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Adolescent–avatar similarity and its predictors: global self-esteem, gender or personality?

Abstract: Avatars are virtual representations of virtual world users. Creating a virtual representation can be considered an important element of the self-esteem formation process in modern adolescents. As previous research suggests, the similarity level between an avatar and its creator is related to the latter's self-esteem. However, previous studies were limited by small and unrepresentative samples, which creates difficulties in generalizing the results. Moreover the studies usually did not include adolescents. This study aims to investigate possible predictors of adolescent–avatar similarity (AAS), in particular global self-esteem, which develops in adolescence. In addition to self-esteem, the importance of personality and gender was also examined. 130 high school students played the *Characterium* computer game, which was designed for this project. The participants also completed measures of global self-esteem and personality and explained why they had created such avatars. In order to test the research hypotheses, hierarchical regression analyses were performed. No relationship was found between adolescents' global self-esteem and AAS; however extraversion and gender were significant predictors of adolescent–avatar similarity. Due to the limited number of studies in adolescents, we discuss our results based on the results of adults. The lack of verification of the first hypothesis may be due to the fact that adolescents use avatars to experiment with their own identity, regardless of their self-esteem. This suggests that they use avatars for a different purpose than adults (who want to boost their self-esteem). We discuss gender and personality results in terms of gender and personalty differences in (adult) players. Additionally we propose a hypothesis of cognitive overload (for adolescent extroverts).

Keywords: *self-esteem, adolescence, avatar similarity, personality, gender*

INTRODUCTION

With the advancement of technology, the virtual world plays an increasingly important role in the lives of young people. Sometimes it is hard for them to distinguish it from the real world (Davis & Weinstein, 2017). The virtual space has nowadays become a new place where young people can develop their Self (Arbeau, et al., 2020; Steinsbekk et al., 2021; Villani et al., 2012). Therefore, contemporary research on young people's self-esteem should take into account their virtual profiles and the representations with which they manifest and modify their self-esteem (Meeus, Beullens & Eggermont, 2019; Valkenburg, Peter & Schouten, 2006). A common part of this virtual world is computer games, the popularity of which results from many factors. Computer games are mainly a source of entertainment (Griffiths, 1997; Hellström, Nilsson, Leppert & Åslund, 2012; Wan & Chiou, 2006; Wearing et al., 2022), but adolescents also emphasize their role in developing social interaction (Arbeau, et al., 2020; Daneels et al., 2020; Wan & Chiou, 2006; Yee, 2006), experiencing an emotionally moving and uplifting moment (Daneels et al., 2020), fostering agency and sense of autonomy (Pavlopoulou et al., 2022), relaxation (Colwell, 2007), reducing boredom (Griffiths, 1997), escaping from ordinary everyday life (Hellström et al., 2012; Wan & Chiou, 2006), taking on challenges (Colwell, 2007; Griffiths, 1997; Yee, 2006), emotion regulation (Arbeau, et al., 2020; Pavlopoulou et al., 2022), and satisfying the need for achievement (Wan & Chiou, 2006).

From the perspective of youth development research, games that give players the opportunity to create representations of themselves in the game world (i.e., avatars) seem to be vitally important. An avatar is a two- or three-dimensional graphic representation of a user in an online community, such as forums, chatrooms, and social

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media (Nowak & Rauh, 2005; Schroeder, 2002). In computer games, an avatar is a character that represents the player in the game world and is under the player's control, as opposed to NPCs (non-player characters), which follow a path programmed by the game developers (Worth, 2015). Depending on the game, a player has a varying level of freedom to customize their avatar. Some games offer ready-made character templates with specific stats (e.g., in the form of character classes), which affects players' choice of avatar as they have to choose avatar classes with the desired (from the perspective of a game's goals) stats. Some other games allow greater customization of features according to a player's preferences and do not limit players' choices to preconceived templates. In such games, the main purpose of the avatar is to represent the player, who can freely customize features such as physical appearance, personality traits and behavior. Therefore, the relationship between an avatar and its creator is very interesting. Research (e.g., Dunn & Guadagno, 2012; Park, 2018; Villani et al., 2016) shows that players create their avatars based on how they perceive themselves, especially in the context of *the ideal self* (what they would like to be), *the actual self* (what they really are) and *the ought self* (what they feel they should be) (Higgins, 1987).

For this reason, avatars are an interesting tool for studying how young people want to present themselves in the virtual world. This study focuses on the predictors of the similarity between the avatar and its adolescent creator: self-esteem, gender, and personality traits.

SELF-ESTEEM AND AVATAR SIMILARITY (AAS)

Self-esteem is defined in a variety of ways (Szpitalak & Polczyk, 2015), but in general it can be concluded that it is an individual's assessment of their own successes and failures and how these compare to their expectations and aspirations (James, 1892/2002; Pope, McHale & Craighead, 1988). An important factor that shapes self-esteem is an individual's sense of their social value and social relationships (Tafarodi & Swann, 1995). This influences the perception of oneself as a good or bad person in the context of social values and norms (social self-esteem; Tafarodi & Swann, 2001). The social environment and peer-to-peer contacts play an especially important role in the evolution of young people's self-esteem (Gorrese & Ruggieri, 2013; Gruenenfelder-Steiger, Harris & Fend, 2016; Jiang et al., 2015), which consequently makes virtual space (very common nowadays) a "social mirror" in which adolescents look at themselves (Orben & Dunbar, 2017; Valkenburg et al., 2021).

Research shows that players create their avatars in different ways and that these ways may be related to their self-esteem. Players create avatars similar to themselves, but many of them create a better version of themselves: better appearance, better style and (in the case of adult players) younger age (Ducheneaut et al., 2009; Dunn & Guadagno, 2012). It is also known that players use avatars as an occasion to experiment with their online self (Mancini & Sibilla, 2017). These different strategies seem to be important in the context of self-esteem. Research on the relationship between self-esteem and avatars (Sibilla & Mancini, 2018) has indicated that two main kinds of user–avatar relationships occur frequently: actualization (the avatar is similar to the player and reflects the player's *actual self*) and idealization (the avatar is idealized in reference to the player's *ideal self*). A 2007 study hypothesized that avatars would reflect players' ideal selves (Bessière, Seay & Kiesler, 2007), and the results actually showed that players rated the created avatars as having more desirable characteristics than themselves; this relationship was stronger for those with lower psychological well-being. It can be concluded that people with a high level of self-esteem tend to choose avatars similar to themselves. Dunn and Guadagno (2012) show that the higher a player's self-esteem, the higher the similarity between them and their avatar. This is probably because a player does not need to change many features when creating an online representation if they view themself positively (Pringle, 2015). Burke (2017) found that adolescent girls who rated their ideal avatars as very similar to themselves had higher levels of self-esteem and greater satisfaction with their physical appearance than those who rated their avatars as very dissimilar to themselves. Moreover, another study found that the greater the discrepancy between the virtual self and the physical self, the lower the self-esteem (Wang, Yang & Shen, 2014). In contrast, Pringle (2015) did not find a relationship between creator–avatar similarity and global self-esteem, but they did find such a relationship for body self-esteem.

In conclusion, a few studies have established that there is a positive relation between individuals' global self-esteem (Dunn & Guadagno, 2012; Wang, Yang & Shen, 2014), body self-esteem (Pringle, 2015), and the similarity of avatars to their adult creators, but only one study has investigated this relationship in adolescents (Burke, 2017). More research on this topic should concern the relationship between adolescents' self-esteem and their avatars, as adolescence is the time when young people build their self-esteem, and the virtual representations (avatars) created by them play an important role in this process. So far, the few studies conducted had some limitations, such as a very small number of participants (Pringle, 2015); all subjects were girls (Burke, 2017); lack of the computer game phase (Burke, 2017; Pringle, 2015); or the use of a commercial computer game that might have been known to the subjects (Dunn & Guadagno, 2012). The purpose of this study was to fill this gap in adolescent research and conduct a study that does not have the above-mentioned limitations. The first hypothesis was put forward:

H1 *The higher the global self-esteem, the higher the adolescent–avatar similarity.*

GENDER AND AVATAR SIMILARITY

Player–avatar similarity is also related to the gender of the creators of these avatars. On the one hand, female players might be under greater social pressure to create

avatars similar to themselves than male players do. Ratan et al. (2019) found that women are more expected to reveal their identities in virtual worlds. On the other hand, women sometimes change their gender in their avatars to avoid being harassed (Chou, Lo & Teng, 2014; Hussain & Griffiths, 2008). Gender differences are also observed in relation to other avatars. In the study by Menshikova and coworkers (2018), study participants were immersed in virtual environments and were tasked to approach avatars and give them certain instructions. Women approached the avatars which matched their ethnic group more closely than those which matched other groups. Men, however maintained the same social distance, regardless of the ethnicity of other avatars. In addition, the degree of similarity between an avatar and its creator affects avatar identification in different ways in men and women. Trepte and Reinecke (2010) observed that, in competitive games, in women there is a stronger negative influence of the player–avatar difference on identification with an avatar than in men.

Despite the role of gender in the avatar-creator relationship (Chou, Lo & Teng, 2014; Hussain & Griffiths, 2008; Ratan et al., 2019), it has not been analyzed in adolescents. The purpose of this study was to fill this gap in adolescent research. Thus the second hypothesis was put forward:

H2 *Gender predicts adolescent–avatar similarity.*

PERSONALITY AND ADOLESCENT–AVATAR SIMILARITY (AAS)

Player–avatar similarity is also related to players' personality – an organized set of characteristics that allow us to predict human behavior in certain situations (Pervin, Cervone, & John, 2005). Dunn and Guadagno (2012) performed a number of analyses of avatar traits and player personality dimensions that were distinguished by Costa and McCrae (1985): extraversion (active, assertive, energetic, enthusiastic), agreeableness (appreciative, forgiving, generous, kind), conscientiousness (organized, planful, reliable, responsible, thorough), neuroticism (anxious, self-pitying, tense, touchy, unstable) and openness to experience (artistic, curious, imaginative, insightful, original, wide interests). Their studies (Dunn & Guadagno, 2012) showed that people with a high level of openness to experience rated their avatars as similar in terms of personality more often than people with a low level of this trait. They also used the term "we" more frequently to describe themselves and their avatar. Moreover, the more conscientious and agreeable the study subjects were, the more they believed that their avatars were similar to them. In addition, the researchers, like McLeod, Liu, and Axline (2014) and Messinger and coworkers (2008), established that extroverts create avatars more similar to themselves than introverts do. Delhove and Greitemeyer (2018) found that a less prosocial personality type correlates with the choice of aggressive roles for avatars. Park and Henley (2007) established that when players had a choice of characters from the fantasy world, they still chose those that matched their personality traits. People with a high level of extraversion more often chose characters who were characterized as charismatic, and people with a high level of agreeableness more often chose characters who played a helping role. Aas, Meyerbröker and Emmelkamp (2010) reached similar conclusions. The participants of their study first defined their personality, and seven months later they created their avatar or used the one they already had in the Second Life (Linden Lab, 2013) platform. Finally, they determined the personality of their avatar. These researchers (Aas, Meyerbröker & Emmelkamp, 2010) did not notice any differences in the personalities of study participants and avatars. In their opinion, these results show that users do not create a new personality for their avatar but base its personality on their own traits. In conclusion, an avatar's personality usually correlates with the player's (Sung et al., 2011), but sometimes players add some modifications, e.g., they choose a character with higher extraversion (Ducheneaut et al., 2009). Sung and coworkers (2011) found that when the subjects defined their personality and the personality of their avatars, a correlation between these personalities was demonstrated. However, when the personality of avatars was determined by other people, only the agreeableness of the avatars and their creators correlated. In contrast, Mancini and Sibilla (2017) determined that avatar customization does not depend on the personality of the players, and the character created may be similar to or completely different from the personality of its creator.

Despite the role of personality in the avatar-creator relationship (Aas, Meyerbröker & Emmelkamp, 2010; Delhove & Greitemeyer, 2018; Dunn & Guadagno, 2012), it has not been analyzed in adolescents. The purpose of this study was to fill this gap in adolescent research. Thus the third hypothesis was put forward:

H3 *Personality predicts adolescent–avatar similarity.*

CURRENT STUDY

Method

Study participants

A total of 130 Polish high school students (75 girls, 55 boys) participated in the study. They ranged in age from 15 to 17 years (M = 16.53; SD = 0.60). The participants were recruited in schools and students' halls of residence in several cities in Poland. The consent to voluntary participation in the study and the GDPR (General Data Protection Regulation drafted and passed by the European Union) forms were signed by minor adolescents and their parents/caregivers. No remuneration was offered.

Measures

Computer game description

The *Characterium* computer game is a non-commercial project developed for the purposes of scientific research. It was created with the cooperation of a psychologists, a computer graphic artist and a computer game developer. Moreover, four adolescents participated in the

discussions on the specifics of the game (e.g. clothing, avatar hairstyles). The mechanics and type of the game was based on the game *Icy Tower* (Free Lunch Design, 2001). In the first pilot study, five adolescents tested the game and found it attractive enough, but too easy. So, obstacles flying across the screen were added to the game. Then, another three people played the game and found it difficult enough. *Characterium* is an arcade game. The arrow keys control the avatar's movement to the right and left, and the space button causes the avatar to jump. The player's goal is to jump higher on the bars and avoid falling. This task is made more difficult by flying objects. A detailed description of the game development process is presented in [*Paleczna, Buczkowicz and Szmigielska (2022)*]. Examples of avatars created by study participants are shown in Figure 1. Elements of the avatar creator as well as the game scene are shown in Appendix in Figures A1-A6.

Figure 1: *Examples of avatars created by adolescents*

Adolescent–avatar similarity (AAS) – the sum of the points in the Similarity Scale. The participants rated the avatar's resemblance in eight areas (e.g., eyes, clothes) on a scale of 1 (*strongly disagree*) to 5 (*strongly agree*). Examples of statements include "*my avatar is very similar to me*", *"my avatar's face is very similar to mine*", "*my avatar's clothes match my dress style*". The minimum number of points that can be obtained on this scale is 8 and the maximum is 40. The higher the result on the scale, the higher the adolescent–avatar similarity. The scale is characterized by high reliability: Cronbach's alpha coefficient for this measure was .90.

Global self-esteem – the sum of the points achieved in the Polish adaptation (Szpitalak & Polczyk, 2015) of the Self-Liking / Self-Competence Scale (SLCS-R; Tafarodi & Swann, 2001). The participants responded to sixteen statements on a scale of 1 (*strongly disagree*) to 5 (*strongly agree*). The range of results for the whole scale varies from 16 to 80. The higher the result, the higher the global self-esteem. The range of results in the subscales varies from 8 to 40. The higher the results, the higher the self-liking and self-competence. Each of the subscales consists of eight items. An example item for the self-liking subscale is "*I never doubt my personal worth*"; for the Self-Competence subscale, *"I am very talented*". "Cronbach's alpha coefficients obtained in this study are: .88" for the self-liking scale and .76 for the self-competence scale (Szpitalak & Polczyk, 2015). Cronbach's alpha coefficient of this scale is .88 for the self-liking scale and .76 for the self-competence scale.

Personality traits: the sum of points achieved in the Polish adaptation (Zawadzki et al., 1998) of the NEO FFI Personality Inventory (Costa & McCrae, 1989) for five personality subscales: Neuroticism (e.g., "I often feel tense and nervous"), Extraversion (e.g., "I like to have many people around me"), Openness to experience (e.g., "Sometimes when I read poetry or watch a work of art, I feel a thrill and a wave of excitement"), Agreeableness ("Some people think that I am cold and calculating"), Conscientiousness ("I am a person who conscientiously does my job"). Each scale consists of twelve items. Study participants rated sixty statements on a scale of 1 (*strongly disagree*) to 5 (*strongly agree*). The range of results for each subscale varies from 0 to 48. The higher the result for a given subscale, the higher the neuroticism, extraversion, openness to experience, agreeableness and conscientiousness. Cronbach's alpha coefficient of the Polish adaptation of the questionnaire is .88 for neuroticism, .77 for extraversion, .68 for openness to experience, .68 for agreeableness, .82 for conscientiousness. Cronbach's alpha coefficients obtained in this study are: .79 for Neuroticism, .80 for Extraversion, .70 for Agreeableness. For the other two subscales, the reliability was below the acceptance level: for the Openness to Experience subscale, it is .64; for the Conscientiousness subscale, it is .46. The results obtained on these two subscales should be analyzed with caution.

Gender – The gender declared by study participants. It could take one of two values: male (coded as 1) or female (coded as 0).

Motives for creating avatars – The motives that adolescents were guided by when creating their avatars: character attractiveness, character ugliness, character originality, similarity to my other avatar, similarity to someone else, similarity to me, my perfect version, the goal of the game. The study participants rated each motive on a scale from 1 (*not significant*) to 5 (*very important*). The final indicator of each motive's importance is the average number of points allocated by all study subjects. The range of the score for each motive is 1 to 5. The higher the number, the more important the motive.

Procedure

The research was conducted in schools and dormitories in September-October 2020. If possible, a computer from the school computer lab was used, otherwise the researcher used their own laptop. At the beginning, the study participants were instructed that the purpose of this study is to establish how different people play computer games. Then the researcher explained the research procedure. Finally, the study participants signed the consent to participate in the study and the GDPR form and submitted the documents signed by their parents. In

the first part of the study, the participants created an avatar and controlled it in the *Characterium* computer game. The avatar was customized by selecting its physical features and competences. The physical features included gender, age, skin color, face shape, eyes, ears, eyebrows, nose, lips and/or earrings, glasses and hair, body shape, clothes and shoes. The choice of competences was based on the distribution of 500 points between ten traits: bravery, creativity, intelligence, agility, accuracy, sensibility, openness, courage, resilience, and perceptiveness. There was no obligation to assign points to every competence, but the number of points assigned to a given competence had to be a multiple of ten (e.g., 20, 130, 250). The selected competencies did not affect the game efficacy. Once an avatar was created, no traits could be changed afterwards. There was no time limit for creating an avatar, and the game was played for five minutes. After the game was over, the participants completed several scales regarding the gaming experience (which were not analyzed for this part of the project) and assessed the avatar's similarity to themselves. In the second stage of the study, the participants completed a number of scales and questionnaires that mainly concerned their self-esteem and personality. Finally, the detailed purpose of the study was explained to the study participants. The described study is part of a larger project (in which the game results were also analyzed; see Paleczna et al., 2022).

Results

Statistical analysis was done with IBM SPSS Statistics 25 software. The descriptive statistics of participant score (the mean, standard deviation and range of results) on the Avatar Similarity Scale and the Self-liking / Self-competence Scale and the NEO FFI Scale are presented in Table 1; the correlation matrix of gender, personality, global self-esteem and AAS is presented in Table 2. The adolescents' motives when creating their avatars are shown in Table 3. The mean, the standard deviation, and the range of results are included. In order to test the research hypotheses, a hierarchical regression analysis was performed (see Table 4).

Descriptive statistics suggest that the most important motives were *character originality*, *character attractiveness*, *similarity to me*; the least important were *similarity to someone else, character ugliness* and *my perfect version*, see Table 3.

To verify the hypotheses, a hierarchical regression analysis was performed. The models were tested to explain the degree of similarity between avatars and adolescents through self-esteem, gender and personality. The results are presented in Table 4.

The first model was statistically insignificant, explaining less than 1% of the variance of the dependent variable. The second model explained 12.5% of the variance of the AAS. The statistically significant predictors were gender and extraversion. For gender, a negative regression coefficient indicates that boys create avatars that are less similar to themselves than those created by girls ($B = 0.35$, $\beta = 0.33$, $p = 0.002$). For extraversion, a positive regression coefficient indicates that the degree of adolescent–avatar similarity increases as extraversion increases ($\beta = 0{,}33$).

Based on the conducted analysis, it was found that gender and extraversion are statistically significant predictors that explain the similarity of avatars to adolescents.

Table 1. Means, standard deviations and the range of participants' scores

	M	***SD***	***Range***
Avatar similarity	19.35	8.01	8–37
Global self-esteem	48.86	10.41	23–80
Neuroticism	27.18	7.96	9–44
Extraversion	28.41	7.60	12–46
Openness to experience	26.06	6.40	13–43
Agreeableness	28.04	6.68	1–44
Conscientiousness	29.35	6.60	10–48

Table 2. Inter-correlations for gender, personality, global self-esteem and AAS

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1. Gender	-	-.24**	.03	-.25**	-.21*	<.01	.20*	-.25**
2. Neuroticism		-	-.36***	.27**	-.20*	-.24**	-.73***	.05
3. Extraversion			-	-.17	.33***	.27**	.51***	.31***
4. Openness				-	.09	.02	-.18*	.02
5. Conscientiousness					-	.28**	.15	.25**
6. Agreeableness						-	.37***	.16
7. Global self-esteem							-	.04
8. AAS (adolescent–avatar similarity)								-

*** – $p < 0.001$; ** – $p < 0.01$; * – $p < 0.05$

Table 3. Adolescents' motives when creating their avatars

	M	*SD*	*Range*
character originality	3.19	1.19	1–5
character attractiveness	3.03	1.33	1–5
similarity to me	2.65	1.47	1–5
the goal of the game	2.48	1.21	1–5
the subject of the game	2.45	1.18	1–5
similarity to my other avatar	2.22	1.24	1–5
my perfect version	2.18	1.33	1–5
character ugliness	2.00	1.11	1–5
similarity to someone else	1.78	1.11	1–5

Table 4. Hierarchical regression predicting adolescent–avatar similarity from gender, personality and self-esteem

Model	Predictor	*B*	*SE*	*Beta*	*t*	*p*	R^2	ΔR^2	*F* Change	*p* Change
1	(constant)	19.31	3.58		5.40	**<0.001**	<0.01		<0.01	0.943
	Global self-esteem	0.01	0.07	0.01	0.07	0.943				
2	(constant)	6.50	9.88		0.66	0.512	0.125	0.125	4.03	**0.001**
	Global self-esteem	-0.06	0.11	-0.08	-0.57	0.569				
	Gender	-3.10	1.49	-0.19	-2.08	**0.040**				
	Neuroticism	0.14	0.13	0.14	1.07	0.288				
	Extraversion	0.35	0.11	0.33	3.18	**0.002**				
	Openness to experience	-0.06	0.12	-0.04	-0.48	0.630				
	Agreeable-ness	0.16	0.13	0.11	1.19	0.237				
	Conscien-tiousness	0.12	0.12	0.09	0.98	0.329				

DISCUSSION

In this study it was expected that there would be a positive relationship between global self-esteem and adolescent–avatar similarity. The study did not confirm this, while such a relationship was demonstrated in the studies by Dunn and Guadagno (2012), Wang, Yang and Shen, (2014), Burke (2017). One study found a relationship between body self-esteem and player–avatar similarity (Pringle, 2015). The lack of confirmation of the first hypothesis (H1) can be explained in several ways.

Hypothesis H1 was based on the results of previous studies which had some limitations: a small number of participants (Pringle, 2015); unrepresentative (girls only) sample (Burke, 2017), the use of a game that might be known to the study participants (Dunn & Guadagno, 2012), and a lack of the computer game phase (Burke, 2017; Pringle, 2015). Our study was therefore designed to remove these limitations; therefore, it is characterized by a larger research group that consists of both girls and boys. In addition, the subjects played a specially designed arcade game with an avatar that was related to the actual gaming experience. Perhaps the differences in research methodology explain the differences in the results.

Perhaps the adolescents were not able to judge properly how much the avatars resembled themselves. This difficulty could have resulted from the limited character creator and the inability to accurately reproduce themselves. For example, among the accessories, the subjects could only choose glasses and earrings. Meanwhile, other types of body decorations, such as tattoos, piercing of various parts of the body and face, as well as intentional cutting of the skin to obtain a scar, also play a significant role for young people (Breuner et al., 2017). Perhaps the adolescents wanted to create a character similar to themselves but it was not possible. On the other hand, adolescence is when individuals shape their identity (Czyżowska, 2007; Klimstra et al., 2010). They do not yet have a stable self-image but are experimenting with various aspects of self (Valkenburg, Schouten & Peter, 2005). Consequently, they do not have a stable point of reference to which to compare their avatars. Thus, an

additional way of assessing similarity, e.g., by other people, should be considered. This method was used by Dunn and Guadano (2012).

Taking into account the fact that adolescents are still shaping their identity and do not have a stable self-image (Topolewska-Siedzik & Cieciuch, 2018), perhaps the dissimilar–similar continuum is insufficient. Maybe it should be extended to include *my ideal self* dimensions (Higgins, 1987). A previous study showed that people with low self-esteem compensate for perceived deficiencies by creating more desirable images (Dunn & Guadagno, 2012). With regard to self-esteem, perhaps adolescents create their avatars not on the basis of who they are now but on the basis of who and what they want to be. Avatars that do not resemble them may therefore be their ideal images of themselves.

In general, the issue of the similarity between an avatar and its creator is complex. It is possible that the subjects faced the dilemma of whether to create a character similar to themselves or suitable for the type of game. The process of creating an avatar was not preceded by any instructions or recommendations regarding the appearance and features of the avatar; however, after the game was over the adolescents were asked about their motives for creating their avatar. As current study shows, "similarity to me" and the "goal of the game" were similarly important to them, while the most important motives turned out to be "originality" and "character attractiveness". As Trepte, Reinecke and Behr (2009) established, avatars are often the result of players' compromise between the desire to create a character similar to themselves and the requirements of the game.

In previous studies, the positive relationship between self-esteem and player–avatar similarity was explained by self-acceptance and the willingness to express one's true image (Burke, 2017; Dunn & Guadagno, 2012). Perhaps such a relationship does not exist among adolescents. They can accept themselves and have high self-esteem, yet they still use the virtual world to explore their own identity. Teenagers who transition from childhood into adolescence are tasked with creating a relatively clear and stable identity (Branje et al., 2021). In order to achieve this, they take on different roles and experiment with them. Initially, it happened offline, now the online world provides great opportunities. Thus virtual worlds are called identity playgrounds (Kafai et al., 2010) and identity workshop (Schroeder & Axelsson, 2006). Therefore, the creation of dissimilar avatars does not necessarily indicate low self-esteem as it could be a sign of the process of adolescents "trying on" different identities. Valkenburg, Schouten and Peter (2005) found that adolescents use the internet to try out what it is like to be someone else. Furthermore, perhaps AAS is related not to adolescents' self-esteem but to the clarity of their self-concept. Adolescents with a more stable self-concept present themselves online in relation to who they really are, while adolescents with a less stable self-concept are more likely to present their idealized versions (Fullwood, James & Chen-Wilson, 2016).

Yet another possibility is that the relationship between adolescents' self-esteem and AAS occurs over time. Perhaps an avatar they create for research does not matter to them as much as one they actually play with. It is possible that when adolescents play a game with an avatar for a long time, they are more closely related to it. According to Bartle (2003), the relationship between an avatar and its creator evolves from two separate identities to the point where the player's identity is that of the avatar. Playing as the same avatar for several weeks or months can therefore increase the player's identification with it. Thus, the avatar can become a reflection of how players evaluate themselves: if this evaluation is positive, their avatars are similar to them; if it is negative, they are dissimilar.

The first significant predictor of AAS was gender (H2). Boys created avatars less similar to themselves than girls. These results are in line with those obtained by Ratan et al. (2019), who suggest that women are under greater pressure to present their true identity in the virtual world than men. Perhaps such pressure is already experienced by female adolescents, but the study did not measure its level. The predictive role of the female gender can also be explained in another way. Women experience a feeling of presence in the virtual world less than men (Felnhofer et al., 2012). It is possible that for them the virtual world identical to the real world, therefore they present themselves as if they were in it. Moreover, men and women spend time in the virtual world for different reasons: for men, entertainment and relaxation play an important role, while women treat it more often as a space for communication and education (Weiser, 2000). The former, more hedonistic motivation encourages one to experiment with one's identity, while the latter encourages one to show one's true identity. Women are also more focused than men on building and maintaining relationships in a virtual environment (Park, Song, & Teng, 2011), which is facilitated by presenting their true identity.

The second significant predictor of AAS was extraversion (H3). This result is in line with the results obtained by Dunn and Guadagno (2012), McLeod, Liu, and Axline (2014) and Messinger et al. (2008), who found that extroverts create avatars more similar to themselves than introverts do. Researchers from these three teams indicate that extraversion is a desirable trait, therefore both extroverts and introverts create extrovert avatars: the former's are similar to their creators, and the latter's are not. The predictive role of extraversion can also be explained in another way. People with a high level of extraversion are outgoing and willing to maintain close relations with others (Costa & McCrae, 1989; Zawadzki et al., 1998). Creating different, alternative identities with an extensive network of social contacts would be a cognitively burdensome task. Perhaps creating similar avatars is a strategy to limit the excessive use of resources (e.g., memory) that would be needed to create many dissimilar virtual representations.

Research limitation

This study is not without limitations. First, the number of respondents was limited because the project was implemented during the Covid-19 pandemic. The

subjects were adolescents who studied online most of that time, so it was not possible to conduct scheduled recruitment and research processes in schools as planned. Thus, it is necessary to repeat the study on a larger sample. Second, Długosz (2020) found that students of Kraków secondary schools during the pandemic showed symptoms of nervousness and low mood. The obtained results should be generalized to the entire adolescent population with great caution. The research should be repeated in post-pandemic conditions. Third, adolescents themselves assessed the similarity of their avatars to themselves, but several studies have found that adolescents sometimes judge themselves inadequately (Bergström, Stenlund, & Svedjehäll, 2000; Lim & Wang, 2013). Therefore, an additional objective assessment of this similarity should be used. Fourth, the adolescents' attitudes to their avatars were not investigated. Although participants' motivation to create a specific avatar was measured, there was no 'random avatar' option. Therefore, it is difficult to assess to what extent the avatars created by the adolescents were random. It is also possible that the adolescents did not like the avatar graphics, which could also have affected their assessment of the similarity and their willingness to create avatars similar to themselves. Moreover, the study did not analyze whether there were differences in the motivation to create a specific avatar of adolescents with lower and higher self-esteem.

Summary

Several studies have established that there is a positive relationship between self-esteem and the similarity of avatars to their creators (Dunn & Guadagno, 2012; Pringle, 2015). This study did not confirm such a relationship in relation to adolescents (H1). This may result from the lack of a stable self-image in adolescents; too narrow an approach to the relationship between the avatar and its creator (as a dimension ranging from lack of similarity to total similarity); or study participants' lack of identification with the avatar as they do not play for long enough. Perhaps, however, the relationship between self-esteem and AAS does not exist, as adolescents use avatars to experiment with their identity, regardless of their self-esteem, or AAS is predicted by self-concept clarity instead of self-esteem. In contrast, gender (H2) and extraversion (H3) were significant predictors of AAS. The obtained results can be used by psychologists who, in cooperation with game developers, can design such avatar creators in games, thanks to which it will be possible to stimulate the development of self-esteem in young people. In future research, it is worth looking for explanations of why female adolescents create more similar avatars to themselves than male adolescents do, and why extroverted adolescents create more similar avatars to themselves than introverted ones do. Perhaps these are completely different reasons than in adult women and men and adult extroverts and introverts. In addition, it is worth investigating whether changes in self-esteem affect AAS. However, not only the similarity between the avatar and its creator should be analyzed, but also whether the avatar is an idealized representation of the player.

Compliance with Ethical Standards

All study subjects and their parents / legal guardians gave informed consent to participate in the study.

The study was approved by the Ethics Committee at the Institute of Psychology of the Jagiellonian University in Krakow.

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APPENDIX

Figure A1: *Gender selection page (title: "Start as…"; options from left: "female", "male").*

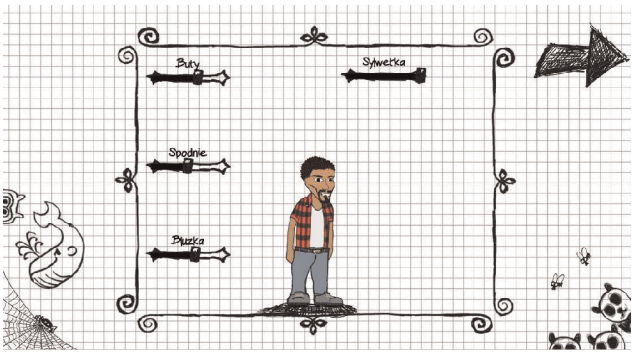

Figure A2: *Page with pseudonym, age and skin color selection (on the top from left to right: "type nickname", "type age"; at the bottom: "skin tone").*

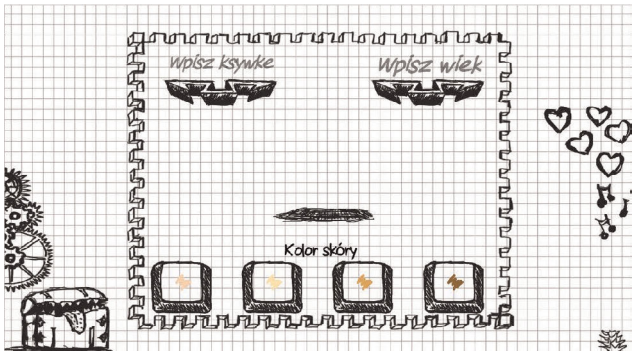

Figure A3: *Page of appearance customization (left side from top to down: "head", "ears", "eyebrows", "hair", "piercing"; right side from top to down: "nose", "lips", "eyes", "beard", "glasses").*

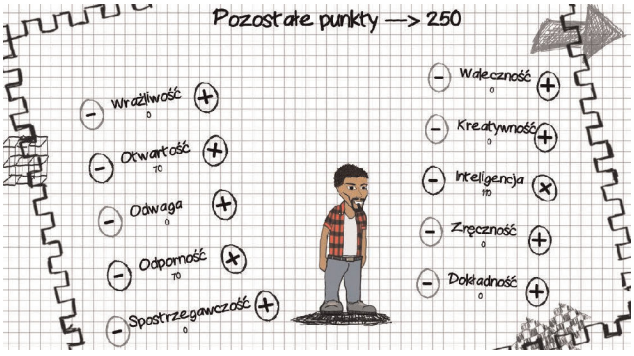

Figure A4: *Page with customization of body shape, clothes and shoes (left side from top to down: "shoes", "trousers", "shirt"; right side: "body shape").*

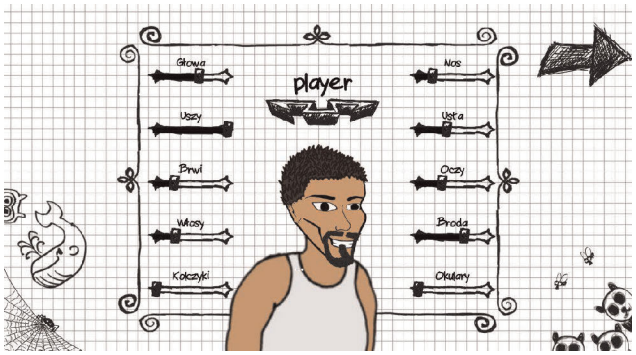

Figure A5: *Competencies customization (title: "remaining points: 250"; left side from top to down: "sensitiveness", "openness", "courage", "resistance", "preciseness"; right side from top to down: "bravery", "creativity", "intelligence", "agility", "perceptiveness").*

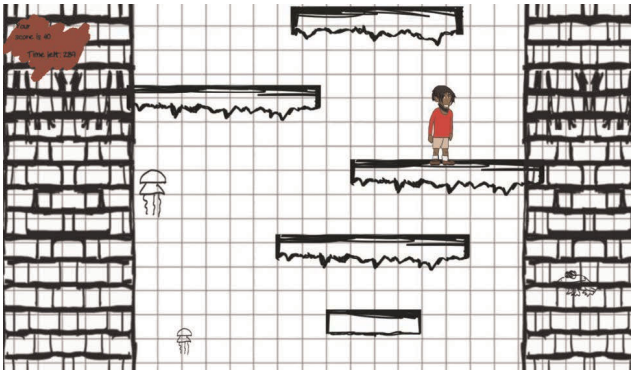

Figure A6: Characterium *game scene*