accept mediated space. MEC-SPQ consists of eight subscales which refer to different aspects of presence: attention allocation, higher cognitive involvement, spatial situation model, self-location, possible action, suspension of disbelief, domain specific interest, and visual spatial imagery (Vorderer et al., 2004). Despite this theoretical framework, lack of validity makes using MEC-SPQ in empirical studies impossible (Lombard et al., 2015).

Among many instruments that measure presence, the *Igroup Presence Questionnaire* (IPQ) seems to be particularly interesting since it was developed for researching IVEs from the very beginning (Schubert et al., 2001). It is based on items from previous works (Carlin et al., 1997; Hendrix, 1994; Regenbrecht, 1998; Slater & Usoh, 1994; Towell & Towell,

1997; Witmer & Singer, 1998) and is supplemented with several new items. The final tool contains items selected on the basis of psychometric analysis, including confirmatory factor analysis (CFA). Its utility has been proved in several studies (e.g., Alsina-Jurnet & Gutiérrez-Maldonado, 2010; Fromberger, 2018; Krijn et al., 2004; Price, 2012, Schwind et al., 2019). Thus, the authors avoided imperfections inherent in other tools, which makes IPQ a solid candidate for every research related to presence.

IPQ was chosen for the adaptation process because of its good psychometric properties shown during validation procedures in other countries (e.g., Vasconcelos-Raposo et al., 2016; Berkman et al., 2021). Additionally, Schwind and colleagues (2019) compared existing presence measures and concluded that IPQ best reflects presence in its nature (Schwind et al., 2019). It is worth noting that novel definitions of presence highlight the role of perceived realism (Weber et al., 2021) and IPQ is the only tool that measures it.

1.3. The origins and description of the *Igroup Presence Questionnaire*

The original *Igroup Presence Questionnaire* (IPQ, Schubert et al., 2001) is a German scale developed to measure the sense of presence experienced during interaction with IVE. It consists of German translations of single items derived from earlier instruments (Carlin et al. 1997; Hendrix 1994; Slater & Usoh, 1994; Witmer & Singer, 1998). The scale and its translations are available without restrictions on the authors' webpage in order to provide the tool free of charge (<http://www.igroup.org>), but no Polish version is yet available. The scale was developed on the basis of two studies conducted with approximately 500 participants. The authors of the original scale created a hierarchical structure of factors. The current version consists of 13 items, 12 of them are divided into three subscales (Spatial Presence – SP, 5 items; Involvement – INV, 4 items; Experienced Realism – REAL, 3 items), while the last item (G1) loads all three factors and is simultaneously the highest loading item of the SP subscale. The tool is available in French (Viaud-Delmon, n.d.), German (Schubert et al., 2001), Japanese (Hyun et al., 2010), English (Berkman et al., 2021), Persian (Panahi Shahri et al., 2009), and Portuguese (Vasconcelos-Raposo et al., 2016); however, only the German (original), English, Persian, and Portuguese versions have been validated properly.

The English version is the most recent (Berkman et al., 2021), although a non-validated English translation was available earlier (e.g., Krijn et al., 2004). During the validation process, the authors used items translated by a German team (Schubert et al., 2001) and conducted confirmatory factor analysis (CFA) to verify the structure of IPQ. It was discovered that the English version might be shorter than the original scale as it had a better fit with 11 items only. In turn, the Portuguese version was created by a back-translation procedure and verification of an internal structure. It was established that this version had the same structure as the original one (Vasconcelos-Raposo et al., 2016). Last but not least, during the validation of the Persian version the internal consistency, split-half, and test-retest coefficients were calculated to serve as evidence that the Persian IPQ had good psychometric properties (Panahi Shahri et al., 2009).

2. Methods

2.1. Translation strategy

According to Schubert and colleagues (2001), the original *Igroup Presence Questionnaire* consists of items formulated in two different languages (6 items originating from older English-language tools and 8 items developed by the IPQ authors). All items were validated in the German language; hence, the English version of the questionnaire published on the Igroup website is translated from the German tool, albeit without separate validation. When applicable, in order to avoid misinterpretations due to consecutive translations, we retrieved the original (English) items used by the German authors. We decided to translate each item independently from the German version and from the English version if applicable. We then compared all translations and decided on the final Polish wording. During the adaptation of the scale we followed the recommendations of Sousa and Rojjanasrirat (2011). First of all, two independent German-speaking professional translators translated all of the items from German to Polish. Additionally, two other English-speaking persons translated six items from English to Polish independently.

In the next step, comparison and synthesis of all of the translations was performed. First, we compared the two translations based on the German

version and found no major discrepancies between them. Simultaneously, we compared the two translations of the items from the English tools, and there were also no major discrepancies. Then we compared the whole Polish version based on the translation from German against the Polish versions of the six items translated from the English originals. We assumed that if we found any inconsistencies in translations, we would fall back to the original (English) versions. Among the six problematic items found, three were identical regardless of the initial language (INV1, REAL2, REAL3). Two other translations differed slightly (G1 and SP3). The translations of one item (REAL1) differed significantly: while the original item (Hendrix, 1996, p. 58) states "How *realistic* did the virtual world seem to you?", the German item states "Wie *real* erschien Ihnen die virtuelle Umgebung?". Following our strategy, we decided to stay with the original English version.

Then, after developing the Polish translation, we conducted a pilot study on several naive participants in order to evaluate the instructions, items, and response format clarity. On the basis of the pilot study, we found several synonymous terms for virtual environment to be confusing ("computer-generated world", "virtual environment", "virtual space", "virtual world"). According to participants, using them all sounds unnatural in Polish since the questionnaire regards a single experience. This is probably a consequence of the way the IPQ had been created (several items had been taken from older tools). We decided to replace the literal translations of these terms with the most popular formulation: "virtual world". We also noticed that the answer options for several items varied: the majority of items had the form of a statement, but some had the form of a question. This was confusing for participants, and so we decided to unify all of the items but one (REAL3, which was infeasible without losing the meaning).

In the final Polish version, 12 items have the form of a statement with 7 answer options from – 3 ("I disagree") to 3 ("I agree") and one item is a question (REAL3; "How real did the virtual world seem to you?") with answers from – 3 ("Like an imagined world") to 3 ("Indistinguishable from the real world"). This item was also moved from the penultimate position to the end of the questionnaire; this is important when comparing results from various language versions, but it does not affect the computations of the subscales. In the next step, another translator (a professional game designer and former English teacher) back-translated the Polish scale into

English; this version of the scale was presented to the authors of the original scale and proved to be fine. The final version can be found in Appendix 1.

2.2. Participants

Data was collected from 245 participants who completed the online survey, including 186 males and 59 females. Tabachnick and colleagues (2001) recommend a 10:1 ratio of participants to items; in this study this proportion was higher and exceeded 17:1. The average age for the sample was 24.1 (SD = 4.47), ranging from 18 to 40 years. Participants were recruited through social media groups of players. Participants were asked to refer to their last interaction with IVE when completing the questionnaire. The majority (n = 213) had experienced IVE via computers; the rest had used video game consoles (n = 26), mobile devices (n = 5), or other tools (n = 1). The majority of participants had interacted with IVE through monitors (236); systems with multiple projections (n = 1) and HMD (n = 8) were rarely chosen. Most participants had previously heard stereo sound (n = 173) or surround sound (n = 57). The main type of application had been 3D games with a third-person perspective (from behind the game avatar) (n = 107), which differentiates the Polish group from the German one, in which the first-person perspective dominated (Schubert, et al., 2001).

2.3. Measures

Several tools regarding various aspects of the game experience were used to examine the external validity.

The *Flow State Scale* (Jackson & Eklund, 2004; Tomczak & Hornowska, 2012) was used to assess the flow state. It contains 36 items measuring nine aspects of flow. For the purposes of the current analysis, the flow variable was calculated as the average result of all items.

The *Immersion Questionnaire* (Jennet et al., 2008; Strojny & Strojny, 2013) was used to measure the players' absorption in the virtual environment. It contains 27 items. Factor analyses performed by its authors conformed the one-factor structure of the scale.

The Polish version of the *VR Realism Scale* (Poeschl & Doering, 2013; Lipp et al., 2021) was used to evaluate a subjective assessment of the game's graphical quality. The 14-item scale measures four dimensions of realism – Scene Realism, Audience Appearance, Audience Behaviour, Sound Realism.

The *Scale of Aesthetics* (Chevalier 2013; Strojny & Strojny, 2016) was used to evaluate the perceived aesthetic aspects of the games' quality. The scale measures two aspects of aesthetics – the classical and expressive dimensions.

The Polish version of the *Player Experience of Need Satisfaction Scale* (Ryan et al., 2006) was used to assess the level of satisfaction of three universal needs (competence, autonomy, and relatedness). The questionnaire was developed according to the objectives of the self-determination theory (Ryan & Deci, 2017).

3. Results

3.1. Confirmatory factor analysis (CFA)

The theoretical validity of the test was verified using CFA. CFA was conducted using R's lavaan package (Rosseel, 2012). In a study conducted by Schubert and colleagues (2001), IPQ revealed a hierarchical three-factor structure. However, the hierarchical structure restricts the impact of items on a general factor through low-order factors only, which makes interpretation of the model very difficult. We decided to test two models. First, the model proposed by the Portuguese team (Vasconcelos-Raposo et al., 2016), which consists of three latent variables without a second order factor. Second, the bifactor model with three original factors and one general factor directly impacting the items. The reason for creating the bifactor model is the unclear nature of presence. Such a model would allow treating presence as a one-dimensional or multidimensional construct.

The three factor and bifactor models with standardised factor loadings are presented in Figure 1 and Figure 2, respectively. The goodness of fit is assessed on the basis of relative indicators' values; the RMSEA (*root mean square error of approximation*) index and SRMR (*standardized root mean square residual*) index should be smaller than .08, TLI (*Tucker-Lewis index*) and CFI (*comparative fit index*) values greater than .95 indicate a proper fit (Hu & Bentler, 1999). Regarding the recommendations above, the created three-factor model should be considered satisfactory (Table 1).

Table 1. Fit indices for the two tested models

Model	TLI	CFI	RMSEA	SRMR
Polish version of three-factor model	.961	.969	.061	.058
Polish version of bifactor model	.958	.972	.054	.051

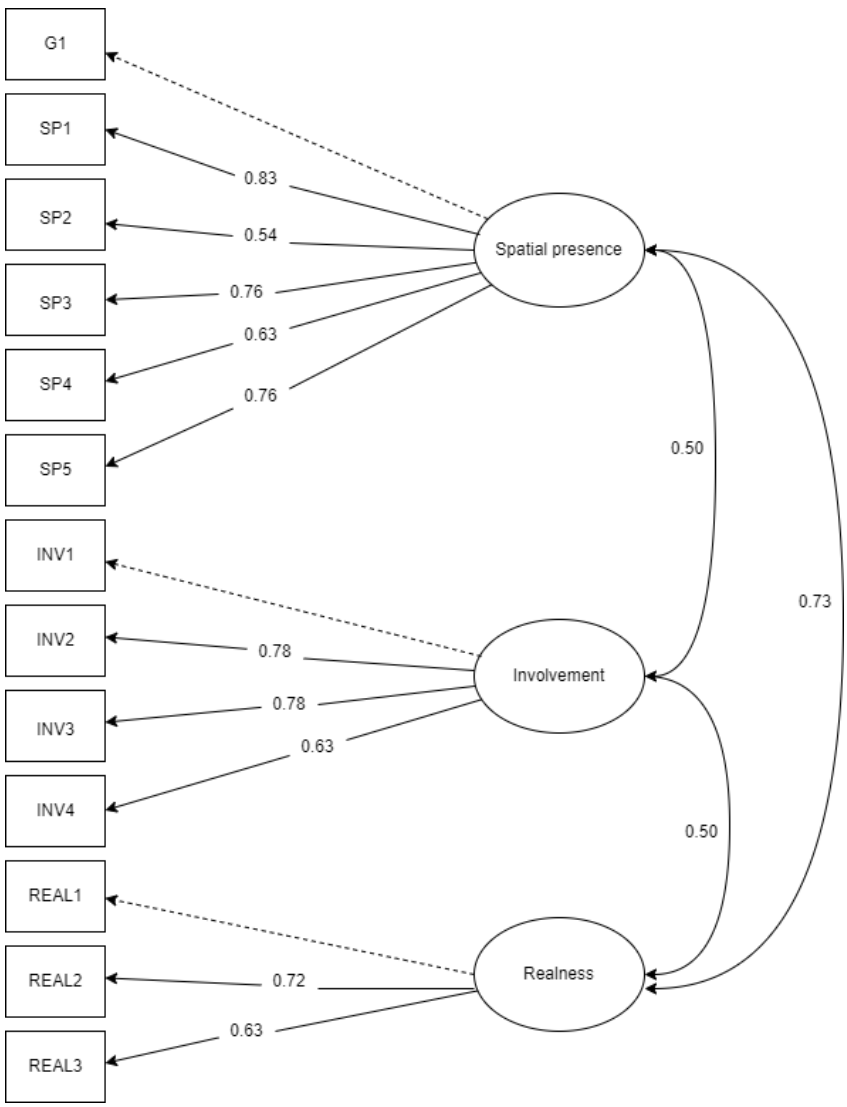

Figure 1. Confirmatory factor analysis of the Polish version of IPQ

Despite the satisfying fit of the three factor model, we decided to create a second model with a general factor. Repeated confirmatory factor analysis reveals a better model fit (Table 1). Regarding the levels of the indicators (Table 1), it appears to be reasonable to acknowledge this model fit as acceptable.

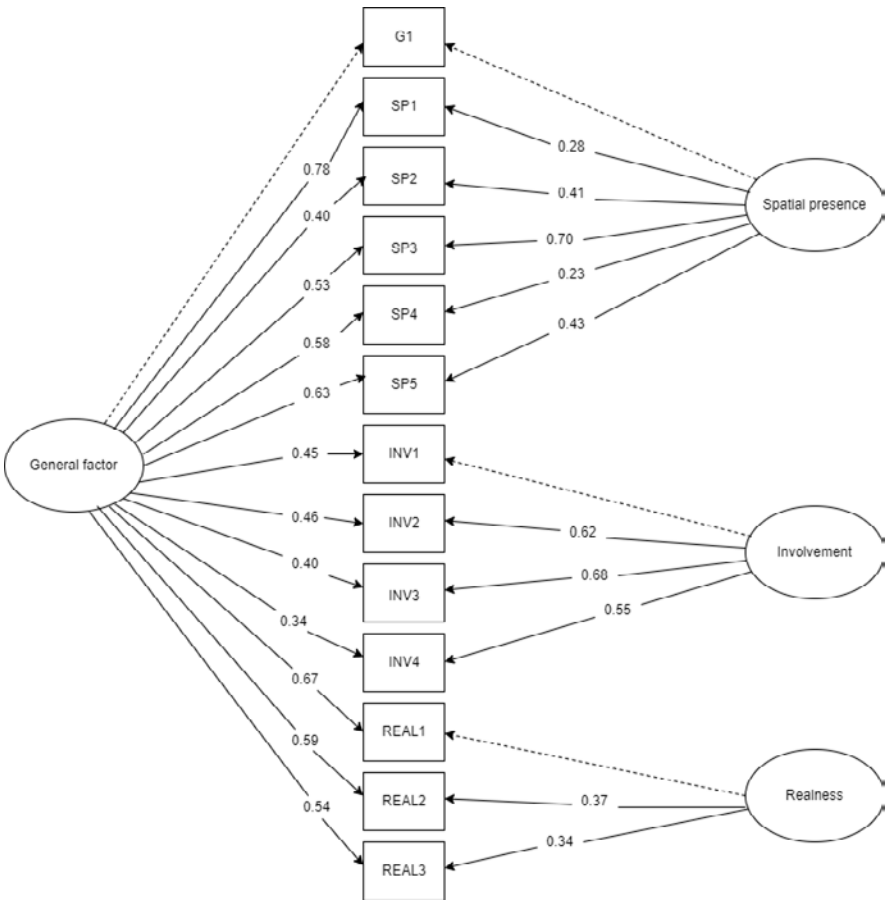

Figure 2. Confirmatory factor analysis of the Polish version of IPQ – final model with standardised factor loadings

3.2. Internal consistency ("reliability) of the Polish version of IPQ

As it is suggested to evaluate internal consistency using at least two different types of analysis (Brzeziński, 2004), the reliability was measured by Cronbach's alpha and split-half analysis using the Spearman-Brown

formula. The scale was divided into odd and even halves. The Spearman-Brown coefficient was high (.94). The alpha coefficients for all factors of IPQ-PL were as follows: .87 for spatial presence, .83 for involvement, .79 for realness, and .89 for the combined scale. These results suggest satisfying internal consistency for all of the subscales and for the whole scale; the obtained coefficients are higher and more stable than the coefficients provided by authors of other adaptations (see Table 2).

Table 2. Cronbach's Alpha of the German, Portuguese, Persian, and Polish versions of the IPQ

Subscale	German version	Portuguese version	Persian version	Polish version
Spatial presence	.77	.66		.87
Involvement	.76	.53		.83
Realness	.70	.83		.79
Combined scale	.87	.76	.87	.89

3.3. External validity

A correlation analysis was performed to examine the external validity. It was theorised that presence would be moderately positively correlated with immersion and realism. Also, there was an expectation that individual factors of IPQ-PL would be weakly correlated with the three basic player needs, satisfaction, classical and expressive aesthetics, and flow.

The results from the analysis of presence's correlations with various related constructs are presented in Table 3. The scores on the *Igroup Presence Questionnaire*, Spatial Presence Scale and Realness Scale were significantly correlated with ratings for the Autonomy Need Scale, Relatedness Need Scale, Immersion Scale, flow, both types of aesthetics, and realism and its aspects. The scores on the Involvement Scale were significantly correlated only with the Immersion Scale. No significant correlation between the Competence Need scale and any aspects of presence was found.

Table 3. Correlations between presence and other potentially related constructs

Variables	Variables										
	Competence need	Autonomy need	Relatedness need	Immersion	Flow	Classical aesthetics	Expressive aesthetics	Realism	Scene realism	Audience behaviour	Audience appearance
IPQ	.02	.24**	.18*	.61**	.22**	.13*	.25**	.32**	.36**	.29**	.17**
Spatial presence	.03	.21**	.20**	.50**	.19**	.14*	.25**	.30**	.34**	.26**	.15*
Involvement	-.04	.09	.02	.52**	.11	-.01	.06	.07	.10	.06	.01
Realness	.05	.27**	.19**	.47**	.23**	.17**	.27**	.42**	.42**	.38**	.29**

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

The strongest correlation between presence and immersion is nothing unusual ($r = .607$, $p < .001$). As mentioned above, both constructs describe the same phenomenon from two complementary perspectives: the point of view of the user or the technology. The weak correlation between presence and realism may be surprising ($r = .324$, $p < .001$); particularly, it seemed that the realness factor should be strongly correlated with realism. However, the VR realism scale refers to the technical excellence and fidelity of VE. Its items refer to features such as reflection, light and shade, or the outfits of virtual humans in VR (e.g. "Reflection in the virtual space seemed to be natural"). Otherwise, realness refers to the subjective sense that the surrounding world is consistent and predictable (e.g. "How much did your experience in the virtual environment seem consistent with your real-world experience?"); this is the most likely cause of the relatively low correlation coefficient between these two variables. The weak correlation between flow and presence ($r = .217$, $p = .001$) was hypothesised to be due to the specific and narrow conceptualisation of presence in comparison to the general character of flow. The stronger correlation between presence and expressive aesthetics ($r = .245$ $p < .01$) than between presence and classical aesthetics ($r = .129$, $p < .05$) was expected since expressive

aesthetics had been found to be stronger compared to immersion and involvement in a previous study (Strojny & Strojny, 2016). The obtained results lead to the conclusion that the external validity is satisfying.

4. Discussion and conclusions

A validated tool for measuring presence is becoming more and more necessary in view of the growing interest in virtual environments in Polish academia and the games industry. It is especially important for the development of virtual environments capable of eliciting high levels of presence. Moreover, it may be crucial for the research which suggests relationships between presence and other important variables. Presence may be related to performance (Stevens & Kincaid, 2015; Schuemie et al., 2001; Slater et al., 1996) and to efficiency of learning (So & Brush, 2008); thus, it may be crucial for professional simulators and serious game development. It also plays a role in evoking emotions (Hodges et al., 1994) and involvement (Witmer & Singer, 1998), making it an important part of video game design.

Because the term "presence" may be defined in many ways, it is important to find one theoretical approach and to translate a tool which has proved to be culturally adaptable. To the best of our knowledge, the IPQ is the only tool whose utility in various cultural contexts has been tested, and so it should be the tool of choice for presence research. This is not only our opinion but also that of other researchers (Vasconcelos-Raposo et al., 2016). Additionally, the growing body of research using this tool supports its use as a primary instrument in this regard. It is for these reasons that we decided to provide a validated Polish version of the IPQ.

During the adaptation we focused particularly on two aspects of this process: excellence of translation and proper statistical validation of the scale. The first issue was important because of the uniqueness of presence as a variable. Since the original IPQ consists of items from English tools but it was created initially in German, we decided to translate items from both sources if available.

As suggested by Sousa and Rojjanasrirat (2011), we performed a qualitative pilot test of a translated instrument that allowed us to identify two

problematic features of the tool. First, we decided to unify the form of all items but one: in the Polish version, thirteen items took the form of statements with seven homogeneous answer options. Second, we decided to unify the description of the virtual environment to which the questions were referenced; in the Polish version we consequently used the wording "virtual world" instead of the four different formulations used in the original. These two changes stemmed from the pilot study and were motivated by the desire to improve the usability of the instrument (from the respondent's perspective). These changes might result in an internal consistency which is higher in comparison to the other language versions which provide such data.

Because previous authors had used CFA, it was possible not only to perform it on a Polish sample but also to compare its results with previous ones. However, we decided not to repeat the hierarchical structure of the model. We maintained a factorial structure similar to that of the Portuguese adaptation (Vasconcelos-Raposo et al., 2016). A three-factor model has a satisfactory fit. In this model, latent variables remained strongly correlated with each other (from $r = .50$ to $r = .73$, see Figure 1). For this reason we also decided to test a bifactor model. In this way, the similarity to the original version of the scale was preserved and at the same time the general factor was loaded directly by items. Moreover, currently there is a heated debate on the nature of sense of presence in the research community about whether the sense of presence is a one-dimensional or a multidimensional construct (Slater, 2009). The bifactor model allows researchers to calculate results either on three subscales (spatial presence, involvement, realness) or on one combined scale. The fit of this model is satisfactory. Compared to the three-factor model, the absolute indices are slightly improved ($RMSEA_{decrease} = .007$, $SRMR_{decrease} = .007$). CFI is slightly increased in the bifactor model ($CFI_{increase} = .003$). Only TLI is worsened ($TLI_{decrease} = .003$), but it is still at a satisfactory level (above. 95).

It is important to note that in the Polish sample the proportion of HMD to monitor users (1:30) was relatively low in comparison to the German sample (1:12 in Study 1 and 1:7 in Study 2) and the Portuguese sample (in which all of the participants wore HMD). There is no reason to expect this fact to influence the results since the German and Portuguese samples also differed in this matter considerably, and their results were similar.

The Polish version of the *Igroup Presence Questionnaire* proved to be valid but more research is still needed. In future studies researchers should try to test the time consistency of the scale. It would also be informative to recruit larger samples with different levels of experience with virtual engagement equipment. Further studies could also incorporate interesting research questions regarding the influence of various virtual experience characteristics (e.g., a game's genre or hardware) on the level of presence and the impacts of different levels of presence on other variables such as involvement, learning efficiency, or performance.

To conclude, the IPQ-PL shows satisfying psychometric properties and it can be used in future research under all types of IVE (e.g., VR, video games). IPQ-PL can be found in Appendix 1. It is worth noting that instructions to this scale may be changed freely by referring to virtual world, cyberworld, video games, and simulations.

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Appendix 1

Kwestionariusz doświadczeń w świecie wirtualnym (IPQ-PL)

Teraz zobaczysz stwierdzenia dotyczące Twoich doświadczeń w symulatorze/grze/świecie wirtualnym. Możesz użyć całej gamy odpowiedzi. Nie ma odpowiedzi dobrych i złych, liczy się tylko Twoja opinia. Zauważysz, że niektóre pytania są bardzo podobne. Jest to konieczne z powodów statystycznych. Pamiętaj by odpowiadać na pytania odnosząc się do pojedynczego doświadczenia.

1. Miałem/am wrażenie, że rzeczywiście jestem obecny w świecie wirtualnym.

Nie zgadzam się						Zgadzam się
- 3	- 2	- 1	0	+ 1	+ 2	+ 3

2. Miałem/am odczucie, że świat wirtualny mnie otacza.

Nie zgadzam się						Zgadzam się
- 3	- 2	- 1	0	+ 1	+ 2	+ 3

3. Odnosiłem/am wrażenie, jakbym tylko oglądał/a obrazki.

Nie zgadzam się						Zgadzam się
- 3	- 2	- 1	0	+ 1	+ 2	+ 3

4. Nie czułem/am się obecny/a w przestrzeni wirtualnej.

Nie zgadzam się						Zgadzam się
- 3	- 2	- 1	0	+ 1	+ 2	+ 3

5. Miałem/am odczucie, że działam w świecie wirtualnym, a nie obsługuję go z zewnątrz.

Nie zgadzam się						Zgadzam się
- 3	- 2	- 1	0	+ 1	+ 2	+ 3

6. Czułem/am, że jestem obecny/na w przestrzeni wirtualnej.

Nie zgadzam się						Zgadzam się
- 3	- 2	- 1	0	+ 1	+ 2	+ 3

7. Pozostawałem/am całkowicie świadomy/a rzeczywistego otoczenia, podczas poruszania się po świecie wirtualnym.

Nie zgadzam się						Zgadzam się
- 3	- 2	- 1	0	+ 1	+ 2	+ 3

8. Przestałem/am być świadomy/a istnienia realnego świata.

Nie zgadzam się						Zgadzam się
- 3	- 2	- 1	0	+ 1	+ 2	+ 3

9. Wciąż zwracałem/am uwagę na moje realne otoczenie.

Nie zgadzam się						Zgadzam się
- 3	- 2	- 1	0	+ 1	+ 2	+ 3

10. Moja uwaga była całkowicie skupiona na świecie wirtualnym.

Nie zgadzam się						Zgadzam się
- 3	- 2	- 1	0	+ 1	+ 2	+ 3

11. Wirtualne otoczenie wydawało mi się całkowicie realistyczne.

Nie zgadzam się						Zgadzam się
- 3	- 2	- 1	0	+ 1	+ 2	+ 3

12. Moje wrażenia ze świata wirtualnego wydawały mi się całkowicie spójne z wrażeniami ze świata realnego.

Nie zgadzam się						Zgadzam się
- 3	- 2	- 1	0	+ 1	+ 2	+ 3

13. Jak bardzo realistyczny wydawał ci się wirtualny świat?

Jakbym go sobie wyobrażał/a						Nie do odróżnienia od świata rzeczywistego
- 3	- 2	- 1	0	+ 1	+ 2	+ 3

Klucz odpowiedzi:
spatial presence = item1 (G1) + item2 (SP1) + item3(SP2) + item4(SP3) + item5(SP4) + item6(SP5)
involvement = item7(INV1) + item8(INV2) + item9(INV3) + item10(INV4)
realness = item11(REAL1) + item12(REAL2) + item13(REAL3)
Skala umożliwia zliczanie wyniku ogólnego (**general factor**) – to prosta suma wszystkich itemów
itemy 3, 4, 7, 9 – pozycje odwrócone; przed przystąpieniem do liczenia podskal należy wyniki dla tych pozycji przemnożyć przez – 1.

Paweł Strojny, PhD – social psychologist, assistant professor at the Institute of Applied Psychology of the Jagiellonian University, Interested in both "beneficial" and "harmful" consequences of involvement in games and other virtual environments.

Natalia Lipp, M. Sc. – psychologist, doctoral student at the Institute of Applied Psychology of the Jagiellonian University, researcher of perception during virtual experiences.

Agnieszka Strojny, PhD – social psychologist, Institute of Applied Psychology of the Jagiellonian University, focused on the effects of presenting death and dying in the context of entertainment.

Polska adaptacja Kwestionariusza *Presence Igroup*

Abstrakt: Poczucie bycia obecnym to kluczowy konstrukt w badaniach nad wirtualnymi środowiskami, a w szczególności nad wirtualną rzeczywistością – najpopularniejszym typem takich środowisk. Poczucie bycia obecnym ma wpływ na efektywność symulacji. W celu stworzenia polskiej wersji *Kwestionariusza Presence Igroup* (IPQ-PL) oryginalne narzędzie zostało przetłumaczone i użyte w badaniu ankietowym (n = 245) testującym strukturę i związki z innymi konstruktami. Wyniki wskazują, że IPQ-PL można uznać za trafne narzędzie do pomiaru poczucia bycia obecnym i wykorzystywać w badaniach na polskich próbach.

Słowa kluczowe: poczucie bycia obecnym, walidacja psychometryczna, IPQ, wirtualne środowiska, kwestionariusz, wirtualna rzeczywistość