Can video games be an innovative tool to assess personality traits of the Millennial generation? An exploratory research

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♟ ABSTRACT. Lo scopo della presente ricerca è quello di esplorare l'esistenza di una possibile relazione tra l'utilizzo dei videogiochi su dispositivi mobili (utilizzo dei videogiochi, frequenza di gioco e preferenze riportate rispetto alle diverse categorie e meccaniche di gioco) e i tratti di personalità, utilizzando il modello dei Big Five. I dati sono stati raccolti su un campione di 981 soggetti omogenei per genere e con un'età media di 23 anni; i risultati mostrano correlazioni positive e potrebbero gettare le basi per un utilizzo innovativo dei videogiochi come strumenti di selezione e valutazione delle risorse umane nelle organizzazioni.

♟ *SUMMARY. The main purpose of this paper is to explore the possible relationship between video games' use on mobile devices and personality traits. Play's developmental impact on learning has been long established, but little has been said about the possible different utilization of games, e.g. as a tool for skills, performance and personality traits assessment in HR and recruitment context. The research questions aimed to verify existing connections between one of the most well–known personality theory (Big Five model), video game utilization (gamers vs. non–gamers), gaming frequency (casual vs. hardcore gamers) and reported preferences to different video games categories and mechanics. Data from 981 subjects was analyzed by descriptive statistics, t–test, Effect Size and correlation analysis. Results showed that gamers differ from non–gamers on Neuroticism and its relative sub–dimension, Impulse and Emotion control; casual gamers (who play monthly or weekly) tend to prefer routine tasks, while hardcore gamers (who play every day or more than once in a day) tend to like unusual ideas, adventure and creative tasks. Players of Role Playing games seems to be more scrupulous and more open, in particular to experience, than those who do not play with games of this category. Players of Puzzle category seem to be more cooperative, friendly, scrupulous and perseverant than those who do not play to this game category, as well as logical, rational, and capable of impulse control. Simulation and strategy category share significant results in Openness to culture dimension. No statistically significant results were found for Action and Adventure categories. Correlations found between BFA dimensions and game mechanics could allow to imagine a new video games' taxonomy that transcend both academic and industrial definitions toward a nomenclature substantiated on psychological basis. This kind of redefinition could help to lay the groundwork to use video games as an assessment tool in personnel selection and evaluation.*

INTRODUCTION

In recent years, due to the widespread availability of affordable video games on desktop, laptop computers and smartphones, is common experience to see children and adults, boys and girls, spending their spare time playing to the latest immersive game app, challenging themselves or their friends online. Why are videogames and mobile gaming applications so popular? How do they manage to engage people? What mechanisms underlie their success? In a psychological research perspective, given their wide dissemination, can they be used as a tool for learning and personality traits assessment?

Over the past century, a considerable amount of literature has been published on gaming and its developmental impact on learning, especially in early childhood. Traditionally, it has been argued that play is a complex and very important activity in evolutionary term, that helps preparing for adult life (Bateson & Bateson, 1987; Callois, 1981; Groos, 1898, Huizinga, 1939). Several studies have reported gaming pivotal role as a mean through which children can develop their physical, emotional, social and moral capacities; moreover, they can learn in a controlled environment, where risks related to rules infringement are minimized and where is possible to test different behaviors and problem solving (Bruner, Jolly & Sylva, 1981; Piaget, 1959; Winnicott, 1974).

Despite its great importance in growth and human evolution, play manifests itself primarily as a spontaneous activity: it acts as a perfect medium that allows the expression of children's natural curiosity and their motivation to explore the world. Researchers agree that play provides a state of mind that is uniquely suited for high–level reasoning, problem solving and creative and imaginative acting: through play, children actively make sense of the world around them, building critical basic skills for cognitive and relational achievement that includes verbalization, language comprehension, vocabulary, imagination, questioning, problem solving, observation, empathy, co–operation skills, and taking the perspective of others. According to Gray (2008), play can be defined as a confluence of several characteristics that can be narrowed down to the following five: (*a*) play is self–chosen and self–directed; (*b*) is an activity in which means are more valued than results; (*c*) it has a structure, or rules, which are not dictated by physical necessity but emanate from players' mind; (*d*) is imaginative, non–literal, in some way mentally removed from "real" or "serious" life;

(*e*) involves an active, alert, but non–stressed frame of mind. As highlighted by the author, play can be considered, first and foremost, an expression of freedom: players not only choose to play, but they also direct their own actions during play. Play always involves some sort of rules, but all players must freely accept them and, in case of their modification, then all players must agree to this change: that is why playing is one of the most democratic activities. Regarding players' age, Gray emphasizes that what is true for children is also true for adults' sense of play: research studies have shown that adults who have a great deal of freedom about how and when to do their work, often experience work as a game, even (in fact, especially) in case of difficult tasks; in contrast, people who work in an environment where they must do just what others tell them to do, rarely experience this kind of feeling.

However, in business organizational environment, this view is seldom supported: modern society tends to dismiss play for adults, because it is perceived as unproductive, petty or even a "guilty pleasure", and if it does, the only kind of honored play is a competitive one. The belief that seems to underlie here is that reaching adulthood only means acting serious: between personal and professional responsibilities, there seems to be no time to play. But, as suggested by Eberle (2014), adults don't lose the need for novelty and pleasure as they grow up: play continues to be interactive, satisfying, highly involving, vital for problem solving, creativity and relationship; moreover, adults do not cease to learn just because they finished their schooling time.

For these reasons, over the past decades, there has been an increasing interest in using playful tools in business and organizational contexts to achieve "continuous learning", which refers to the ability to continually develop and improve skills and knowledge to perform effectively and adapt to changes in the workplace. Experience, involvement, and attribution of meaning can be seen as key factors in continuous learning, and in the learning process in general (Kolb, 1984; Lewin, 1951). In addition, recent evidence suggest that learning is most effective when it is active, problem–based, experiential, and providing immediate feedback (Connolly, Boyle, MacArthur, Hainey & Boyle, 2012): serious games and business games seem to fully meet this need because, through simulation and direct involvement, are able to convey a message, teach a lesson, provide experience; therefore, they can be used in managerial contexts to promote forms of individual and organizational learning, training soft skills and supporting collaboration, motivation and teamwork

abilities. Interactivity, high involvement, and the possibility to have instant feedback are central aspects of videogames too: these characteristics give them great opportunities to succeed as a means of communication and learning in very different types of environments.

Nowadays, when talking about games, it is impossible to ignore video games' topic: a video game can be defined as an electronic game that involves human interaction with a user interface generating visual feedback on a video device (i.e. TV screen or computer monitor, but in the 2000s, any display device that can produce two– or three–dimensional images). The electronic systems used to play video games are known as platforms, that can range from large mainframe computers to small handheld computing devices, like smartphones; the input device used for playing, the game controller, varies across platforms and include gamepads, joysticks, mouses, keyboards, touchscreens of mobile devices and buttons. Players typically view the game on a video screen and game sounds from loudspeakers are often provided; touchscreen's introduction on smartphones has allowed to include haptic, vibration–creating effects, force feedback peripherals and virtual reality headsets, which brought players to a more immersive game experience.

Due to their constant innovation and transformation in graphics quality, artificial intelligence, avatar representation, and story line, video games' classification can result as a difficult task to manage. According to Zammitto (2010), grouping games by genre do provide a quite efficient framework toward a clear classification but there have been many different approaches, both from academia and game industry, trying to reach an agreement on vocabulary and definitions that has yet not been achieved. On one hand, the academic perspective leans toward building up a common vocabulary to discuss video games, but does not offer a suitable approach for generalization without falling too short or employing too much overlapping; on the other hand, the industrial perspective offers multiple classification, but does not define which game types should be included in a specific genre, and does not seem to be completely agnostic from companies' interest.

Given this scenario, Rolling and Adams' work (2003) stands out as a thorough and systematic analysis for game genres that allows a consistent interpretation of games for classification: they identified ten game genres (action, strategy, role–playing, sports, vehicle simulation, construction and management simulation, adventure, artificial life, puzzle and

games for girls) and recognized that there are some games that fall within more than one genre. Moreover, they introduced the concept of "key elements of games" to indicate that games are composed by certain elements (equivalent to the concept of "atoms", the smallest parts that games can have) which are: 1) rules, 2) types of challenges to overcome, 3) victory conditions, 4) world settings, 5) level of abstraction–realism, 6) interaction mode, 7) player roles, 8) structures and 9) narrative. In their theorization, game's genres are clusters of a particular array of elements: this perspective made possible to describe the relation between games genres and game elements, allowing an identification of the core aspects that make games cohesive as an instrument to play.

Using this work as a starting point, Zammitto (2010) revised their genres' categorization and then created and validated a gaming preference questionnaire, with a series of implications in games' designing that are out of the purpose of this paper: in this study, Zammitto's gaming preference questionnaire was took as a fundamental reference questionnaire to develop a game mechanics instrument for data collection, to investigate the possible relation between gaming preferences, game mechanics and personality traits.

A list of game's genres for the Italian context is shown in Table 1.

In 2010, the video game industry increased its commercial importance, with growth driven particularly by emerging Asian markets and mobile games. In 2015, video games generated sales of USD 74 billion annually worldwide: with regards to the Italian context, AESVI (the association that represents video game industry in Italy) stated that video games' market ended 2015 with a turnover of nearly EUR 1 billion and a growth trend of 6.9% compared to 2014. In 2015, there are more than 25 million video gamers in Italy (49.7% of Italian population aging more than 14), equally distributed by gender. The distribution by age groups shows a widespread of gamers up to 54 years, with a significant concentration in the 14–24 age range (19.2% of gamers, compared to 12.4% of the Italian population), in the 25–34 age range (18.1% of gamers, compared to 13.3% of the Italian population) and in 35–44 age range (24.3% of gamers, compared to 17.7% of the Italian population). Deeper analysis of socio–demographic variables delineated a gamer profile with a medium–high level of education (49.8% of gamers are holding a high school diploma or a degree, 7.7% more than the national average). Life goals declared by gamers also outline a balance between professional and family needs (achievement of success

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Table 1 – Comparison between Rolling and Adams' genres, Zammitto's Gaming Preference Questionnaire genres and list of game's genres for Italian context

Rolling and Adam's genres		Zammitto's Gaming Preference Questionnaire genres		List of game's genres for Italian Context
Action	Shooting	Action	Shooting	Action
	No shooting		No shooting	
			Fighting	
Strategy	Turn based	Strategy	Turn based	Strategy
	Real Time		Real time	
Role playing		Role playing		Role playing
Sports		Sports		(none)
Vehicle simulation		Simulations	Vehicle	Simulation
Construction & management simulation			Construction	
Artificial Life			Artificial Intelligence	
Adventure		Adventure		Adventure
Puzzle		Puzzle		Puzzle
Games for Girls		(none)		(none)

in the profession and/or in the study, obtaining a secure job and a decent salary, and/or have children) and play or entertainment needs (fun and pleasures of life, holidays and sports). The wide diffusion of devices, the development of mobile network's infrastructure, and the most assiduous use of technology by the Italian consumers, led gaming operators to increase their investment in applications and mobile sites in the last two years, contributing to develop more complex, immersive, engaging and challenging mobile games.

We usually consider video games as a mere upgrade of traditional analog games but, as explained by Johnson (2005), video games demand far more from a player than traditional games: the process of learning boundaries, goals, and control of a video game is often highly challenging, and calls on many different areas of cognitive function, as well as a great amount of patience and focus from the player. This means that, contrary to the popular perception that games provide instant gratification, video games delay gratification far longer

than other forms of entertainment: moreover, some research suggests that video games may even increase players' attention capacities, in addition to increase hand–eye coordination and visual–motor skills, sensitivity to information in the peripheral vision and the ability to count briefly presented object (Green & Bavelier, 2003). Learning principles found in video games have been identified as possible techniques with which seems possible to reform education system: Gee (2003; 2007) noticed that gamers adopt an attitude that is of such high concentration, they do not realize they are learning; it seems that, while playing video games, they "learn by doing" and this seems to also foster creative thinking (Glazer, 2006).

Findings from these studies suggest that play games and video games is closely connected with learning, but there is little published data on how games and videogames can be used as assessing tool to evaluate skills, performances and personality traits.

As stated by Zammitto (2010), most of the work on the

relationship between personality and video games has been focused on susceptibility to aggression and violence, while a considerably smaller number of studies explored personality aspects to better understand gamers and their preferences. Personality is defined as the organized totality that makes a person unique: this combination of traits, needs and motivations influences the way of behaving, thinking and approaching internal and external situations.

One of the most well–known factor theories is the Five Factor Model developed by Costa & McCrae in 1992. The model, one of the most used in work assessment context, defines personality as a combination of attitudes, motivations, interpersonal skills, emotional and experiential styles. This combination is composed of five factors: Openness, Conscientiousness, Extraversion, Agreeableness and Neuroticism. These factors are continuous variables and one's personality can be described as the likeliness that those trends will appear. Tools developed following this model, like NEO–PI–3 and NEO–FFI–3 (Costa & McCrae, 2010) and BFQ–2 (Caprara, Barbaranelli, Borgogni & Vecchione, 2007), are widely used in recruitment and assessment contexts. As the current organizational context is characterized by a frame of increasing complexity, involving continuous changes and facing the unexpected, is necessary to find new ways of working that require the development of several abilities (as symbolization, anticipation, self–regulation, cognitive flexibility, criticism, synthesis skills to distinguish important information from the continuous flow, creativity, and innovation); for this reason, is no longer enough just to analyze the job, the task, the knowledge and techniques owned by a person: personality, defined as a dimension that persists over time, is increasingly a privileged place of analysis to study, though evaluation plans, the ongoing expertise, dispositions and traits which, in a certain context, allow workers to express themselves competently.

To imagine games and videogames as an assessment tool for skills, performance and personality traits could allow researchers and HR manager to get in touch with the Millennials, which includes individuals who are the current new generation of workers or are next to enter the work market and present personality traits that seem to be fully satisfied through videogames. Millennials are a demographic cohort between Generation X and Generation Z: the name was coined by Strauss & Howe to refer to those born in a range from the early 1980s to the early 2000s. Regarding their personality traits, Millennials are represented as civic–minded, with a strong sense of community (both local and global) (Strauss & Howe, 2000); as confident and tolerant, but also as narcissistic and with a sense of entitlement (Twenge, 2006); as "trophy kids", a term that reflects a trend in competitive sports where mere participation is frequently enough for a reward (Alsop, 2008); as constantly looking for versatility, flexibility and innovation in the workplace (Kunreuther, Kim & Rodriguez, 2008); as optimistic, engaged and team players (Furlong, 2012). Given this brief yet complex description, it should be unsurprising to acknowledge the significant and steady increase of videogame players all over the world, including Italian context: videogames characteristics of engagement, versatility, innovation, competition and instant feedback (but, as reported above, not instant gratification) seem to combine very well with all that Millennials are searching for in real life.

Zammitto (2010) suggested that people who has determined personality traits would prefer certain type of videogames: the aim of her investigation was to contribute to demographic game design by identifying gamers' personality profile to better satisfy their needs and enjoyment.

The aim of this paper is to explore the possible existing relationship between video game utilization and personality traits and to understand the possible video games utilization as an innovative, interactive, and effective assessing tool for HR and personnel selection context.

Given the lack of data about video games utilization in assessment activities, the research questions that led our efforts were three:

- Is there a relationship between one of the most well–known personality theory (Big Five factor model), video game utilization and gaming frequency?
- Is there a relationship between Big Five factor model and reported preferences to different video games genres' categories?
- Is there a relation between the Big Five factor model and game mechanics?

METHOD

Participants

981 subjects participated to this study. The average age was 23 ($SD = 6$); minimum age is 18 and maximum age is 61. Participants' gender distribution shows that 60% of subjects

were female; 58% of the participants were gamers (571 out of 981); within the group of gamers, 62% self–denominated as casual gamers, while 38% self–denominated as hardcore gamers. To better explain this division in two subgroups, is important to underline that there were no "casual" or "hardcore" definitions given to participants: they were asked about the frequency of their gaming sessions (monthly, weekly, daily, several times a day); those who answered "monthly" or "weekly" were categorized as casual (low frequency of gaming sessions), while those who answered "daily" and "several times a day" were categorized as hardcore (high frequency of gaming sessions).

Procedure

The research method used for this study was survey. Subjects recruited for the research were voluntary participants to informative and selective activities promoted within a job fair, where people can meet and get in contact with business companies, gather information about them, submit their CVs and be interviewed by HR managers to access any open positions in their business company. Each business company has its stand and participants can freely move around to interact and access to several proposed services. The organization staff of the job fair gave to the authors of this paper an independent stand to conduct the survey, to explain participants the aim of the research, to give them space and time to complete all the instruments and to ask for further information if they needed to.

As an incentive to participation, those who entered the research sample were also informed about the opportunity to receive an individualized report of the Barbaranelli, Caprara & Steca's (2002) Big Five Adjective (BFA) questionnaire, to be added to their résumés; this opportunity could be pursued by leaving their e–mail contact in the demographical questionnaire: since the main goal of attending the job fair was to be selected by featured companies and get a chance to find a job, this possibility has been very favorably welcomed by participants to the research. In fact, in this way, they had the chance to expand their self–awareness and make their CVs more complete and captivating. We are aware that giving this kind of opportunity to candidates could have influenced their participation in the study. Nevertheless, our research aims to build a shared culture with respect to the awareness of their abilities, skills and potential in the workplace. A high level of awareness of their current capabilities and potential could enable people not only to have a higher success rate during job interviews and assessments, but also to reach those work positions that allow them to experience a high level of organizational well–being. Job fairs represent in the Italian context a real chance for personnel assessment and selection, with candidates competing for open positions in companies: for this reason, we used regulatory tables for selection and evaluation context for scoring BFA's data.

The time required to complete the entire battery of tests was about 20 minutes.

Measures

Participants were invited to complete three self–administered instruments during a single session: demographic questionnaire; a list of game mechanics, inspired by the "Gaming preference questionnaire" (Zammitto, 2010); BFA personality test (Barbaranelli et al., 2002).

Demographic questionnaire

The first questionnaire collected data on demographic variables (e–mail contact, age, gender, geographic location) and gathered information on gaming habits, such as gaming utilization (that allowed the distinction between gamers and non–gamers), gamer self–denomination (as seen above, this allowed the categorization between casual *vs* hardcore gamers), self–reported preference to different categories of games, and favorite game titles.

Game mechanics checklist

The second instrument consist of a list of game mechanics, designed with the aim to be as comprehensive as possible. To do so, Zammitto's (2010) "Gaming preference questionnaire" was considered, since it represents the most recent and updated thorough list of game elements which assesses whether players enjoy such game characteristics. This tool was not considered as a scientific questionnaire with defined psychometric properties, but as a checklist of game mechanics, to be analyzed individually. The final list of mechanics consists in 50 items (e.g., "I prefer

games where I can shoot"; "I prefer to control one avatar at the time"), answers ranging on a 4 point Likert scale (1 = Strongly agree, 2 = Quite agree, 3 = Quite disagree, 4 = Strongly disagree).

Big Five Adjectives Personality Test

The third part of the survey was BFA personality test (Big Five Adjectives; Barbaranelli et al., 2002). This inventory was created within the Big Five Factor theory framework, to assess people's personality; results yield their scoring in *Neuroticism*, *Extraversion*, *Openness*, *Agreeableness* and *Conscientiousness*. For the Italian adaptation, authors defined ten sub–dimensions, two for each dimension: *Dynamism* and *Dominance* for *Extraversion* dimension; *Cooperativeness* and *Friendliness* for *Agreeableness* dimension; *Scrupulousness* and *Perseverance* for *Conscientiousness* dimension; *Emotion Control* and *Impulse Control* for *Neuroticism* dimension; *Openness to culture* and *Openness to experience* for *Openness* dimension.

In this study, an adjective–based inventory had been used for different reasons: (*a*) the set of possible descriptors is finished, being represented by all the adjectives contained in the vocabulary; (*b*) adjectives are related directly to the behavior through the lexical hypothesis; (*c*) adjectives are an easy and rapid assessment method (a list of adjectives can be easily completed in 10–15 minutes); (*d*) adjectives allow a personality assessment not anchored to a specific situation or a specific behavior, for this can be used in very differentiated situations (from a self–assessment led by the respondent to an *assessment center* finalized to obtain ratings provided by judges).

Data analysis

Descriptive, *t–test,* Effect Size and correlation analysis were conducted using SPSS statistical software (ver. 20). For each variable, skewness and kurtosis was analyzed, with values ranging from −1 to +1. Effect Size (ES) is a name given to a family of indices that measure the magnitude of the difference between two means. Unlike significance tests, these indices are independent of sample size: therefore, we have chosen to implement this kind of data analysis. In this study, we chose to use Cohen's among the possible ES' index and refer to Cohen's

benchmarks to interpret resulting data (Cohen's $d>|.20|$ small effect size; Cohen's $d>|.50|$ medium effect size; Cohen's $d>|.80|$ big effect size; Cohen's $d>|1|$ huge effect size).

RESULTS

Relationship between BFA dimensions, video game utilization and gaming frequency

As the first research question aimed to investigate the relationship between BFA dimensions, video game utilization, and gaming frequency, t–tests were run to find significant differences between non–gamers and gamers and, within these last ones, significant differences between casual and hardcore gamers in personality traits following BFA dimensions. Results are shown in Table 2.

Comparing non–gamers (N = 571) with gamers (N = 410), data analysis show significant differences between the two subgroups for the sub–dimension of *Agreeableness*, *Friendliness* (gamers: *M* = 40.6, *SD* = 13.2; non–gamers: *M* = 34.6, *SD* = 15.3; *t* = 1.08, *p*<.05) and the dimension of *Neuroticism* (gamers: *M* = 39.5, *SD* = 10.9; non–gamers: *M* = 27.7, S*D* = 7.9; *t* = 2.63, *p*<.01), with its relative sub–dimensions of *Emotional control* (gamers: *M* = 38, *SD* = 11.6; non–gamers: *M* = 29.6, *SD* = 10.2; *t* = 1.74, *p*<.05) and *Impulse Control* (gamers: *M* = 44, *SD* = 11.9; non–gamers: *M* = 32.6, *SD* = 6.9; *t* = 2.32, *p*<.05). To figure out how gamers and non–gamers differ on Big Five factors, Effect Size analysis, using Cohen's *d*, was run: data show a small effect size difference (Cohen's *d* = −.41) on *Friendliness* sub–dimension; a huge effect size is reported on *Neuroticism* (Cohen's *d* = −1.23) and its sub–dimension of *Impulse Control* (Cohen's *d* = −1.17), while a medium effect size can be noted on *Emotion Control* sub–dimension (Cohen's *d* = −.77). These data suggest a substantial difference between gamers and non–gamers for this factor and its relative sub–dimension.

Regarding gaming session's frequency, casual (N = 608) and hardcore (N = 373) gamers differ for the sub–dimension of *Extroversion*, *Dynamism* (casual: *M* = 38.4, *SD* = 12.4; hardcore: *M* = 35.5, *SD* = 13.1; *t* = 1.80, *p* = .05), for the sub–dimension of *Conscientiousness*, *Perseverance* (casual: *M* = 45.4, *SD* = 13.2; hardcore: *M* = 34, *SD* = 14.5; *t* = 1.76, *p*<.05) and for the *Openness* dimension (casual: *M* = 42.6, *SD* = 10.3; hardcore: *M* = 45.2, *SD* = 9.2; *t* = −2.09,

Table 2 – Relationship between Big Five factor model, video game utilization and gaming frequency

Big Five traits	Non-gamers[a]		Gamers[b]					Gamers						
								Casual[c]		Hardcore[d]				
	M	*SD*	*M*	*SD*	*t*	*p*	*d*	*M*	*SD*	*M*	*SD*	*t*	*p*	*d*
Extraversion	34.00	11.10	36.90	12.20	.59	.55	−.25	37.90	11.80	35.50	12.60	1.560	.11	.19
Dynamism	35.00	12.60	37.20	12.70	.41	.67	−.21	38.40	12.40	35.50	13.10	1.80	**.05**	.22
Dominance	37.10	12.60	38.40	12.10	.25	.80	−.11	39.20	12.50	37.40	12.70	1.11	.26	.14
Agreeableness	39.30	16.60	40.10	12.60	.15	.87	−.05	40.30	12.90	39.90	12.30	.46	.64	.03
Cooperativeness	45.60	15.50	41.90	12.40	−.72	.46	.26	42.30	12.80	41.30	11.80	.63	.52	.08
Friendliness	34.60	15.30	40.60	13.20	1.08	**.04**	−.41	40.90	13.50	40.10	12.90	.46	.64	.06
Conscientiousness	39.60	13.60	39.10	13.10	−.09	.92	.03	39.50	12.50	38.60	13.90	.50	.61	.06
Scrupulousness	45.10	15.30	43.80	12.40	−.26	.79	.09	44.10	11.50	43.30	13.40	.50	.61	.06
Perseverance	33.50	10.30	34.80	13.70	.23	.81	−.10	45.40	13.20	34.00	14.50	1.76	**.04**	.82
Neuroticism	27.70	7.90	39.50	10.90	2.63	**.01**	−1.23	38.80	11.10	40.50	10.60	.87	.24	−.15
Emotion Control	29.60	10.20	38.00	11.60	1.74	**.04**	−.77	37.50	11.90	38.70	11.10	−.80	.42	.10
Impulse Control	32.60	6.90	44.00	11.90	2.32	**.02**	−1.17	42.90	12.00	45.40	11.50	−1.63	.10	−.21
Openness	45.00	4.60	43.70	9.70	−.31	.75	.17	42.60	10.30	45.20	9.20	−2.09	**.03**	−.26
Openness to culture	43.10	9.40	41.30	12.10	−.35	.72	.16	39.80	12.30	43.50	11.40	−2.39	**.01**	−.31
Openness to experience	50.80	2.40	47.50	8.80	−.90	.36	.51	46.80	9.20	48.50	8.10	−1.50	.13	−.19

Note. [a] *n* = 412; [b] *n* = 569; [c] *n* = 353; [d] *n* = 216

p<.05) and its sub−dimension *Openness to culture* (casual: *M* = 42.6; *SD* = 12.3; hardcore: *M* = 43.5, *SD* =11.4; *t* = −2.39, *p* = .01). Effect Size analysis shows that there is a big effect size on *Perseverance* (Cohen's *d* = .82), while a small effect size has been registered on *Dynamism* (Cohen's *d* = .22), *Openness* (Cohen's *d* = −.26) and on *Openness to culture* (Cohen's *d* = −.31). These data testify a substantial difference between casual and hardcore gamers on *Perseverance*, while the difference on *Openness* and *Openness to culture* is not so relevant as it could appear.

Relationship between BFA dimensions and reported preference to different video games' categories

T−test and Effect Size analysis were run on gamers and non−gamers of different categories of video games (adventure, action, role playing, puzzle, simulation, strategy). No statistical significant results were found between participants who reported to play Adventure and Action categories and those who reported not to play to these categories on BFA

dimensions (see Table 3 and Table 4).

Regarding Role Playing category, significant results were reported for those who play to this category on *Scrupulousness* sub–dimensions, *Openness* factor and *Openness to experience* sub–dimension (see Table 5). Effect size analysis for *Scrupulousness* sub–dimensions showed a small effect size (Cohen's $d = .40$), as well as for *Openness* (Cohen's $d = −.27$) and Openness to experience (Cohen's $d = −.47$).

Puzzle category was the one with more statistical significant results. Except from *Extraversion* dimension, *Emotional control* sub–dimension, *Openness* and *Openness* to experience, those who reported to play to this kind of games showed higher mean values than non–gamers (see Table 6). Effect Size analysis showed small effect size values (Cohen's *d*) for all statistical significant dimensions.

For *Simulation category* (see Table 7), only for *Openness to Culture* dimension results were statistically significant. Gamers showed a higher mean value ($M = 43.4$, $SD = 11.3$) than non–gamers ($M = 40.9$, $SD = 12.2$; $t = −1.41$, $p<.05$). Effect Size analysis has found a small effect size (Cohen's $d = −.21$).

Gamers who plays to *Strategy category* showed higher mean values than non–gamers on *Openness dimension* ($t = −.36$, $p<.001$) and both its relative sub–dimensions, *Openness to culture* ($t = −2.61$, $p<.001$) and *Openness to experience* ($t = −2.87$, $p<.001$) (see Table 8).

Effect Size analysis showed a small effect size for all three dimensions (Cohen's $d = −.42$ for Openness dimension; Cohen's $d = −.34$ for Openness to culture; Cohen's $d = −.37$ for *Openness to experience*).

Analyzing the correlation between BFA dimension and the number of video games' categories played by the respondent, the only small positive correlation can be retrieved between *Openness* (Pearson's $r = .24$, $p<.01$), *Openness to culture* (Pearson's $r = .19$, $p<.01$), and *Openness to experience* (Pearson's $r = .15$, $p<.05$).

Relationship between BFA dimension and game mechanics

Results of the correlational analysis (Pearson's *r*) between BFA factors and game mechanics are shown in Table 9. Pearson's *r* is a measure of the linear dependence (correlation) between two variables (in this case, BFA and game mechanics). It has a value between +1 and −1 inclusive, where +1 represent a total positive linear correlation, 0 is no

linear correlation, and −1 is total negative linear correlation. Results are shown in Table 9.

Pearson's *r* values are modest, ranging from $r = −.21$ to $r = .20$; nevertheless, all result showed a statistical significance ($p<.001$). For a better legibility, results will be reported referring to Big Five dimensions.

Data showed a small positive correlation between *Extraversion* dimension and the item "I enjoy controlling multiple units": the same pattern has been found on the *Dominance* sub–dimension; a small negative correlation has been found on game mechanic of dealing with big and complex world, both on *Extraversion* dimension and *Dynamism* sub–dimension. *Dominance* sub–dimension showed a small positive correlation with game mechanics relative to the presence of music and rhythm as an important part of the gameplay and where is necessary only to resolve puzzles.

Agreeableness dimension showed a small positive correlation with the item "I prefer games where my character can learn abilities" and a small negative correlation with the item "I prefer games where I have the chance of controlling several avatars at a time". *Cooperativeness* sub–dimension result positively correlated with mechanics referring to the evolution and the level growth of the game's character ("I prefer games where I can decide evolution paths for my units", "I prefer games where my character can learn abilities", and "I enjoy levelling my character"), and with mechanics related to intellectual challenges and quests. A small negative correlation is found between this sub–dimension and mechanics related to control of multiple units (e.g., "I prefer games that I have the chance of controlling several avatars at a time"). Regarding Friendliness sub–dimension, small positive correlations has been found on items of receiving hints for play optimization and of preferring intellectual challenges; a small negative correlation is retrieved on item "I prefer games where I have to mainly kick and punch enemies".

About *Conscientiousness* dimension, small positive correlations are found on mechanics related to building and pulling on structures, resolving puzzles and dealing with challenges that require eye–hand coordination; small negative correlations with this dimension are found with items that underlines the importance of gun's usage in the gameplay, the wander without clear finality and objectives, and playing online (with or without others). Same correlation patterns are retrieved on the *Scrupulousness* sub–dimension, except for item "I enjoy fooling around the game world without any main reason or objective"; in

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Table 3 – Relationship between BFA dimensions and reported preference to Adventure video game category

| Big Five traits | Adventure | | | | | | |
| | Non-gamers[a] | | Gamers[b] | | | | |
	M	SD	M	SD	t	p	d
Extraversion	36.60	12.10	37.90	12.40	−.74	.46	−.10
Dynamism	36.90	12.90	37.90	12.40	−.54	.59	−.07
Dominance	38.30	12.20	39.10	14.00	−.42	.67	−.06
Agreeableness	39.90	12.10	40.60	14.80	−.36	.72	−.05
Cooperativeness	42.10	11.90	41.60	14.50	.25	.80	.03
Friendliness	40.30	12.70	41.10	15.30	−.41	.68	−.05
Conscientiousness	39.00	12.10	39.50	16.00	−.28	.78	−.03
Scrupulousness	44.10	11.20	42.90	15.80	.67	.50	.08
Perseverance	34.30	13.10	36.60	15.60	−1.17	.24	−.16
Neuroticism	38.90	10.40	40.70	13.00	−1.16	.25	−.15
Emotional control	37.50	11.30	39.20	12.80	−.99	.32	−.14
Impulse control	43.60	11.30	44.20	13.80	−.35	.73	−.05
Openness	43.60	8.30	44.50	13.40	−6.78	.50	−.08
Openness to culture	41.50	11.00	41.10	15.00	.27	.79	.03
Openness to experience	47.40	7.40	48.40	12.30	−.74	.46	−.09

Note. [a] $n = 755$; [b] $n = 266$

addition, a small positive correlation is found between this sub–dimension and the presence of intellectual challenges' mechanic, while a small negative correlation is established with moving around own avatar fast in the gameplay. *Perseverance* sub–dimension showed small positive correlations with getting high scores and gameplays that have a story that unfolds while playing; small negative correlations are found between this sub–dimension and guns' using, engaging only sometimes with characters stronger than the average, and fooling around the game world without any main reason or objectives.

Small positive correlations are found between *Neuroticism*

dimension and items "I prefer games where my character can learn abilities", "I prefer games that are an intellectual challenge", and "I enjoy resolving puzzles for their own sake": the same patterns are showed on *Impulse control* sub–dimension; in addition, this sub–dimension has a small positive correlation with managing resources' mechanic. A small negative correlation is found for *Neuroticism* dimension, and its relative sub–dimensions of *Emotion* and *Impulse control*, and weapon using mechanic.

Finally, *Openness* dimension only showed a small positive correlation with item "I prefer games with intelligent life"; unexpectedly, this item do not correlate with *Openness* sub–

Table 4 – Relationship between BFA dimensions and reported preference to Action video game category

Big Five traits	Action						
	Non-gamers[a]		Gamers[b]				
	M	*SD*	*M*	*SD*	*t*	*p*	*d*
Extraversion	36.00	12.10	38.20	12.20	−1.44	.15	−.18
Dynamism	36.40	12.70	38.30	12.80	−1.16	.25	−.15
Dominance	37.70	12.40	39.50	12.90	−1.12	.26	−.14
Agreeableness	40.10	12.50	40.10	13.10	.03	.97	.00
Cooperativeness	42.20	11.80	41.60	13.60	.36	.72	.05
Friendliness	40.60	13.50	40.30	13.10	.20	.84	.02
Conscientiousness	39.80	12.30	38.20	14.20	.93	.35	.12
Scrupulousness	44.90	11.70	42.10	13.40	1.8	.08	.02
Perseverance	34.70	12.80	35.00	15.10	−.20	.84	−.02
Neuroticism	39.70	10.90	38.70	11.40	.72	.47	.09
Emotional control	38.10	11.60	37.50	11.80	.42	.68	.05
Impulse control	44.40	11.30	42.80	12.90	1.01	.31	.13
Openness	43.20	8.90	44.70	10.80	−1.22	.22	−.15
Openness to culture	40.90	11.80	42.20	12.30	−.79	.43	−.11
Openness to experience	47.20	7.60	48.20	10.30	−.89	.37	−.11

Note. [a] *n* = 592; [b] *n* = 389

dimensions. *Openness to culture* sub−dimension showed small (only) positive correlations with "making building and structure", "resolving puzzles for own sake", being challenged with eye−hand coordination tasks, and "dealing with a story that unfolds while playing" mechanics. Regarding *Openness to experience* sub−dimension, small (only) positive correlations are found between this sub−dimension and items "I prefer games that I can decide evolution paths for my units", "I enjoy that rarely I have to engage with a character stronger than the average", and "I prefer games where my character's stats have a key role in hitting and resisting while fighting".

DISCUSSION

As for the first research question, gamers and non−gamers had been compared on the BFA dimensions. Gamers show a higher mean scores on *Friendliness* sub−dimension, compared with non−gamers: this data can be interpret as that gamers are more friendly than non−gamers; yet, different sample size could have affected this kind of result; for this reason, running Effect Size analysis has been an important step to interpret correctly this difference: since there is a small, yet significant, Effect Size difference, the gap between

Table 5 – Relationship between BFA dimensions and reported preference to Role Playing video game category

Big Five traits	Non-gamers[a]		Gamers[b]				
	M	SD	M	SD	t	p	d
Extraversion	37.00	12.20	36.30	12.10	.31	.75	.06
Dynamism	37.50	12.80	34.70	12.20	1.19	.23	.22
Dominance	38.20	12.50	39.80	13.20	−.69	.49	−.12
Agreeableness	40.30	12.50	39.10	14.70	.50	.64	.09
Cooperativeness	42.10	12.20	41.40	14.40	.29	.77	.05
Friendliness	40.80	13.00	38.60	15.30	.87	.38	.15
Conscientiousness	39.50	12.70	37.00	15.30	1.03	.30	.18
Scrupulousness	44.50	12.10	39.30	13.90	2.27	**.02**	.40
Perseverance	34.60	13.40	36.00	15.50	−.55	.58	−.09
Neuroticism	39.50	10.70	38.00	13.50	.75	.45	.12
Emotional control	37.90	11.50	37.80	13.00	.02	.98	.01
Impulse control	44.10	11.50	41.30	14.60	1.31	.19	.21
Openness	42.60	10.30	45.20	9.20	−2.52	.01	−.27
Openness to culture	41.20	11.70	43.20	14.10	−.92	.36	−.15
Openness to experience	47.00	8.10	51.70	11.50	−2.97	**<.001**	−.47

Note. [a] $n = 853$; [b] $n = 128$

gamers and non−gamers is not so deep as it could appear from mean scores comparison, suggesting that gamers and non−gamers do not differ substantially in the *Friendliness* dimension.

Furthermore, gamers showed higher mean scores on the *Neuroticism* dimension, and the same pattern can be noted on the sub−dimension of *Emotion* and **Impulse control**: in this case, Effect Size analysis (medium for *Emotion control*, and huge for *Neuroticism* and *Impulse control*) allows to say that gamers seem to be more capable of emotion and impulse control. This can be probably due to the training that playing

video games provides: as stated by Zillmann & Bryant (1994), people use video games to better manage emotional states, and this can happen in a more or less conscious way. For example, through video games people can manage their emotions, searching for relax (e.g. playing to "disconnect" from a hard day by soaking up into game play and relieving stress) or, on the contrary, looking for specific emotions (e.g., adrenaline in a survival horror game).

Video games structure seems to be suited to ensure that people get into a psychological flow state (Csikszentmihalyi & Csikszentmihalyi, 1998; Massimini & Carli, 1998) that is

Table 6 – Relationship between BFA dimensions and reported preference to Puzzle video game category

Big Five traits	Puzzle						
	Non-gamers[a]		Gamers[b]				
	M	*SD*	*M*	*SD*	*t*	*p*	*d*
Extraversion	36.80	12.70	37.00	11.40	−.12	.91	−.02
Dynamism	37.10	13.00	37.20	12.50	−.11	.91	−.01
Dominance	38.40	13.20	38.50	11.80	−.02	.98	−.01
Agreeableness	38.00	13.30	43.20	11.20	−3.30	**<.001**	−.42
Cooperativeness	40.10	12.80	44.70	11.60	−3.0	**<.001**	−.38
Friendliness	38.10	14.10	43.90	11.30	−3.49	**<.001**	−.45
Conscientiousness	37.10	12.70	42.10	13.20	−3.05	**<.001**	−.39
Scrupulousness	41.70	12.30	47.00	12.00	−3.45	**<.001**	−.44
Perseverance	33.60	13.20	36.60	14.30	−1.78	**.05**	−.22
Neuroticism	38.20	11.50	40.90	10.30	−1.96	**.05**	−.25
Emotional control	37.50	11.90	38.40	11.40	−.60	.55	−.08
Impulse control	41.90	12.60	46.50	10.30	−3.16	**<.001**	−.40
Openness	43.30	9.90	44.50	9.40	−.94	.35	−.12
Openness to culture	40.10	11.70	43.40	12.20	−2.22	**.03**	−.31
Openness to experience	48.20	9.00	46.80	8.30	1.30	.19	−.19

Note. [a] *n* = 581; [b] *n* = 400

characterized by a) an intense concentration on what is being done; b) the merging of action and awareness; c) the loss of self–perception as social actors; d) the feeling of being able to effectively handle the situation because the necessary skills to face the challenge presented by the context(in this case, video game) have been developed; e) the feeling that time passes fastest than normal; f) the feeling that the activity that is taking place is satisfactory.

Psychological flow, however, is not always a present condition during gaming sessions; it is, indeed, an emotional state reached only when there is a good balance between player's skills and game's difficulty. If the game is too simple, for example, the player could be bored, while if it is too complex, it could evoke anxiety and frustration. For this reason, game's difficulty will increase progressively, so that the player will develop new skills and strengthen those that he/she already possess. When a high skills level is reached in adventure or action games, a player can no longer experience strong emotions yet, in a paradoxical way, can get to relax (Keller & Bless, 2008).

Comparing casual and hardcore gamers on Big Five dimensions, data showed that, on *Dynamism* sub–

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Table 7 – Relationship between BFA dimensions and reported preference to Simulation video game category

	Simulation						
Big Five traits	Non-gamers[a]		Gamers[b]				
	M	SD	M	SD	t	p	d
Extraversion	36.30	12.00	38.80	12.80	−1.37	.17	−.16
Dynamism	36.80	12.70	38.40	13.10	−.85	.40	−.12
Dominance	37.90	12.40	40.30	13.10	−1.27	.21	−.19
Agreeableness	40.20	13.10	39.70	11.40	.29	.77	.04
Cooperativeness	42.20	12.70	41.20	11.60	.53	.59	.08
Friendliness	40.80	13.60	39.30	12.30	.72	.47	.11
Conscientiousness	39.20	13.10	39.20	13.20	−.00	.99	.00
Scrupulousness	43.80	12.50	44.00	12.10	−.10	.92	−.02
Perseverance	35.10	13.70	34.00	13.70	.52	.60	.08
Neuroticism	39.20	11.60	39.50	9.10	−.13	.90	−.03
Emotional control	37.60	11.90	38.50	10.90	−.74	.46	−.08
Impulse control	44.10	12.30	42.70	10.50	.80	.42	.12
Openness	43.30	9.60	45.40	9.90	−1.42	.16	−.21
Openness to culture	40.90	12.20	43.40	11.30	−1.41	**.04**	−.21
Openness to experience	47.40	8.90	48.40	8.40	−.79	.43	−.19

Note. [a] n = 758; [b] n = 223

dimension, casual gamers report a higher mean score than hardcore gamers; the same pattern is verifiable on the *Conscientiousness* sub−dimension, *Perseverance*. From these results, it appears that those who self−refer to play video games monthly or weekly describe themselves as more dynamic, brisk and active, as well as responsible, liable, self−disciplined, and striving for achievements in activities in which they are involved.

Running Effect Size analysis, Cohen's *d* showed different values for these two sub−dimensions: for *Dynamism* sub−dimension, a small Effect Size is retrieved from analysis, while a big Effect Size is reported for *Perseverance*; these results suggest that those who self−refer to play video games daily or several times a day do not substantially differ on the dynamic sub−factor from those who report to play monthly or weekly, while casual gamers seem to show more persistent attitudes and behaviors than hardcore gamers. In other words, less time passed playing video games has not a substantial impact on energy or active behavior, but could tell something about showed preferences for planned behavior, being prepared and paying attention for details, liking order and schedules, and acting dutifully.

Table 8 – Relationship between BFA dimensions and reported preference to Strategy video game category

| Big Five traits | Strategy | | | | | | |
| | Non-gamers[a] | | Gamers[b] | | | | |
	M	SD	M	SD	t	p	d
Extraversion	37.10	12.00	36.50	12.40	.36	.72	.05
Dynamism	37.60	12.90	36.40	12.60	.68	.49	.09
Dominance	38.00	12.80	39.20	12.40	−.71	.47	−.09
Agreeableness	39.70	13.00	40.80	12.40	v−.65	.52	−.09
Cooperativeness	41.00	13.00	42.10	11.70	−.14	.89	−.09
Friendliness	39.90	13.30	41.50	13.40	−.94	.35	−.12
Conscientiousness	38.60	13.10	40.00	13.20	−.82	.41	−.11
Scrupulousness	43.60	12.70	44.20	12.10	−.36	.72	−.05
Perseverance	33.90	13.30	36.40	14.30	−1.41	.16	−.18
Neuroticism	38.70	11.10	40.30	10.90	−1.17	.24	−.14
Emotional control	37.70	12.10	38.20	11.00	−.34	.74	−.04
Impulse control	42.90	12.10	45.20	11.50	−1.54	.12	−.19
Openness	42.30	9.50	46.30	9.50	−3.36	**<.001**	−.42
Openness to culture	39.90	12.20	43.90	11.40	−2.61	**<.001**	−.34
Openness to experience	46.40	8.90	49.60	8.20	−2.87	**<.001**	−.37

Note. [a] *n* = 615; [b] *n* = 366

Regarding the *Openness* dimension, and its sub–dimension *Openness to Culture*, hardcore gamers showed significant higher mean scores, compared with casual gamers. For both, a small Effect Size is reported, meaning that the difference found in results is not indicative of a profound gap between the two sub–groups: a high frequency of gaming sessions seems to have little impact on creativity, intellectual curiosity, preference for novelty and variety, and on the extent to which a person is imaginative or independent. Therefore, is not possible to state that hardcore gamers are certainly more creative and intellectually curious than casual gamers; yet, a general tendency in this direction was recorded. This tendency seems supportive and consistent with previous results on *Persistence* sub–dimension: casual gamers tend to prefer routine tasks, while hardcore gamers tend to like unusual ideas, adventure and creative tasks.

Although interpreting these results in a clear and straightforward way is not always easy, it is interesting to note that a relationship between these variables exists indeed; therefore, knowing preferences and playing habits seems to be a useful and innovative way to get to know important

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Table 9 – Correlation (Pearson's *r*) between Big Five factor model and game mechanics

Games mechanics	Extroversion	Dynamism	Dominance	Agreeableness	Cooperativeness	Friendliness	Conscientiousness	Scrupulousness	Perseverance	Neuroticism	Emotion control	Impulse control	Openness	Openness to culture	Openness to experience
Item 5								−.15*							
Item 7							−.19*	−.21*	−.12*	−.18*	−.15*	−.16*			
Item 9						.14*									
Item 10									.15*						
Item 13	−.14*	−.15*													
Item 14				.13*											
Item 16						−.14*									
Item 18							−.16*		−.18*						
Item 19					.15*										.13*
Item 20							−.16*	−.17*							
Item 22				.13*	.14*						.13*	.14*			
Item 23					.12*	.13*		.14*			.15*	.20*			
Item 25							.14*	.14*						.14*	
Item 29							.14*	.14*	.14*			.16*		.16*	
Item 31									−.14*						.13*
Item 32												.14*			
Item 35							−.13*	−.18*							
Item 36					.12*										
Item 37												.12*			
Item 39				−.12*	−.14*										
Item 40							.14*	.13*						.20*	
Item 41									.14*						
Item 42							.16*	.15*						.15*	
Item 43															.14*
Item 44	.13*		.18*		−.13*										
Item 47					.14*										
Item 50				.13*											

Note. * *p*<.001

aspects (such as personality traits) of Millennials generation, serial players who are next to enter the work market.

The second research question was about relationships between Big Five factor model and reported preferences to games' categories. Regarding scores interpretation process, Barbaranelli et al. (2002) suggest that it can be referred both to the individual scales and to the overall profile resulting from all dimensions. In fact, ratings in a single scale assume significance especially in relation to scores reported in other scales: this observation invites to maintain a cautious attitude in data interpretation. While no statistical significant results were found for Action and Adventure categories, data showed that those who play to Role Playing games seems to be more scrupulous, more open (and in particular open to experience) than non–gamers of this category. These findings may be due to the fact that, in this kind of games, individuals play the role of one or more characters and, through conversation and dialectic exchange, create an imaginary space where fictitious, adventurous facts happen in a neat narrative; each character is defined by a variety of features (e.g., strength, dexterity, intelligence, charisma and so on), generally testified through scores that describe their capabilities; actions taken in the game succeed or fail according to a formal system of rules or guidelines. For these characteristics, it is no surprising that gamers that reported preference for role playing games need to implement scrupulous behaviors, as well as to be open to new experience, to be successful; following specific rules and being open to sudden changes of the gameplay scenario are key skills in managing this kind of games.

Puzzle category players seem to be more cooperative and friendly, scrupulous and perseverant than those who do not play to this category, as well as capable of impulse control and logical and rational. Puzzle games (such as Candy Crush Saga) can be defined as a non–competitive and cognitive games, in which the player should think about his/her moves in advance and can help other players by giving lives or accesses to next levels. To be precise, methodic, systematic, determined, attentive, tenacious and efficient represent a set of skills necessary to be successful in this category, as well as generous, helpful, patient and analytical.

Simulation and Strategy categories share significant results in *Openness to culture* dimension. Simulation games try to reproduce an actual aspect of reality and put the player in a position that demand to act like he/she was actually in the situation presented: generally it require a mix of skill, luck and strategy, and for this reason can be defined as strategy games'

subcategory; both categories are influenced by the capability of the player to make effective decisions and require to be receptive to changes, analytical, logic and rational, as well as intuitive, because strategic moves are generally contrasted by fate and fortune. Moreover, those who play Strategy games seems to be more open mentally, and, in particular, open to experience: this means that, to play strategy games, there is a need of being imaginative, original, creative and unpredictable that seems not to be as fundamental as for simulation games: maybe, these skills are not that useful in strictly reproducing various aspects of real or fantasy life, while seem important to individuate new path to solve incoming problems and situations.

Regarding findings of positive correlation between the number of games' category played by participants and BFA *Openness* dimension and its relative sub–dimension, these results seems consistent with openness to different values and lifestyles: trying different games' categories, an individual can get involved in different situation and test different skills, achieving a global skills training. This could be an important aspect in candidate's personality evaluation, that could tell something about his/her behavior not only in games' world, but also in the real work environment.

The third research question aimed to explore existing correlation between BFA dimensions and game mechanics. Correlations found between BFA dimensions and game mechanics could allow to imagine a new video games' taxonomy that transcend both academic and industrial definitions toward a nomenclature substantiated on psychological basis. This kind of redefinition could help to lay the groundwork for using video games as an assessment tool in personnel selection and evaluation: in a future perspective, this could allow business companies and HR managers to use video games as suitable instrument for selecting the right candidate that applies for a specific job profile or open position. For instance, if a business company is looking for a candidate with a personality profile that demands particularly high levels of conscientiousness, it may use a video game that asks the player to solve puzzles or tasks that require a high degree of eye–hand coordination effort.

Given the knowledge and ease of use of technological devices that characterizes the Millennials' generation, this kind of assessment, on one hand, might be more engaging and less anxiety–provoking for candidates, allowing them to fully express their true potential; on the other hand, it might give business companies an effective and realistic assessment of the candidate who will cover the open position.

Conclusion, limitation and inputs for future research

The intention of this discussion is not to support inconsistent theories like that whoever plays is necessarily better than those who do not play, but to underline that inferring personality traits from video gaming behavioral habits and video games' preference could be possible. Using video games as an assessment tool is a new field of research in Italian context, that surely needs several other investigations with different instruments and type of measurement: one of the aims of this paper was to support already existent theories and intuitions with empirical data, hoping to awaken interest in this subject and add potentially relevant information for further research.

Each scientific study has its own strengths and its weaknesses; for example, we have previously discussed the hypothetical beneficial impact that giving the BFA profile might have had on research participants. We do not know if this element has been crucial to participation or whether participants have been moved by interest in the research topic. We hypothesized that the participants, mainly belonging to the Millennials generation, were moved by a strong interest and curiosity towards the research topic (that is the connection between job search, personality and video games): in any case, future research can better clarify this point by eliminating this kind of incentive or replicating the study in a different setting.

In our perspective, this research work arises in scientific literature as an innovative contribution that tries to take into account recent macroscopic changes both in technology, such as the widespread and pervasive use of technological devices, both in socio–demographic aspects, such as the presence in the work market of a new generation, Millennials, that has its own personality characteristics and peculiar ways to see and interact with external reality.

As an input for future exploration and improvements, research could investigate some other aspects that have remained outside of the present study, as for instance the possible relationship between games' scores and achievement. In fact, if gamers' reported preferences of different categories of games (and underlying elements that give structure to the game, the so–called "game mechanics") can be consider as an effective path to collect information on their personality traits, games' scores and achievements could be considered as a mean to collect information on gamers' performance: this could be a way to measure them more precisely and to possibly correlate players' achievements and results to performance tests (such as, for instance, DAT and Raven Matrices), avoiding the exclusive use of self–report instruments.

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