

Puzzle Persona Report

The purpose of this study was to construct puzzle player personas to understand how puzzle players are both similar and different from each other. For constructing personas, a well-developed scale for measuring preferences to play puzzle games was required. Since such a scale does not exist in prior literature, we aimed to construct a novel way to measure players' puzzle gaming behavior and preferences by ourselves.

Earlier literature has shown that mobile game players are motivated to play for different reasons than players who enjoy more immersive experiences such as online strategy games, massively multiplayer online role-playing games, or esports games based on mechanics of first-person shooter games. Furthermore, motivations have been shown to be linked to players' purchase behavior and time they spend in playing games. Motivations are also widely used in market research and in companies' own studies on their user base. Because of these reasons, we decided to select motivations as a core perspective for investigating players' puzzle play habits and preferences.

In psychological motivation theories, motivation is usually divided into intrinsic and extrinsic motivation. According to a grand theory known as Self-Determination theory (SDT), in extrinsically motivating activities a person acts mainly because of external pressure or another kind of instrumental outcome. In intrinsically motivating activities, a person considers the activity as rewarding in itself. In other words, an intrinsically motivated person engages with an activity because it manages to satisfy her psychological needs.

We have developed in our earlier research a method to analyze players' intrinsic motivations to play digital games (<https://scholarspace.manoa.hawaii.edu/handle/10125/59686>). However, prior research on gaming motivation suggests that puzzle players may be *both* intrinsically and extrinsically oriented. To be intrinsically motivated means that because the activity is inherently gratifying for the person, she is likely to continue to play and to return to use the same application/service again. Also, when a person is intrinsically motivated, she feels that she can act independently and that her decisions matter (autonomy), that her skills align with the demands of the activity (competence), and that she is connected to others in meaningful ways (relatedness). An activity which is intrinsically motivated is considered to be fun, entertaining, exciting, and pleasurable. Such an activity does not need external rewards to be satisfying for an individual. Rather, a person *wants* to engage with this kind of activity because it manages to satisfy his or her basic human needs of self-determination.

Motivations to play literature asks *why* we play games in general, or why we play specific type of games. Fleshing out motivations or reasons to play puzzle games provides us tools for understanding habitual play, but this information, by itself, is not sufficient for predicting specific players' game choice or preferences in specific game features. However, in-depth knowledge of what motivates to play puzzle games can be utilized in constructing player types and predicting patterns in players' habitual gaming behavior.

Materials and Procedure

A total of 1,513 survey participants (ages 18–75) were recruited from United Kingdom (n=1093) and USA (n=420). The survey was targeted only to those respondents who reported to play puzzle games at least

occasionally. This was done because analyzing motivations is sensible only if a person is at least a little bit interested in the activity.

Based on a literature review and discussions with fellow researchers as well as with an industry operator, a 28-item inventory to examine players' motivations to play puzzle games was developed. We utilized the IMG-15 (we added two items to this to make it IMG-17 version) inventory for measuring intrinsic motivations to play digital games (<https://scholarspace.manoa.hawaii.edu/handle/10125/59686>), and developed a total of eleven new inventory items to measure possible extrinsic motivations to play puzzle games. In this we relied on model developed by Guay, Vallerand, and Blanchard (2000: "On the Assessment of Situational Intrinsic and Extrinsic Motivation: The Situational Motivation Scale (SIMS)" *Motivation and Emotion*, Vol. 24, No. 3) which is used in investigating both situational intrinsic and extrinsic motivations. Although the model by Guay et al. (2000) is not directly applicable with our study, the authors argue for several type of extrinsic motivations which we used as a framework for developing survey items to measure specific extrinsic motivations to play puzzle games.

The extrinsic motivational factors argued by Guay et al. (2000) are:

1. *Identified regulation*. Situations in which an individual values specific type of activity because of its expected positive outcomes. This kind of motivation is extrinsic, because a person does not engage with it because the experience is rewarding in itself but rather because it is perceived to be an effective means to an end.
2. *Amotivation*. An amotivated person acts in a specific way mainly to avoid other options but she lacks both intrinsic and extrinsic reasons in relation to the particular qualities of the activity type under analysis.
3. *External regulation* happens when behavior is regulated by prices and rewards, or to avoid those consequences which would follow from not behaving in a specific way. There is an obligation, external pressure and control which encourages a person to engage in the activity type.

Of these three factors of more extrinsic motivation, we included only identified regulation and amotivation in our study. External regulation was excluded from this study because we were interested only in activities with which players were willing to engage with for a reason or another. External regulation necessitates that we would take into consideration also other things besides a player and a game which we did not want to do. Because gaming is a pastime activity and very typically a freely chosen type of spending time, external regulation did not seem plausible in the current context.

We developed and compiled a total of eleven new survey items to measure the hypothesized factors of *identified regulation* and *amotivation*. The new items were based on both a literature review and on our previous research projects in which we have analyzed both qualitative interview data and quantitative survey data. The items for measuring hypothesized *amotivation* to play puzzle games were "I play to kill time", "I play to avoid boredom", "I play because it makes me forget real-life problems", "I play because of the lack of better options", "I play but I am not sure if it is worth it", and "I play puzzle games because games make my worries more bearable". The items for investigating *identified regulation* were developed into: "I play because it releases stress", "I play to train my brain", "I play to keep my mind sharp", "I play to enhance my memory", and "I play because gaming reduces my negative feelings".

The 17-item version of the Intrinsic Motivations to Gameplay (IMG) scale has been developed to measure SDT-based factors of *autonomy*, *relatedness*, and *competence* as well as *fun* and *immersion* – the latter of which are common ways to describe one's reasons to play games that are perceived to be meaningful and rewarding by themselves.

Survey participants were instructed to think about their reasons to play puzzle games and specify how important (5-Likert, 1 = completely unimportant, 5 = very important) a total of 28 motivations were for their

habit of playing puzzle games. Descriptive statistics for the full 28-item inventory are reported in Table 1. The survey included questions about respondents' puzzle game feature preferences, favorite puzzle games, and their habits of playing other games besides puzzle games (video games, online casino games, esport games). The survey also included questions regarding participants' age, gender, expenditure of money on games and weekly play time.

Puzzle Gaming Motivation (N=1,513)		Mean	STD
1	I play games because I enjoy interacting with other players (R)	1.86	1.14
2	I play because also my friends play (R)	1.91	1.17
3	I play because I enjoy especially playing together (R)	2.09	1.24
4	I play because of the challenge (C)	3.75	1.14
5	I play to master my skills and to win myself (C)	3.03	1.31
6	I play to make progress and to achieve objectives (C)	3.18	1.31
7	I play because I want to identify with the game characters (I)	1.65	1.03
8	I play because game events bring about emotions (I)	1.90	1.11
9	I play because I want to be part of the gameworld and its events (I)	1.82	1.12
10	I play because playing games is relaxing (F)	3.75	1.05
11	I play because games are entertaining (F)	3.87	1.04
12	I play because games are enjoyable (F)	4.07	0.98
13	I play because in games I can make my own decisions (A)	2.59	1.32
14	I play because in games I can make a difference with my actions (A)	2.02	1.19
15	I play because in games I can make meaningful choices (A)	2.20	1.25
16	I play because I want to interact with in-game characters (I)	1.81	1.10
17	I play because I think that games are interesting (F)	3.60	1.12
18	I play to kill time	3.43	1.19
19	I play to avoid boredom	3.47	1.17
20	I play because it makes me forget real-life problems	2.72	1.32
21	I play because it releases stress	3.35	1.21
22	I play to train my brain	3.08	1.32
23	I play to keep my mind sharp	3.25	1.29
24	I play because of the lack of better options	2.00	1.11
25	I play to enhance my memory	2.89	1.32
26	I play but I am not sure if it is worth it	2.14	1.15
27	I play puzzle games because games make my worries more bearable	2.30	1.27
28	I play puzzle games because gaming reduces my negative feelings	2.58	1.29

Table 1. Descriptive statistics for the full 28-item motivations to play puzzle games scale. (R): Relatedness, (C): Competence, (I): Immersion, (F): Fun, and (A): Autonomy in the IMG Inventory of intrinsic motivations to play (<https://scholarspace.manoa.hawaii.edu/handle/10125/59686>).

The survey data was collected in cooperation with an international market research company to obtain a large sample of the populations from both UK and USA. The data was collected with a web-based survey tool, and it took about 12 minutes to take the whole survey with a computer, a tablet or a mobile phone. After collecting the data, we cleaned it by analyzing participants' response time and by removing cases that replied to the survey

too quickly. Furthermore, we cleaned the data from participants who showed content nonresponsivity by responding similarly to every question. As a result, the final sample included in the analysis consisted of 1,513 respondents (mean age 37.1, 36% male respondents, 63% female respondents, 1% other/did not specify).

Based on the results reported in Table 1, we can conclude that puzzle game players are both intrinsically and extrinsically motivated. The most important reasons to play are 12: “I play because games are enjoyable”, 11: “I play because games are entertaining”, 10: “I play because playing games is relaxing”. All of these survey items measure the intrinsic motivational factor of *fun*. In addition to these items, also extrinsic reasons such as 18: “I play to kill time”, 19: “I play to avoid boredom”, and 21: “I play because it releases stress” were regarded as important for puzzle game behavior. From the items developed to measure *competence* the item 4: “I play because of the challenge” was considered to be an important driver to play puzzle games.

Results

Exploratory Factor Analysis

An exploratory factor analysis (EFA) was conducted to investigate underlying latent structures of the puzzle game motivation scale (Table 1). The number of extracted factors was identified by using the Parallel Analysis and Velicer’s MAP test. To conduct a parallel analysis, we first ran an EFA on the data and then a parallel analysis (PA), which generated an artificial data set for identifying the correct number of factors. Both the PA test and the MAP test suggested that five factors were to be extracted, and therefore we proceeded to investigate five-factor solutions.

An exploratory factor analysis using principal axis factors and promax rotation was used with the data of 1,513 respondents to investigate the latent structures of players’ motivations to play puzzle games. We used promax rotation because it allows correlations between identified factors, and does not force them to be orthogonal to each other. Earlier research has shown that intrinsic motivations to play are related to each other, and this was why we chose promax rotation method although extrinsic motivations and intrinsic motivations are also arguable orthogonal to each other.

We used factor loadings of $>.40$ as the criterion to define whether an item loaded on a factor. Before we conducted the EFA, we excluded items 10–12 and 17 from the analysis. This was done, because all of these items measure *fun*, and our previous studies have revealed that these items do not have much explanatory power. Indeed, almost everyone thinks that he or she plays because it is fun yet everybody seems to understand ‘fun’ quite differently from each other. This condition means that including the items which measure *fun* makes the process of identifying player personas unnecessarily difficult and unstable.

In the first five factor solution, all of the items except item 26: “I play but I am not sure if it is worth it” and item 24: “I play because of the lack of better options” loaded on a factor. This was not too surprising since our model included a total of 12 items from the IMG scale which has already been validated in Japan, Canada, UK, and Finland. Factor loadings, descriptive scale sums, and Cronbach’s alphas are reported in Table 2.

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Puzzle motivation 1	0.7504				0.3886
Puzzle motivation 2	0.6538				0.5380

Puzzle motivation 3	0.6867				0.4531
Puzzle motivation 4		0.3084	0.4910		0.5243
Puzzle motivation 5		0.3116	0.4428		0.4662
Puzzle motivation 6			0.4719		0.5697
Puzzle motivation 7	0.8018				0.3593
Puzzle motivation 8	0.6453				0.4312
Puzzle motivation 9	0.7402				0.4095
Puzzle motivation 13	0.4126		0.4687		0.4449
Puzzle motivation 14	0.5968		0.3310		0.4037
Puzzle motivation 15	0.5992		0.3691		0.3894
Puzzle motivation 16	0.8080				0.3485
Puzzle motivation 18				0.7063	0.5234
Puzzle motivation 19				0.6833	0.4878
Puzzle motivation 20	0.7832				0.3711
Puzzle motivation 21	0.4751				0.5398
Puzzle motivation 22		0.8597			0.2587
Puzzle motivation 23		0.7984			0.2835
Puzzle motivation 24				0.3193	0.6680
Puzzle motivation 25		0.8073			0.2918
Puzzle motivation 26					0.8732
Puzzle motivation 27	0.8068				0.3310
Puzzle motivation 28	0.6890				0.3772
Mean	1.920	2.741	3.072	3.321	2.968
Std. Dev.	0.883	1.058	1.200	1.026	0.895
Alpha	0.913	0.850	0.902	0.754	0.668

Table 2. Factor loadings, mean sums, standard deviations and Cronbach' Alphas for the five factors of puzzle game motivation.

Next we utilized the Kaiser–Meyer–Olkin (KMO) test to measure sampling adequacy for conducting a factor analysis. The KMO value was very good (0.925). A total of 9 items loaded on the first factor. These items indicate that the player is motivated to play puzzle games, because she wants to experience relatedness to other players such as friends, online acquaintances, or family members. She also plays puzzle games because she wants to immerse herself in the gameworld and interact with its character, and because she wants to be autonomous, make her own choices and act freely. The nine items which loaded on the first factor combine three intrinsic motivations to play games: *relatedness*, *immersion*, and *autonomy*. Because this one factor bundles these elements together in a way which differs from earlier studies on intrinsic motivations, we label this factor *Gamer*. It would be misleading, however, to call this factor simply 'intrinsic motivation', because items which measure intrinsically motivating *competence* did not load on this factor. Hence, we call this factor *Gamer*, also because these motivations can be regarded to be uncommon for most of the puzzle game users.

Second factor consisted of four items. A player motivated by this factor plays puzzle games, because playing these games makes her worries feel more bearable, because playing puzzle games reduces negative feelings and stress, and because playing makes her forget about real-life problems. All of these four elements measure a player's will to avoid her everyday life and seek alternative experiences from games. Her everyday life is filled with bad experiences and negative emotions and puzzle games offer a temporary relief to this situation. In a word, she plays because she wants to *Escape* real-life and its problems. Gaming is not rewarding in itself, but because it makes you forget about the difficult issues of real life.

Three items loaded on the third factor. These items describe that a player plays puzzle games because she wants to enhance her memory, train her brain, and to keep her mind sharp. All of these items portray aspects of *Identified Regulation* in which a person is motivated to play because she feels that playing will result in beneficial impacts on her life. Again, this motivational factor does not denote intrinsically motivating behavior but instead reasons to engage with games because of their anticipated positive outcomes.

Four items loaded on Factor 4. These items describe that the person plays puzzle games because of the challenge, because she wants to master her skills and win herself, because she wants to achieve goals and make progress in the game, and because she can make her own decisions (a cross-loaded item with Factor 1). We call this factor *Challenge* and it this factor denotes to intrinsic motivation to play puzzle games, similarly to Factor 1: *Gamer*.

Finally, two items of "I play to kill time" and "I play to avoid boredom" loaded on the fifth factor. Both of these items, and also "I play because of the lack of better options" which showed a more low loading on this factor, describe *Amotivation* to play puzzle games. Although a factor should have at least three items to be properly identified, the two items which loaded on this factor showed high loading and they thus indicate that *Amotivation* is indeed a standalone reason to play puzzle games.

These results support partly the model of situated motivations by Guay et al. (2000) but there are also several important differences. The model by Guay et al. (2000) argued for four types of situated motivations: intrinsic motivations, identified regulation, external regulation, and amotivation. In our study, we found that there are five motivations to play puzzle games: three extrinsic motivations of *Escape*, *Identified Regulation* and *Amotivation*, and two intrinsic motivations of *Challenge* and *Gamer*, the latter of which combines autonomy, relatedness, and immersion. Furthermore, we found that items which portray *Escape* did not load on the *Gamer* factor which indicates that immersive experiences can be both intrinsically motivating (in *Gamer*) and extrinsically motivating (in *Escape*), depending on whether the player finds gaming to be inherently meaningful and rewarding or just a means to an end.

Cluster Analysis and Puzzle Personas

Next, we conducted a cluster analysis to investigate whether puzzle personas could be identified based on players' motivations to play. We computed z-standardized factor scores for each survey participant by using the 26-item puzzle motivations scale as reported in Table 2. This was followed by an analysis in which we identified which of the five factor was regarded as the most important motivation type for each survey participant. This resulted in five main puzzle player personas. As we can see from Table 3, all of the five personas were quite large: the smallest player cluster consisted of 231 survey participants, and the largest one of 358 participants. A total of 1,500 respondents were included in this analysis phase. Descriptive statistics of the background variables for each player type are presented in Table 3.

	Gamer Gary	Escapist Emily	Trainer Tracy	Challenger Chris	Casual Carol
N	358	231	328	264	319
zGamer	0.70	-0.25	-0.24	-0.20	-0.17
zEscapism	-0.04	0.63	-0.31	-0.12	-0.09
zRegulation	-0.15	-0.28	0.68	-0.01	-0.34
zCompetence	-0.19	-0.09	0.05	0.67	-0.27
zAmotivation	-0.31	0.00	-0.19	-0.33	0.86
Puzzle motivation average sum	3.13	2.87	2.62	2.74	2.40
Men	168	73	89	107	108
Women	190	158	239	157	209
Age	34.95	35.55	41.55	39.68	33.75
Puzzle Gaming, Weekly Play Hours	6.58	7.37	7.56	7.78	6.74
US\$ Spent on Puzzle Games Monthly	14.98	7.02	4.83	7.01	4.25
... of which with a computer	3.62	2.23	0.79	2.50	0.88
... of which with a console	4.20	2.03	2.04	2.20	1.94
... of which with a handheld	2.76	0.67	0.61	0.98	0.41
... of which on free-to-play mobile games	1.84	1.11	0.73	0.62	0.69
... of which on premium mobile games	2.57	0.98	0.66	0.71	0.34
Played Digital Game Genres					
Action genres (action, action-adventure, adventure, platform)	3.23	2.79	2.40	2.81	2.65
RPG genres (rpg, strategy, simulation)	3.24	2.99	2.61	3.06	2.87
Racing & Sports	2.57	1.84	1.89	1.91	1.81
King Puzzle	2.42	2.12	2.14	2.12	2.16
Building Puzzle	1.55	1.34	1.25	1.35	1.33
Graphic Adventure	1.49	1.34	1.14	1.28	1.15
Fantasy Puzzle	1.40	1.10	1.11	1.08	1.09
Color & Word Puzzle	1.49	1.29	1.39	1.30	1.25
Puzzle Game Average	1.67	1.44	1.41	1.43	1.40
Aggression	3.24	2.63	2.35	2.81	2.54
Caretaking	2.90	2.94	2.65	2.71	2.70
Coordinate	3.14	2.77	2.55	2.60	2.59
Exploration	3.77	3.74	3.40	3.78	3.54
Management	3.40	3.38	2.81	3.31	3.08
Physical Challenges	3.33	2.63	2.65	2.79	2.59
Cognitive Challenges	3.81	3.81	3.72	4.03	3.61
Solving Challenges	3.41	3.52	3.73	3.47	3.32
Emotional Challenges	3.45	3.14	2.80	3.19	2.79

Table 3. Means of standardized factor scores, factor sums and the background variables for the five main puzzle personas.

Cluster 1 (358 respondents, 23.6%) had the highest mean value for *Gamer* factor, and a very low value for *Amotivation*. This player cluster had 168 male and 190 participants, and since the whole data included only 36%

male and 63% female respondents, the Cluster 1 can be regarded to be more typical for male than female puzzle players. We therefore name this player type **Gamer Gary**. Gamer Gary is the second most young of the five personas. He spends less time in playing puzzle games, but he spends more than double the money on puzzle games on different gaming platforms than the other personas. Gamer Gary plays action video games, role-playing and strategy games and racing/sports games much more than the other personas. He also enjoys aggressive gameplay elements and physical and emotional challenges more than the other player types. Shortly put, his identity of being a video game player hobbyist, i.e., a gamer is clear.

It is important to note that this persona spends more money also on puzzle games although he does not play these games very much. This is perhaps because Gamer Gary is used to put money on games and this effect may thus transfer to also F2P mobile puzzle games. We can also note now that being motivated to play puzzle games predicts strongly how much money is used in puzzle games, and that this effect is strongest with *Gamer* motivation regardless of whether we are talking about computer puzzle games, F2P mobile puzzle games, or anything in-between.

Cluster 2 (231 respondents, 15.3%) reported that playing puzzle games because these games provide experiences of *Escapism* was the most important reason for their play habit. These players reported relatively low scores for *Gamer* and *Identified Regulation* motivation types, but still second most high puzzle motivation average mean sum. They also used second most money on puzzle games after Gamer Gary. This cluster included more female than male players, and thus we call this persona **Emily Escapist**.

Cluster 3 (328 respondents, 21.7%) considers that *Identified Regulation* is the main reason for their puzzle game play. This player persona showed low scores for both *Gamer* and *Escapist* motivation types. These players had the highest mean age (41.6) and lowest share of male participants (89/239). Players of this cluster reported to spend under \$5 on puzzle games monthly, and they also reported to play less action video games and rpg/strategy games than the other player personas. Similarly to all other personas, also players of this cluster reported to play King Puzzle games over other popular puzzle games. Of the all five personas, players of this cluster showed the highest preference in challenges of solving different types of puzzles (word puzzles, memorizing puzzles, mazes, and riddles). Since these participants reported to play mostly because of *Identified Regulation*, we call this puzzle persona **Trainer Tracy**.

Cluster 4 (264 respondents, 17.5%) plays puzzle games mostly because of *Challenge*. When we consider that our sample consisted mostly of female puzzle game players, we can argue that this cluster is more typical for male players than for female players. We call this player persona **Chris Challenger**. This player persona also reported to play video games the second most after *Gamer Gary*. This player persona uses the most time in playing puzzle games of the five clusters, and also the second most money on puzzle games. These players also reported the highest preference of the personas on cognitive challenges (logical problem-solving, in-depth understanding, thinking out-of-the-box etc).

Finally, Cluster 5 (319 respondents, 21.1%) reported to play mainly because of boredom and to kill time, that is, for *Amotivation*. These players had the lowest mean age of the five personas, and they reported to spend least money of the puzzle games monthly. We call this player persona **Casual Carol**, because she does play only occasionally without intrinsic motivation to play, and by spending only little money.

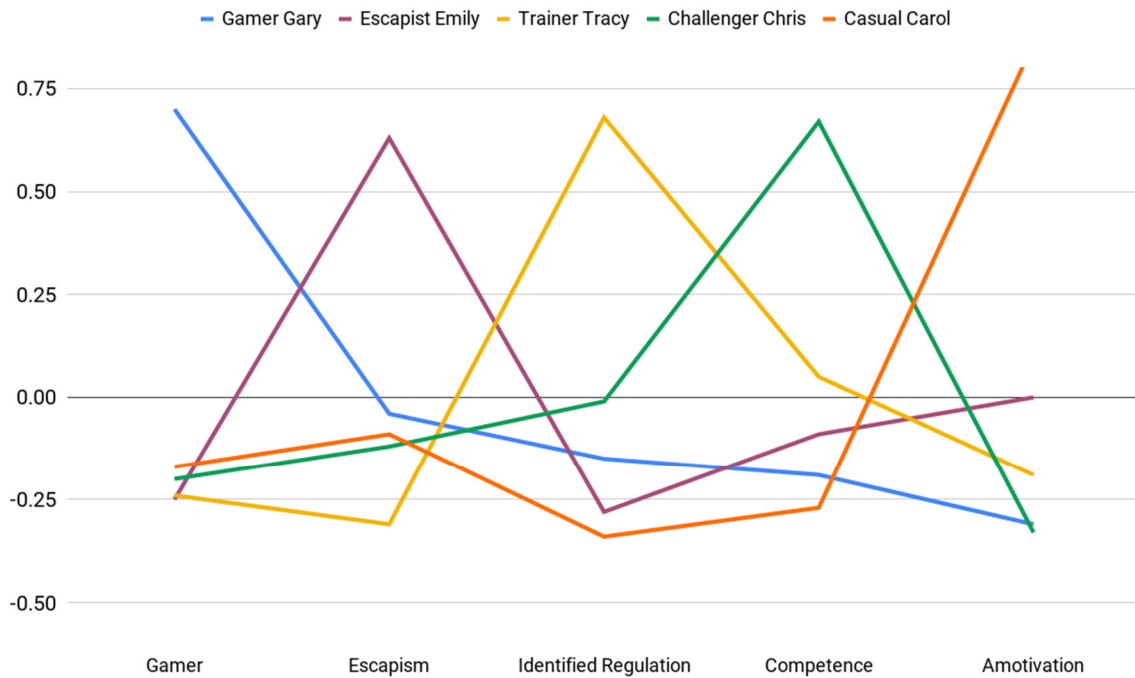


Figure 1. Motivation to play puzzle games (Mean Factor Scores) separately for the five player personas.

	Gamer Gary	Escapist Emily	Trainer Tracy	Challenger Chris	Casual Carol
N	358	231	328	264	319
Big Five Personality Traits					
Neuroticism	3.04	3.71	2.89	2.91	3.22
Extraversion	2.97	2.60	3.05	2.81	2.79
Openness	3.77	3.76	3.78	3.84	3.50
Agreeableness	3.74	3.65	3.92	3.82	3.69
Conscientiousness	3.73	3.51	3.99	3.98	3.64
Puzzle game features					
Leaderboards	3.19	2.62	2.76	2.80	2.62
Good and mood-appropriate music	3.56	3.32	2.96	3.14	2.94
Cartoonish style	3.05	2.92	2.44	2.71	2.68
Artistic style	3.59	3.54	3.32	3.51	3.11
Anime / manga style	2.83	2.37	2.02	2.19	1.99
Realistic and believable style	3.32	2.99	3.03	2.79	2.73
Impressive and authentic physics	3.46	3.22	3.11	3.14	2.87
Missions or quests	3.73	3.64	3.44	3.89	3.48
Interesting theme	3.90	4.01	3.85	4.25	3.82
Mini-games	3.41	3.23	3.13	3.21	3.01

Tournaments	3.25	2.58	2.53	2.60	2.57
Arenas	3.03	2.23	2.16	2.20	2.16
Hidden objects	3.48	3.17	2.99	3.17	2.81
Fascinating story	3.68	3.25	3.04	3.25	2.97
Point-and-click style	3.29	3.03	2.97	3.03	2.79
Retro or pixel graphics	3.09	2.58	2.57	2.58	2.52
Humor	3.49	3.30	3.10	3.30	3.13
Favorite themes & settings					
Historical	3.31	3.13	2.97	3.20	2.84
Conspiracy	3.29	3.01	2.76	3.02	2.80
Crime	3.46	3.14	2.96	3.20	2.90
Post-apocalyptic/dystopic	3.38	3.09	2.72	3.18	2.90
Dark/Gothic	3.10	2.90	2.50	2.91	2.65
Drama	3.27	3.32	2.92	3.05	2.91
Fantasy	3.59	3.67	3.12	3.64	3.39
Horror	3.05	2.62	2.41	2.43	2.45
Military/War	3.10	2.43	2.32	2.38	2.42
Mystery	3.72	3.65	3.43	3.71	3.40
Medieval	3.20	3.09	2.64	3.20	2.73
Sci-fi	3.52	3.27	2.86	3.54	3.14
Space	3.44	3.17	2.95	3.31	3.02
Anime	2.76	2.54	2.14	2.31	2.19
Western	3.08	2.58	2.38	2.57	2.45
Artistic	3.44	3.42	3.19	3.56	3.07
Retro	3.34	3.50	3.22	3.34	3.19
Realistic	3.76	3.57	3.53	3.54	3.51

Table 4. Means of Big Five factor sums, puzzle game feature sums, and favorite theme & setting sums for each of the five puzzle personas.

From Table 4 we can note that puzzle personas differ from each other according to some of the five personality traits. Escapist Emily showed much higher score on *Neuroticism* and lower on *Extraversion* than the other four personas. Casual Carol had lower score for *Openness* than the others, and Trainer Tracy and Challenger Chris had a high score for *Conscientiousness*.

Shortly put, *Conscientiousness* measures to what extent a person is dutiful, reliable and organized. *Neuroticism* is the degree to which a person is anxious and irritable. *Extraversion* measures one's tendency of being talkative, active, and assertive. *Agreeableness* deals with subjects such as kindness, generosity, and gentleness. And *Openness* is about being creative, imaginative, and introspective. The 15-item Big Five results (BFI-15) should be considered in relation to what is known about the factor sum levels across countries in general. According to Schmitt et al. (2007), typical levels for the Big Five factors in North America (NA) and Western Europe (WE) are: *Extraversion* (NA: 3.40; WE: 3.35), *Agreeableness* (NA: 3.75; WE: 3.55), *Conscientiousness* (NA: 3.60; WE: 3.35), *Neuroticism* (NA: 2.9; WE: 2.95) and *Openness* (NA: 3.7; WE: 3.70). When these values are compared with the results of our study, we can note that *Openness*, *Conscientiousness*, and *Agreeableness* are quite similar to the average factor sums of the region. In contrast to this, *Extraversion* sums

are notably lower and *Neuroticism* is radically higher for Escapist Emily than for the average resident of their region.

These results differ also from online slots personality traits: While online slots players are not dutiful and organized, and also not very anxious or irritable persons, puzzle players are quite dutiful and organized (*Conscientiousness*), kind and generous (*Agreeableness*), and creative (*Openness*) – but not talkative or active (*Extraversion*) and in the case of Escapist Emily, also anxious and irritable.

From the list of puzzle game feature preferences we may observe that Gamer Gary, who prefers puzzles to be more similar to video games and also spends the most money on puzzles, enjoys e.g. leaderboards, mini-games, tournaments, and arenas much more than the other personas. He also likes fictive qualities such as story, anime style, and game music more than the others. Challenger Chris shows the highest preferences for missions and quests which is not surprising, since challenges are often mission-based.

From the list of recurrent themes and fictive settings we can furthermore see that Escapist Emily enjoys fantasy, drama, and retro-style more than the others. Gamer Gary has the highest scores for several themes and settings, but Challenger Gary enjoys artistic style a bit more than the others. Overall, realism, mystery, and retro style was enjoyed by all of the five player personas.

Finally, we continued to make a more fine-tuned player persona segmentation by conducting Kmeans clustering for each of the five identified puzzle personas. We predefined that each of the five clusters were to be divided into two groups to further investigate possible latent sub-groups within each persona. The main results are reported in Table 5.

	Gamer Gary		Escapist Emily	
	True Gamer	Easy Gamer	Easy Escapist	True Escapist
	130	232	150	88
zGamer	0.75	0.70	-0.10	-0.51
zEscapism	-0.07	0.00	0.63	0.62
zRegulation	-0.15	-0.21	-0.52	0.12
zCompetence	0.06	-0.48	-0.13	-0.04
zAmotivation	-0.60	-0.01	0.11	-0.18
Puzzle motivation average	2.86	3.09	2.80	3.00
Men	70	102	54	26
Women	60	130	96	62
Age	36.53	34.06	33.83	38.50
Puzzle Gaming, Weekly Play	5.88	6.61	6.99	8.03
Monthly Money Total	11.76	15.16	7.31	6.49
Computer	3.33	3.47	2.37	1.98
Console	3.06	4.29	1.89	2.29
Handheld	1.86	2.82	0.64	0.73
Free-to-Play Mobile Games	1.18	1.98	1.13	1.07
Premium Games	2.33	2.59	1.28	0.43
Action genres	3.20	3.15	2.79	2.80

RPG genres	3.17	3.19	3.07	2.86
Racing & Sports	2.41	2.56	1.83	1.85
King Puzzle	2.17	2.55	2.18	2.01
Building Puzzle	1.39	1.62	1.32	1.39
Graphic Adventure	1.38	1.54	1.34	1.36
Fantasy Puzzle	1.24	1.47	1.10	1.09
Color & Word Puzzle	1.29	1.57	1.32	1.23

	Trainer Tracy		Challenger Chris		Casual Carol	
	Easy Trainer	True Trainer	True Challenger	Easy Challenger	Easy Casual	True Casual
	181	149	151	113	189	130
zGamer	-0.34	-0.11	-0.28	-0.10	0.01	-0.42
zEscapism	-0.32	-0.29	-0.18	-0.05	0.06	-0.31
zRegulation	0.65	0.71	0.28	-0.40	-0.60	0.04
zCompetence	-0.09	0.23	0.66	0.69	-0.31	-0.20
zAmotivation	0.10	-0.54	-0.48	-0.13	0.84	0.88
Puzzle motivation average	2.66	2.56	2.86	2.59	2.31	2.53
Men	40	51	62	45	67	43
Women	141	98	89	68	122	87
Age	40.47	42.87	40.84	38.13	33.73	33.77
Puzzle Gaming/ Weekly Play	7.77	7.30	7.98	7.50	6.59	6.96
Monthly Money Total	4.70	4.98	8.22	5.40	3.59	5.21
Computer	0.64	0.98	3.09	1.71	0.93	0.80
Console	2.03	2.05	2.79	1.41	1.50	2.57
Handheld	0.66	0.55	0.91	1.06	0.19	0.73
Free-to-Play Mobile Games	0.80	0.63	0.53	0.74	0.73	0.64
Premium Games	0.57	0.76	0.90	0.46	0.24	0.48
Action genres	2.47	2.31	2.89	2.69	2.68	2.60
RPG genres	2.68	2.51	3.06	3.05	2.96	2.73
Racing & Sports	1.89	1.90	1.99	1.79	1.75	1.89
King Puzzle	2.22	2.04	2.23	1.98	2.07	2.29
Building Puzzle	1.27	1.23	1.34	1.37	1.32	1.34
Graphic Adventure	1.12	1.15	1.30	1.25	1.14	1.16
Fantasy Puzzle	1.12	1.11	1.11	1.06	1.07	1.11
Color & Word Puzzle	1.43	1.34	1.37	1.20	1.26	1.22

Table 5. The five main puzzle personas as divided into a total of ten sub-clusters by utilizing Kmeans clustering procedure.