Predicting Player Preferences for Single-Player or Online Games Using Individualism-Collectivism Lexical Expressions on Weibo

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Abstract

Players' preferences for different types of games are influenced by their personal characteristics. The number of players determines that single-player game modes exhibit higher autonomy, whereas online game modes exhibit higher collectivity. Given that individuals with individualistic tendencies emphasize independence while collectivist individuals emphasize collaboration, we posit that players' individualism-collectivism orientation may influence their preferences for single-player or online games. This study leverages Weibo big data and employs text analysis methods to investigate whether differences exist in the expression of individualism-collectivism words and word categories in the Weibo posts of single-player game players versus online game players, and seeks to utilize these features to predict players'preferences for single-player or online games. The results reveal that individualistic word categories appear with higher frequency in the Weibo posts of single-player game players, while collectivistic word categories appear with higher frequency in the Weibo posts of online game players. Using machine learning methods, player types can be predicted using only individualism-collectivism word expressions as independent variables, though the accuracy is relatively low. This study provides preliminary evidence for identifying users' game preferences through Weibo big data and possesses certain practical value.

Full Text

Preamble

Predicting Players' Preferences for Single-Player or Online Games Through Individualism-Collectivism Word Usage on Weibo

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Abstract: Players' preferences for different game types are influenced by their personal characteristics. The number of players involved determines that single-player game modes afford greater autonomy, while online game modes afford greater collectivity. Given that individuals with individualistic tendencies emphasize independence, whereas those with collectivistic tendencies emphasize collaboration, we hypothesized that players' individualism-collectivism orientation may affect their preference for single-player or online games. Using large-scale Weibo data and text analysis methods, this study investigated whether differences exist in individualism-collectivism word and category expressions in the Weibo posts of single-player and online game players, and whether these features can predict player preferences. Results showed that single-player game players exhibited higher frequencies of individualistic words, while online game players exhibited higher frequencies of collectivistic words. Using machine learning methods with individualism-collectivism word expressions as independent variables could predict player type, though accuracy was low. This study provides preliminary evidence for using Weibo data to identify users' game preferences and holds certain practical value.

Keywords: individualism-collectivism; single-player game; online game; player type; text analysis

1 Introduction

Over the past decade, the number of gamers in China has grown rapidly, with surveys indicating that the total number of gamers exceeded 530 million in 2015 (王艳, 2016). Game developers continuously release diverse games to meet varying market demands. Based on player count, games can be broadly categorized into single-player games and online games. In this study, single-player games refer to games participated in by only one player, whereas online games refer to games in which multiple players are simultaneously online and can interact with one another.

In daily life, we observe that single-player and online game players appear to be distinct groups. In other words, some players tend to prefer single-player games, while others prefer online games. Why do people prefer different types of games? Previous research has confirmed that players' game choices are influenced by their individual characteristics, with players selecting games that better match their personal traits (Chory & Goodboy, 2011; Fang & Zhu, 2011).

The most fundamental difference between single-player and online games lies in the availability of support from other players. In single-player games, players must rely on themselves to complete tasks, thus requiring greater independence. In online games, players can interact and jointly complete tasks, thus requiring greater collectivity. Consequently, players who prefer single-player games may enjoy completing tasks independently, while those who prefer online games may enjoy completing tasks collectively. This difference between the two player groups may be captured by the psychological concept of individualism-collectivism orientation. Research generally holds that individualistic individuals focus more on personal autonomy and uniqueness, whereas collectivistic individuals focus more on group interests and inter-member collaboration (苏红 & 任孝鹏, 2014; Oyserman, Coon, & Kemmelmeier, 2002; Hofstede, 1991). Therefore, players who prefer single-player games may have higher individualistic tendencies, while those who prefer online games may have higher collectivistic tendencies. In other words, we propose that players' individualism-collectivism orientation may influence their preference for single-player or online games.

Previous measurements of individualism-collectivism orientation have primarily employed self-report methods (Triandis & Gelfand, 1998) or experimental tasks (Talhelm et al., 2014). However, these approaches may be subject to experimenter effects and social desirability biases. Recent studies have used big data methods to track changes in the frequency of specific words in the Google Books database over time, enabling quantitative assessment of national-level trends in individualism-collectivism orientation (Greenfield, 2013; Zeng & Greenfield, 2015). This research approach provides a new perspective for measuring individualism-collectivism orientation. Therefore, this study adopted a similar method, calculating the frequencies of individualism-collectivism-related words and word categories from players' extensive Weibo posts, with the ultimate goal of using these frequency features to predict whether players prefer single-player or online games.

This study had two objectives. The first was to investigate differences in individualism and collectivism keywords and word category expressions in the Weibo posts of single-player and online game players. We hypothesized that single-player game players would exhibit more individualistic word expressions, while online game players would exhibit more collectivistic word expressions. Specific hypotheses were as follows: H1) Online game players would express "we" more frequently, while single-player game players would express "I" more frequently; H2) Online game players would express more collectivism-oriented words such as "help" and "friendship," while single-player game players would express more individualism-oriented words such as "autonomy" and "personality."

The second and more important objective was to use machine learning methods to predict players' choices between single-player and online games based on individualism and collectivism keywords and word category expressions.

2.1 Game Selection

In this study, single-player game players specifically refer to players of *The Scroll of Taiwu* (a single-player strategy role-playing game, SRPG), while online game players specifically refer to players of *Justice Online* (a massively multiplayer online role-playing game, MMORPG).

The selection of these games was based on several considerations: 1) We consulted popular game rankings on several websites and found that both games were popular in China during the current time period; 2) Both *The Scroll of Taiwu* and *Justice Online* are domestically developed PC games released around September 2018 with ancient Chinese settings, providing certain comparability; 3) *The Scroll of Taiwu* has only a single-player mode, while *Justice Online* has only an online mode. Some popular games such as *Minecraft* have both single-player and online multiplayer modes, but since this study aimed to distinguish between "single-player" and "multiplayer online" player groups, such games were not considered for inclusion.

2.2 Player Weibo Data Acquisition

We searched Weibo for two keywords: 1) For single-player game (*The Scroll of Taiwu*) players, the keyword was "#TheScrollofTaiwu#" ; 2) For online game (*Justice Online*) players, the keyword was "#JusticeOnline#" . Using web crawler methods, we captured user information and Weibo text containing these keywords to obtain data for single-player and online game players.

Two main considerations guided our player identification on Weibo: 1) A user mentioning a game in their Weibo text, such as "The Scroll of Taiwu," does not necessarily indicate they are a player of that game. However, if a user' s Weibo text contains "#TheScrollofTaiwu#," it indicates the user participated in the game' s topic discussion, and based on our incomplete observations, users who participate in topic discussions are highly likely to be players of that game. Therefore, we used "#TheScrollofTaiwu#" and "#JusticeOnline#" as our search keywords; 2) We removed verified accounts (those with a "V" badge) from the collected user accounts, including streamers, clubs, and official game developer or operator accounts. Because these accounts belong to public media, their Weibo expression styles differ from ordinary players and could contaminate our results, they were excluded.

We ultimately obtained Weibo data from 124 single-player game (*The Scroll of Taiwu*) players and 1,000 online game (*Justice Online*) players.

Regarding the large discrepancy in data volume between the two player groups (approximately 10-fold), we believe a possible explanation is that the official *Justice Online* Weibo account frequently holds retweet-and-win coupon events, resulting in more online game players participating in the game' s topic discussions. For the single-player game (*The Scroll of Taiwu*), there are few official activities, and participation in game topic discussions relies solely on players'

voluntary engagement, thus the relative number is smaller. This fact demonstrates that identifying gamers, particularly single-player game players, through game-related expressions on Weibo is challenging, as only a minority of users express themselves about games on the platform. This indirectly reflects the significance of our study—if we can predict users' game preferences from their daily expressions, the approach could be applied to much broader user populations.

2.3 Player Sample Selection

We randomly selected 120 players from the 1,000 online game players as our analytical sample of online game players. The single-player game player sample consisted of 124 players.

We sampled a subset of online game players because the large difference between the original sample sizes of single-player and online game players could cause bias in subsequent difference tests. Therefore, we chose to extract a subset to match the sample size of single-player game players.

The average Weibo registration year for all online game player samples was 2010.45 (SD = 0.62), with males comprising 26.3% of the sample. These values did not differ substantially from the extracted online game player sample (Weibo registration year: M = 2010.38, SD = 0.63; male proportion: 27.50%). Therefore, we believe the online game player sample used in our analysis can represent the overall online game player sample.

2.4 Feature Extraction

Analysis of Weibo data involves analyzing extracted feature values. The features we extracted from players' Weibo posts can be divided into two main categories: 1) User features, extracted from user profiles, including each user' s gender, Weibo registration year, follower count, mutual follower count, following count, and like count; 2) Weibo expression features, extracted from user Weibo text, including each user' s total number of Weibo posts, number of original posts, total word count of original posts, frequency of "I,"frequency of "we,"frequency of words in the individualism dictionary, and frequency of words in the collectivism dictionary. Python programs were used for feature extraction.

We selected these features primarily based on our research objectives and hypotheses. We were particularly interested in whether 1) individualism-collectivism word expression frequencies and 2) individualism-collectivism word category expressions (i.e., word frequencies in the individualism and collectivism dictionaries) would differ between single-player and online game player groups. For Weibo text feature extraction, only users' original posts were used, as original posts better reflect users' personal characteristics.

Based on previous literature, "I"and "we"were selected to represent individualistic and collectivistic tendency words, respectively (DeWall et al., 2011). Words such as "different" and "independent" were selected to form the individualism

dictionary, while words such as "together" and "family" were selected to form the collectivism dictionary. Other words included in the dictionaries are shown in Table 1 (Xu & Hamamura, 2014; Twenge, Campbell, & Gentile, 2012; 包寒吴霜 et al., 2018).

2.5 Analysis

(1) Difference Tests
To investigate differences in user features and Weibo expression features between the two player groups, we used Python computational functions to conduct difference tests on extracted feature values (such as the frequency of "I" in Weibo posts) from single-player and online game player data. Because the distributions of all feature values violated normality assumptions, we performed Mann-Whitney U tests on all variables.

(2) Player Type Prediction
Using the SVM method in machine learning, we extracted several feature values from players' Weibo expressions (such as gender) as independent variables to predict player category (the dependent variable). Two considerations guided our independent variable selection: 1) features that showed differences between the two player groups based on difference test results, and 2) features of particular research interest. Because the original values of word frequency features were very small, we multiplied the raw data by 100 when using word frequency features as independent variables. For the dependent variable, single-player game players were coded as "0" and online game players as "1."

We randomly selected 80% of all samples (including both single-player and online game players, totaling 244 players) as the training set and the remaining 20% as the test set. By inputting the training set' s independent and dependent variables, we used SVM for learning to obtain a prediction model. We then used this model to input the test set' s independent variables and predict their dependent variables (i.e., player type). Finally, we calculated model accuracy as the number of correct predictions divided by total predictions, which served as our model evaluation metric. Higher accuracy indicates better player classification performance.

Given the small sample size in our study, using a single random split for model prediction might produce substantial bias. Therefore, we randomly generated 500 training sets to create 500 models, calculated each model' s accuracy, and used the mean of the 500 accuracy values as our final model evaluation metric.

3.1 Differential Test Results

Descriptive statistics and difference test results for feature values extracted from the two player groups'Weibo data are shown in Table 2 . Regarding user features, we found that single-player game players included slightly more males (54.84%), while online game players included very few males (27.50%). Single-player game

players' mutual follower counts ($p < 0.01$) and following counts ($p < 0.05$) were significantly higher than those of online game players. Both groups had similar average Weibo registration years around 2010, with no significant difference.

Regarding Weibo expression features, we found no significant difference in total Weibo counts between the two groups. However, single-player game players' original post counts ($p < 0.01$) and total original post word counts ($p < 0.05$) were significantly higher than those of online game players. For individualism-collectivism word expressions, online game players showed higher frequencies of both "I" ($p < 0.01$) and "we" ($p < 0.05$) in their Weibo posts. For individualism-collectivism word category expressions, single-player game players showed higher frequencies of words from the individualism dictionary ($p < 0.05$), while online game players showed higher frequencies of words from the collectivism dictionary ($p < 0.05$).

3.2 Player Type Prediction Results

Using the SVM method in machine learning, we extracted several feature values from Weibo data as independent variables and used player type as the dependent variable for model learning and test set prediction. Results are shown in Table 3 . As can be seen, using only gender as an independent variable, the mean accuracy across 500 models reached 63.43%. Using only the individualism-collectivism expression set (i.e., the four features of "I" frequency, "we" frequency, individualism dictionary frequency, and collectivism dictionary frequency) as independent variables, the mean model accuracy reached 55.13%. However, using both gender and the individualism-collectivism expression set (five features total) as independent variables yielded a mean accuracy of 63.41%, which did not represent improvement over the gender-only prediction model.

4 Discussion

In this study, we extracted feature values including individualism-collectivism word expression frequencies and individualism-collectivism word category expression frequencies from Weibo data of 124 single-player game (*The Scroll of Taiwu*) players and 120 online game (*Justice Online*) players. We then conducted difference tests on these features between the two player groups and finally used machine learning methods to classify players' game preferences based on these features. Results showed that online game players expressed more collectivistic words and collectivism dictionary words in their Weibo posts, while single-player game players expressed more individualism dictionary words. Modeling with individualism-collectivism expressions as independent variables achieved approximately 55% accuracy in classifying players' game preferences, whereas modeling with gender as an independent variable achieved higher accuracy of approximately 63%.

The first purpose of this study was to investigate differences in individualism and collectivism keywords and word category expressions in the Weibo posts of

single-player and online game players. We hypothesized that single-player game players would show more individualistic word expressions, while online game players would show more collectivistic word expressions. Our results largely confirmed these hypotheses, finding that online game players expressed "we" more frequently and more collectivism-oriented words such as "help" and "friendship," while single-player game players expressed more individualism-oriented words such as "autonomy" and "personality." Additionally, results showed that single-player game players had higher counts of original posts and greater total word counts in original posts. Expressing one' s opinions in public forums is considered a behavior that demonstrates personal uniqueness (Ho & Dempsey, 2010). Therefore, these original post quantity features also suggest that single-player game players have higher individualistic tendencies. However, we found an unexpected result: online game players also expressed "I" more frequently in their Weibo posts. A possible explanation is that single-player game players may not frequently use subjects when expressing themselves. For example, subject-less expressions like "Had a late-night snack today, so happy" are common in colloquial Weibo posts. Overall, consistent with Chory and Goodboy (2011), this study reaffirms that gamers' individual traits influence their game choices, and players tend to select games that better match their personal characteristics. Specifically, the study found that individualistic individuals prefer single-player games, while collectivistic individuals prefer online games.

The second and more important purpose of this study was to use machine learning methods to predict players' choices between single-player and online games based on individualism and collectivism words and word category expressions. Results showed that models trained on individualism-collectivism text expressions could predict player type, but accuracy was only slightly above chance level. This may be because even within the same player group, individual differences are substantial, as indirectly reflected by the large standard deviations of feature values. It should be noted that the current sample size for model training is very small; increasing the sample size might improve prediction accuracy. Additionally, the prediction sample size is also very small. If the current model were used to predict preferences for single-player or online games among tens of thousands of Weibo users without target values, even with only 60% accuracy, the number of successful predictions would still be considerable. Moreover, this study found substantial gender differences between single-player and online game player groups, suggesting that gender should be considered as a variable in future research discussing player types. In summary, although the current model can be further improved, it already possesses certain practical value.

In conclusion, this study found that players with higher individualistic tendencies in their Weibo expressions prefer single-player games, while those with higher collectivistic tendencies prefer online games. Using individualism-collectivism words and player gender from Weibo expressions can predict preferences for single-player or online games, though prediction accuracy needs further improvement. Through analysis of different player types, this study achieves prediction of gamer types and can be applied to game advertising

placement, holding certain commercial application value.

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Note: Figure translations are in progress. See original paper for figures.