Cultural Influences on Play Style

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Abstract—In general, video game researchers do not differentiate between players' nationalities. Cultural theories, however, show that cultural differences concern numerous values, including values associated with interaction with media. We therefore ask the question whether there exist cross-cultural differences in play style. For our investigation we use a large sample database containing *Battlefield 3* game statistics. Hofstede's cultural dimensions theory [1] was used to construct three play style categories in which players are most likely to exhibit cultural differences: competitiveness, cooperation, and tactical choices. Using ANOVA tests, we found clear differences between the play style of players of different nationalities in the competitiveness and cooperation categories. MANOVA tests showed that national culture accounts for 5.6% of variance in competitive, and 4.2% in cooperative play style. Pairwise comparisons showed that in particular German and Swedish players demonstrated cooperative behavior significantly more often than players from the United Kingdom and United States.

I. Introduction

Video games are often attuned to a particular culture. For instance, in the role-playing game genre, "Japanese"–style game are conceptually quite different from "Western"–style games. The implicit assumption is that Japanese players respond to different elements in gameplay than Western players, and play their games in different ways. There is, however, no scientific research available that investigates the effect of a player's country of residence or culture on play style. In fact, in the field of video game research there is a tendency to explore data originating from a single country, such as the United States [2], South Korea [3], or Hong Kong [4]. Literature suggests that there are potential cultural differences in usage behaviors [5], [6], [7], but prior research has not associated these usage differences with a particular in-game play style, and they investigate only role-playing games. As proposed by Lee and Wohn [7], the present study focuses on linking play style with players' country of residence (national culture), rather than to a general concept of culture as it creates "a conceptual confound of ethnicity, nationality, and geography." Thus, the main research question in this study is: to what extent does national culture influence players' in-game behavior?

In order to examine cross-cultural differences in play style, the notion of play style needs to be defined, and linked to relevant cultural and national characteristics. The background section (II) proposes three categories of play style that are most likely to be influenced by cultural differences. For our research, we used the PsyOps database which contains a large amount of information on players of the *Battlefield 3* video game [8]. It meets three requirements which are crucial for the present investigation, namely : (1) it contains a large number

of international participants; (2) it is based on a video game that allows players to express different play styles; and (3) it contains a considerable number of quantitative variables measuring play style. Details of the data collection and data analysis are discussed in the experimental setup section (III). The remainder of the paper presents our results (IV), discusses them (V), and draws conclusions (VI).

II. Background

We provide background information on recognizing cultural differences (II-A) and motivations for playing games (II-B). These lead to the introduction of three overarching elements of playstyle: competition, cooperation, and tactical choices (II-C). Finally, we introduce *Battlefield 3* and argue why it is a suitable environment for investigating cross-cultural differences in play style (II-D).

A. Cultural differences

Cultural studies have shown national differences in how people respond to different types of media. Cross-cultural differences regarding media interaction may be found in play of video games. The relationship between video games and cultural identity has actually been investigated [9], though not specifically from the perspective of cultural differences in play style.

In recent years, the notion of culture has been used as a basis for numerous models showing how it might be a cause for different social characteristics. This approach is well presented in Schein's definition of culture [10] as "the way in which a group of people solves problems and reconciles dilemmas. Culture is the outcome of the shared experiences arising from an organization's attempts to resolve fundamental problems of adapting to the external world and achieving internal integration and consistency." Scholars design models that explain culture as a set of definite dimensions. The most popular set of cultural dimensions was defined by Hofstede [1], [11], who distinguished six dimensions of cultural values: (i) power distance index; (ii) individualism versus collectivism; (iii) uncertainty avoidance index; (iv) masculinity versus femininity; (v) long-term orientation versus short-term orientation; and (vi) indulgence versus restraint. We expect that 'individualism vs. collectivism' and 'masculinity vs. femininity' are particularly applicable to video games.

B. Motivations for playing games

Differences in play style can be linked to the different motivations players have for playing video games. Kunda [12]

defines motivation as the inner force pressuring individuals to take certain actions and pursue anticipated achievements. It applies in particular to online games, which tend to offer more diverse gameplay choices and options for players. Even though players seek different qualities in games, they are often pulled towards the same game due to its versatility. Caplan, Williams, and Yee [13] point out that being motivated by different needs makes the process of gameplay yield unique meaning and consequence for each individual player. Motivation and qualities of the game that players find appealing obviously affect their play style, for example by "determining whether he/she prefers solo-play or collective-play, to what extent he/she would like to cooperate and communicate with other gamers, and how much he/she devotes time and energy to the development of his/her virtual character" [4].

Motivation is often used as a grouping factor in player classification. Bartle [14] categorized players of text-based Multi-User Dungeons (MUDs) into four types based on what goal they tried to pursue: player-killing, personal achievements, social interaction, or exploration. Yee [15] pointed out that Bartle's player taxonomy had never been empirically tested, nor had it been shown that the four types were independent of each other. Results from an on-line survey revealed that player motivations in fact did not suppress each other. Yee recognized three overarching motives for in-game behavior: achievement, socializing, and immersion [15].

Sherry and Lucas [16] examined the reasons and motives people hold for engaging in video games on the basis of uses and gratifications theory, which provides a general framework that describes how various media serve as solutions to everyday problems [17]. Their findings allowed them to formulate a model in which people play games in order to access one or more of six psychological states: (i) competition (defeating others); (ii) challenge (success following effort); (iii) diversion (to escape stress); (iv) fantasy (novel or unrealistic stimuli); (v) arousal (excitement and other positive emotions); and (vi) social interaction (social experience) [16], [18].

C. Play style

Through an examination of existing literature, we found that culturally-specific play style is likely to occur in three categories: competitiveness, cooperation, and tactical choices. We explain these categories below.

Competitiveness: 'Masculinity versus femininity' is one of the dimensions listed by Hofstede's theory [1] (see Subsection II-A). It consists of values related to the division of emotional roles between men and women. Cultural values that are considered masculine include, for instance, competitiveness, admiration for strength, and materialism; feminine values relate to sensitiveness and a peaceful life attitude. Societies dominated by masculine values tend to be more competitive. Hofstede et al. [1] found that index scores for masculinity are high in German-speaking countries, Japan, and Italy; moderately high in English-speaking Western countries; and low in Nordic countries, the Netherlands, and some Asian countries, such as Korea and Thailand. Studies and questionnaires dedicated to gaming motivation list competition as a vital reason to engage in games. In classic game modes which dominate on-line first person shooters (FPS), players score points and win

the game by eliminating other players' in-game characters. In fact, competition functions as the main feature of so called "deathmatches," which are amongst the most common game modes of both first-person shooters and strategy games. Since competition lies at the core of the majority of games, we expect to find cross-cultural differences in competitive aspects of play style.

Cooperation: 'Individualism versus collectivism' is another of the dimensions listed by Hofstede's theory [1]. It offsets a cultural value of individualism (independence, individual goals, self-reliance) against one of collectivism (interdependence, group goals) [1], [19]. Hofstede found that individualism is a core value of Western countries, while collectivism dominates Eastern and less-developed countries [1]. Applied to video games, it means that certain players, due to their culture, may value common goals, cooperation, and helping each other as more desirable than fulfilling one's personal achievements.

The notion of cooperation is often listed by players as an important quality, which they find essential in video games. Treating games as a tool for socialization has had a major impact on the gaming industry. Granic, Lobel, and Engels [20] emphasize that "perhaps the biggest difference in the characteristics of video games today, compared to their predecessors of 10 to 20 years ago, is their pervasive social nature." Besides competition, most Massively Multiplayer Online Games (MMOGs) offer players opportunities for large-scale cooperation.

Somewhat surprisingly, the appeal of social interaction is present regardless of the game genre. Jansz and Tanis [21] found that social interaction is the third most important motivation (after competition and enjoyment) to engage in online FPS games. As Frostling-Henningsson [22] noticed, many people prefer to play video games in online gaming centers (such as arcade halls and LAN parties) because they experience an increased sense of togetherness, which "was perceived as being more fun and more socially rewarding than gaming in solitude from home." In most cases social interaction in FPS games takes the form of uniting players for a common cause, which encourages cooperation [22]. The extent of socialization and cooperation will naturally differ depending on the game genre.

Tactical Choices: Modern video games offer a wide spectrum of tactical choices regardless of their genre. Przybylski, Rigby, and Ryan [18] note that "games involving conflict and combat can readily support the need for autonomy by empowering the player with opportunities for action, choices over strategies and missions, and relatively open environments in which to act," meaning that games with conflict in fact encourage players to make strategic decisions. Tactical choices could encompass choice of weapons (e.g., long range or short range, low damage or high damage), choice of vehicles (e.g., land or air vehicles, fast or heavily armored), and choice of approach (e.g., stealthy or full-frontal assault, individual or team-based).

Tactical choices relate to several of the dimensions of Hofstede's theory [1]. 'Power distance' relates to obedience, understanding of hierarchy and equality; 'uncertainty avoidance' is associated with neuroticism, rule obedience, need

for clarity, and structure; and 'long-term orientation versus short-term orientation' refers to stability, adaptability, and perseverance [11]. Although the notion of tactical choices is rather broad, potential cross-cultural differences in gameplay might be associated with differences in national cultures.

D. Battlefield 3

The game we used for our research is *Battlefield 3*, which is an FPS game that allows up to 64 players to play online together in one match. It contains numerous options for customization, strategy, and tactics. All three of the afore-mentioned play style categories (competitiveness, cooperation, and tactical choices) can be differentiated in *Battlefield 3*. The game allows players to choose one of four classes (Assault, Engineer, Support, and Recon), which vary in their abilities as well as available gun types and equipment. Weapons differ in type, optimal range, rate of fire, and magazine capacity. All four classes have unique equipment which enables players to support their teammates in various ways: the Assault class can provide teammates with medkits and revive them when they are killed; the Engineer class is able to repair vehicles; the Support class provides teammates with ammunition crates; and the Recon class specializes in surveillance and spotting enemies. Although each class facilitates cooperation among players, it is up to players themselves whether they focus on achieving individual or communal goals.

III. Experimental Setup

Theories and literature (II) suggest the existence of cross-cultural differences in play style. Therefore, our study aims to determine whether differences in play style based on players' country of residence are in fact statistically significant, and whether any trends or patterns can be observed. This section describes data collection (III-A), feature selection (III-B), and data analysis (III-C).

A. Data collection

Our data set was collected for a previous research project that investigated the link between play style, personality, and age [8]. Data was collected automatically during a period of six weeks in 2011. Data was solely collected from participants who allowed us access to their data, and also completed a questionnaire that provided information on their age, country of residence, player name, gaming platform, and personality. Each participant gave consent to anonymous use of their game statistics; since participants provided their in-game name it was assured that data came from unique individuals. In total, the collected data set contained 826 statistical features from 9368 participants from 90 different countries of residence [8].

B. Feature selection

The present study investigates cross-cultural differences in play style. Since it is hard to indicate where cultural boundaries lie, we decided that a participant's home country provides a reasonable indication of their culture, in accordance with the suggestion by Lee and Wohn [7]. In order to maximize data integrity, ensure external validity, and attain high statistical power, in the present research we only used data from participants whose total play time was greater than zero, who

TABLE I.   *Battlefield 3* PLAY STYLE VARIABLES.

Competition	Cooperation	Tactical choices
Kill/death ratio	Savior ribbons	Transport warfare ribbons
Win/loss ratio	Avenger ribbons	Armored warfare ribbons
Flag defender ribbons	MCOM attacker ribbons	Air warfare ribbons
Flag attacker ribbons	MCOM defender kills	Time spent in vehicles
MVP ribbons	Laser designation ribbons	AAV–A71 Amtrac time
Combat effic. ribbons	Surveillance ribbons	HMWV time
Accuracy ribbons	Maintenance ribbons	A10 Thunderbolt II time
Melee ribbons	Resupply ribbons	C4 planted
Number of dog tags	Beacon spawn ribbons	Mortar shots
Capture flag points	Resupplies	Grenade shots
Defending flag points	Heals	Claymore shots
	Repairs	
	Revives	
	MAV spots	
	UGS spots	

were between the ages of 12 and 65, and whose country of residence had at least 200 participants in the data set.[1] This left us with a database containing 7126 participants from eight different countries (Australia, Canada, Finland, Germany, the Netherlands, Sweden, United Kingdom, and United States). Previous research [8] uncovered a link between age and play style, but we could disregard that effect as in our data set no significant age differences among countries were observed.

Game statistics had to be meaningfully quantified to accurately reflect play style in the three established categories: competitiveness, cooperation, and tactical choices. Domain knowledge was employed to construct 37 variables of play style that were divided into these three categories. The play style variables comprise potential in-game behavior that all players could exhibit while playing the game. If a player chose not to engage in specific game actions the value of the corresponding variable would be zero. Not exhibiting certain game actions was considered meaningful in this study as it shows play style preference. Almost all variables were time ratios, which constitute an appropriate measure of in-game behavior (absolute values would be meaningless since players engaged in the game for different periods of time). All variables, divided according to the three categories, are listed in Table I. Except for kill/death ratio and win/loss ratio, they are specified per total time played. They all reflect separate actions and are a measure of a different in-game behaviors. Most variables exhibit low to moderate correlation with each other.[2] Arguments for choosing the variables are given below.

Competitiveness: Competitiveness in *Battlefield 3* can be exhibited as a result of two motives: mastering the game, and having a goal-oriented play style. Goal-oriented behavior in *Battlefield 3* is linked to the specific objectives given in each game mode. A good example of a relevant game mode is 'Conquest,' which uses a map with flags in multiple locations.

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[1]A play time of zero indicated that the player's data were unavailable for some unknown reason. An age lower than 12 or higher than 65 (usually given as zero or 99) indicated that the player was probably not truthful about his age. Just a handful of players were excluded because of these criteria. Most of the exclusions were because a player's country of residence had less than 200 participants. The number 200 was arbitrarily chosen as 'sufficiently large to provide significant results.' Of the countries excluded all but one provided less than 100 players.

[2]While definitions of what is considered low and what is considered moderate correlation vary, in this paper we place low correlation in the range [.00, .15] and moderate correlation in the range [.15, .60]. Correlations higher than .60 are high, and usually an indication that two variables are representing the same underlying feature.

Players are divided into two opposing teams and each team has a limited number of 'tickets.' Tickets are lost by player elimination and by the opposing team capturing flags. A team with no tickets left loses. Thus, competitiveness is reflected by a player's skills in eliminating opponents and capturing flags. A common variable that reflects competition in shooter games is kill/death ratio, but this variable alone cannot be a reliable reflection of the variety in a player's competitive play style. To reflect competition, we chose a range of variables that are measure mastery of the game (e.g., how accurately a player shoots, and how often he or she was the highest scoring player in a team).

Cooperation: Battlefield 3 enables players to help each other in various ways. Assistance can be provided to teammates directly by, for instance, repairing a vehicle, reviving teammates, and providing ammunition and medkits. This type of in-game behavior is the core of collaboration in *Battlefield 3*. In most cases it is, in fact, based purely on cooperation, because helping other players does not provide individual benefit during the game (players do, however, get points for these actions). Moreover, cooperation in play style can be observed in less direct actions; for example, players can use equipment to reveal enemy locations to their team. To reflect cooperation, we chose a range of variables that take into account both direct and indirect actions that benefit other players.

Tactical Choices: The complexity of *Battlefield 3* allows a high variety of tactical choices. Players can strive to win in numerous ways by using various means. The use of vehicles and so-called tactical equipment provides a good reflection of preferred tactical play style. *Battlefield 3* offers players a range of unique vehicle types: jeeps, tanks, choppers, boats, and jets. Using them is optional, so players may choose to utilize various means of transportation or refrain from using them. Similarly, tactical equipment like C4 explosives, grenades, mortars, or claymores are accessible to all players, but using them is not required to win the game. To reflect tactical choices, we selected a range of variables that indicate the use of optional vehicles and equipment.

C. Data analysis

One-way analysis of variance (ANOVA) was employed to compare each play style variable between countries. Data was not normally distributed, as shown by Shapiro-Wilk tests ($p < .001$ in all cases) and histograms. However, because of the large sample sizes, and because we removed countries with less than 200 players, ANOVA is robust to the violation of the assumption of normal distribution. Levene's test for homogeneity of variances indicated that for the majority of variables the variance of data is not equal. As the group variances were not statistically equal, the Brown-Forsythe test was executed to provide decent robustness and retain high statistical power.

Multivariate analysis of variance (MANOVA) was used to assess whether combining play style statistics in each of the three groups has an impact on the results, and what percentage of variance in each play style group can be explained by cultural identity. One-way ANOVA checks cultural differences in each play style variable separately, while MANOVA allows

TABLE II.   ANOVA RESULTS OF THE COMPETITIVENESS CATEGORY.

	df	F	η	p
Kill/death ratio	7	4.93	.005	< .001
Win/loss ratio	7	3.98	.004	< .001
Flag defender ribbons	7	2.50	.003	.014
Flag attacker ribbons	7	5.63	.007	< .001
MVP ribbons	7	7.68	.007	< .001
Combat efficiency ribbons	7	4.40	.005	< .001
Accuracy ribbons	7	12.10	.015	< .001
Melee ribbons	7	4.06	.003	< .001
Number of dog tags	7	10.20	.008	< .001
Capture flag points	7	3.96	.004	< .001
Defend flag points	7	1.55	.002	.145

for the assessment of the extent to which nationality affects competitiveness, cooperation, and tactical choices when all variables in a category are combined. Combining variables and performing statistical tests on the sets of variables may show greater effect of culture on play style than the results of separate analysis of each gameplay statistic. In addition, significant MANOVA results can also indicate that the categorization of play style is meaningful.

Once the differences between participants from different countries was established as statistically significant, post-hoc pairwise comparisons were utilized. Comparing countries with each other separately offered an insight into specific patterns between countries. The Games-Howell test was used to retain high statistical power, even though both variances and group sizes were unequal and data was not normally distributed. This test provided reliable and statistically significant results as it uses the studentized range statistics.

The Brown-Forsythe test and the Games-Howell test were both considered statistically significant at $\alpha \le .001$.

IV.   RESULTS

This section will present the results of the statistical analyses. First the general results of analysis of variance will be presented in each play style category (IV-A). Then the results of multivariate analysis of variance will be presented to show how culture impacts the combined variables in all three categories of play style (IV-B). Finally, we will make pairwise comparisons between the countries for play style variables that differed significantly (IV-C). A more detailed explanation of these results is given by Bialas [23].

A. One-way analysis of variance (ANOVA)

The goal of the one-way analysis of variance (ANOVA) was to establish whether cross-cultural differences in play style exist. Note that, since the assumption of homogeneity of variance was violated, we used the Welch-Forsythe F-ratio. Eta squared (η) effect sizes were calculated to provide an estimate of the proportion of variance explained by each categorical variable. According to the guidelines of Kotrlik et al [24] for interpretation of effect sizes in Information Technology research, the effect sizes obtained in this study tend to have a rather low magnitude.

Competitiveness: From Table II it can be observed that there was a significant effect of the country of residence on 9 of the 11 competitive play style variables.

TABLE III.   ANOVA RESULTS OF THE COOPERATION CATEGORY.

	df	F	η	p
Savior ribbons	7	9.50	.010	< .001
Avenger ribbons	7	6.59	.007	< .001
MCOM attacker ribbons	7	2.50	.007	.270
MCOM defender kills	7	7.51	.007	< .001
Laser designation ribbons	7	5.91	.006	< .001
Surveillance ribbons	7	4.88	.004	< .001
Maintenance ribbons	7	.468	.001	.858
Resupply ribbons	7	7.77	.008	< .001
Beacon spawn ribbons	7	5.05	.004	< .001
Resupplies	7	6.45	.006	< .001
Heals	7	14.00	.016	< .001
Repairs	7	1.31	.001	.243
Revives	7	6.14	.009	< .001
MAV Spots	7	4.62	.003	< .001
UGS Spots	7	5.20	.004	.145

TABLE IV.   ANOVA RESULTS OF THE TACTICAL CHOICES CATEGORY.

	df	F	η	p
Transport warfare ribbons	7	1.63	.002	.122
Armored warfare ribbons	7	1.91	.002	.064
Air warfare ribbons	7	1.33	.001	.230
Time spent in vehicles	7	1.18	.001	.309
AAV–A71 Amtrac time	7	.682	.001	.687
HMWV time	7	1.68	.002	.109
A10 Thunderbolt II time	7	1.20	.001	.298
C4 planted	7	6.63	.006	< .001
Mortar shots	7	1.83	.002	.078
Grenade shots	7	11.85	.011	< .001
Claymore shots	7	1.22	.001	.287

Cooperation: From Table III it can be observed that there was a significant effect of the country of residence on 11 of the 15 cooperative play style variables.

Tactical choices: From Table IV it can be observed that only two of the variables measured showed significant effect of nationality.

B. One-way multivariate analysis of variance (MANOVA)

A one-way multivariate analysis of variance (MANOVA) test was employed in each of the three categories of play style. The aim of the MANOVA was to determine whether cross-cultural differences in play style exist when the variables are analyzed jointly. Prior to conducting the MANOVA, Pearson correlations were utilized between all play style statistics within each group in order to test the assumption that the variables are moderately correlated with each other.

Competition: Although Barlett's test of sphericity[3] was significant ($\chi^2(44) = 802953.91, p < .001$), Pearson correlations between the variables reflecting competitiveness in play style showed a meaningful pattern of moderate correlations in the majority of variables [23]. The results suggested that performing a MANOVA was appropriate. In order to maximize the statistical power of the MANOVA, variables that repeatedly did not show a moderate correlation (i.e., between .15 and .60) with other variables were not taken into consideration. Two variables met the exclusion criterion: Capture flags points, and Flag attacker ribbons.

The MANOVA results revealed that nationality has a significant effect on competitive play style, using Wilk's statistic,

$\lambda = .944, F(63, 49798) = 6.51, p < .001$. MANOVA suggests that 5.6% of the variance in competitive play style variables is explained by a player's nationality.

Cooperation: Although Barlett's test of sphericity was significant ($\chi^2(77) = 293278.40, p < .001$), Pearson correlations between the variables reflecting cooperation in play style showed a meaningful pattern of moderate correlations in the majority of variables [23]. The results suggested that performing a MANOVA was appropriate. Three variables that repeatedly did not show moderate correlations with other variables were removed to maintain high statistical power of MANOVA: Laser designation ribbons, Repairs, and Heals.

The MANOVA results revealed that nationality has a significant effect on cooperative play style, using Wilk's statistic, $\lambda = .958, F(84, 49791) = 3.64, p < .001$. MANOVA suggests that 4.2% of the variance in cooperative play style variables is explained by a player's nationality.

Tactical choices: A MANOVA analysis of the variables that represent Tactical Choices was deemed useless, as these variables showed very few significant results.

C. Pairwise comparisons

In order to fully understand the link between culture and play style, pairwise comparisons between the values for play style variables for different countries were employed. Since the literature did not suggest any patterns with regards to cultural differences in play style, post-hoc Games-Howell tests were carried out to compare all countries with each other on the competitive and the cooperative play style variables. Details of these test are reported by Bialas [23].

For competitiveness, the only outstanding pattern that could be observed was a relationship between Germany and the United States. These two countries significantly differed from each other with regards to three of the competitive play style variables. However, German participants had higher means in two variables (Flag attacker ribbons and Accuracy ribbons), while American players on average had more MVP ribbons. Thus, no specific patterns concerning the category of competitiveness were shown.

In terms of cooperation, the results of the Games-Howell test demonstrated a number of interesting patterns. German players tend to exhibit numerous statistically significant differences in cooperative play style. The differences between German players occur most frequently with players from the United Kingdom (five variables), the United States (four variables), and Canada (four variables). In all but one case (MCOM defender kills) German players scored significantly higher than players from other countries, which means that, in general, German players tend to play more cooperatively than players from the United Kingdom, United States, and Canada. A similar pattern can be observed in the in-game performance of Swedish players, who tend to significantly differ from players from both the United Kingdom and United States (four variables in both cases). In three out of four variables, Swedish players score significantly higher than British and American players. Thus, the observable patterns from the Games-Howell test indicate that players from the United Kingdom and the United States are generally less likely to cooperate than players from Germany and Sweden.

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[3]Barlett's test is used to verify that variances are homogeneous across the samples.

V. DISCUSSION

The aim of this study was to establish whether national culture has an influence on how players behave in video games. Our results show that cross-cultural differences in play style do exist. Variables that reflected players' cooperative and competitive actions demonstrated significant effect of national culture. MANOVA revealed that national culture explains 5.6% of variance in competitive and 4.2% of variance in cooperative in-game behavior. The most significant finding regarding the pairwise comparisons was that German and Swedish players tend to exhibit more cooperative behavior than players from the United Kingdom and the United States. The results also suggest that tactical choices made by players are not influenced by their nationality.

Admittedly, the size of the effect of national culture on play style that we found is small (around 5%). That is not surprising: in general, we expect that players let the game situations and their personal skills determine their decisions. Culture will only influence a tendency towards a particular play style in situations where there is, in fact, a legitimate choice available.

The nature of cross-cultural differences in play style is hard to determine. One possible explanation would be that nationality has a direct impact on how people choose to play video games. However, considering the complexity of the concept of culture, a more likely explanation of its link to play style is that it correlates with specific aspects of culture. In this study play style was categorized into three categories, which were established based on Hofstede's [1] cultural dimensions theory. Our results are in line with Hofstede et al.'s countries index [11]. The fact that German and Swedish players displayed cooperative behavior in the game more often than players from the United Kingdom and the United States is consistent with those countries' scores in the Individualism dimension.

It should be noted that in the data set there is a possibility of sample bias towards expert players due to the method used to recruit participants [8]. However, the data set covers a widespread distribution of numerous game statistics, which suggests the inclusion of players of diverse game expertise.

We realize that statistical analyses on large sample size databases are prone to giving very small p-values that suggest significant effects where they in fact do not exist. This holds in particular for multiple independent tests, like the series of ANOVAs performed in this study. The limitation of performing statistical analyses on large sample size databases was dealt with in two ways in this research. First, taking $p < .001$ as a level of significance threshold mitigated the effects of the large sample size. Second, the effect sizes were reported as they are considerably more robust than the p-values or magnitudes of the coefficients.

We expect that larger effects might be found when comparing play styles between Western and Eastern countries. However, in our data set the number of players from Eastern countries was insufficient to be usable for analyses. This is not surprising, as *Battlefield 3* is typically a "Western game."

Demonstrating that there is a significant relationship between play style and players' nationality may have an influence on future research in the fields of player modeling and game personalization. So far, video game studies have not differentiated between play style preferences among different nationalities. The acknowledged small but significant impact of culture on play style may influence the academic perspective on analyzing video games users. It may also have practical implications for improving the designs of video games.

VI. CONCLUSION

The aim of this study was to find an answer to the question to what extent national culture influences a player's in-game behavior. Based on our findings, we conclude that cross-cultural differences in play style exist and do affect play style. In our *Battlefield 3* data set we found that national culture accounts for 5.6% in competitive play style, and 4.2% in cooperative play style. We found no significant results for the influence of culture on tactical choices. When comparing countries, the most noticeable pattern was apparent with regards to cooperation, where it was observed that players from Sweden and Germany tended to exhibit significantly more cooperative in-game behavior than American and British players. This finding is consistent with the Hofstede et al.'s [11] index of countries. Thus, the results support Hofstede's claim [11] that people from the United Kingdom and the United States assign higher value to their individual goals than to the collective, which we found extends to their in-game behavior.

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