Dark Desires? Using the Theory of Basic Desires to Better Understand Toxic Behavior in Multiplayer Online Games

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Abstract

Within the context of multiplayer online battle arena video games (MOBAs) toxic behavior (TB) remains a complex and yet unsolved socio-technological challenge. While significant work has been done recently, there is a lack of theory-guided approaches for curbing TB. In this work, we test the motivational theory of basic desires for explaining the occurrence of TB. For this, we used a survey approach and collected a sample consisting of players of the successful MOBAs League of Legends and Dota 2 (n = 308). Using a PCA, results indicate two underlying factors of the 16 basic desires (i.e., physiological and social factors). Consequently, both factors hold the potential to explain TB. In addition, the predisposition age showed a significant influence on TB in our sample. These findings highlight the 16 basic desires as a promising frame for understanding the antecedents of TB.

Keywords: multiplayer online battle arena video games, toxic behavior, individual motivation, theory of basic desires.

1. Introduction

During the last decades information technologies (IT) have become central pillars of digital transformation. This development imposes changes to the everyday interactions of individuals related to the development, maintenance, and use of computer systems, software, and social networks for the processing and distribution of data that manifest themselves in areas such as online education, social networks, smartphones, and entertainment [1]. This digital disruption came with two different sides of a coin. On the one hand, this development has typically been viewed as positive and beneficial including phenomena such as in academic performance, general development or collaboration [2]. On the other hand, recent studies have suggested worrying evidence that IT use also includes serious "dark sides." In other words, IT use may lead to negative consequences with varying degrees of severity for individuals, employees, families, firms, and societies. Accordingly, negative phenomena such as techno-stress [3, 4] or cyberbullying [5] enjoy heightened attention in research and practice.

Within the context of entertainment and more specifically *of multiplayer online battle arena video games (MOBAs)* such as League of Legends (LoL) or Defense of the Ancients 2 (Dota 2), one phenomenon related to the dark side of IT use, enjoying heightened levels of attention is toxic behavior (TB), which is an umbrella term used to describe various types of negative in-game behaviors including harassment, flaming, trolling (e.g. gaining enjoyment from intentionally annoying other players), and cheating (e.g., smurfing other accounts or the use of programs to automate certain in-game behaviors) during games [6, 7, 8]. On a level of content, TB is considered to be a sincere problem and the main driver of the churn of players relevant for the industry limiting the user experience for players [9, 10]. However, despite some infrequent attempts regarding opportunities for curbing TB [11] it remains unclear to the present day how to buffer TB on a level of technology.

Answering this, we seek to contribute to this shortcoming by identifying references to buffer TB in a theory guided manner. For this, we consult the theory of 16 basic desires, which is a motivational theory postulating that the intrinsic desires of power, curiosity, independence, status, social contact, vengeance, honor, idealism, physical exercise, romance, family, order, eating, acceptance, tranquility, saving hold the potential

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to explain a wide array of individual behaviors [12, 13]. Within the context of MOBAs and despite some incomplete attempts [14] the theory of basic desires has never been holistically applied in relation to TB. Building on this, we aim to better understand two different aspects related to the occurrence of TB. First, we seek to derive an efficient instrument detecting underlying factors of the 16 basic desires. Second, building on the results of the earlier aspect, we want to explore the predictive potential of the identified factors in relation to TB. For this, we make use of inferential statistics (e.g., principal component analysis, regression analysis) and a survey approach with the aid of a digital questionnaire collecting data from players of the two multiplayer online games LoL and Dota 2. Based on this, the paper is guided by the two subsequent research questions (RQ):

RQ 1: Are there underlying factors of the 16 basic desires that can be identified via principal component analysis?

RQ 2: What is the explanatory potential of the previously identified factors in relation to TB?

To answer our two RQs, the remainder of this paper is structured as follows. First, in the theoretical background section, we introduce TB, basic desires, and individual dispositions that were relevant in previous work in the context of TB. Next, we describe the methodology including research design, measurements used, and data collection. Following this, we present the results comprising the identification of factors underlying the basic desires and their potential to predict TB. Afterwards, we discuss our main findings, their implications and limitations, and future work. The paper closes with a short conclusion section.

2. Theoretical background

2.1. Toxic behavior in multiplayer online games

TB is one of the most relevant challenges in a variety of popular MOBAs (such as LoL, Dota 2, or Fortnite). Whereby, the occurrence of TB shows a close proximity to the design features of real-time interaction and competition [9, 15] that are enabled by the progressive digitization and further developments in hardware during the last decades [16]. On a level of content, TB is a umbrella term to describe various types of negative behaviors while playing MOBAs such as harassment, flaming, trolling, or cheating [6, 10, 17]. TB can show itself on different levels of manifestations such as verbally (e.g., voice chat), non-verbally (e.g.,

text chat) or behavioral components (e.g., intentionally supporting the enemy team) [7]. In Figure 1 a typical scenario showing TB in the MOBA LoL is depicted as an example of text related TB. Opposed to better researched and understood constructs such as cyberbullying (describing an intentional and aggressive form of personal harassment in the online environment that oftentimes happens with a shift in times between the behavior of the aggressor and the victim) [18, 19], TB is much more temporal happening in real-time, a rather normalized part of the ordinary culture of play, and is more anonymous, and can be understood as an attempt to cope with frustration occurring during games [20].

Figure 1. Sample TB in game chat.

Due to the fact that TB is considered to be one of the main reasons for the churn of players indicating potential losses, the industry of MOBAs already carried out attempts to buffer TB including reporting features penalties for misbehaving players, providing design features to fade out toxic players (muting and blocking features to enable silencing players) and nudges toward collaborative behavior underlining the added-value of positive collaboration during games [10, 21]. Within the last couple of years, TB started to enjoy heightened levels of attention in research as well. Accordingly, previous research already identified the relevance of the design elements team competition and multiplayer exchange allowing players to attribute failure to others [10], that TB predominantly emerges over the course of a game as a response to negative events, to discourage existing players [22], and that TB scares away new players [23]. Additionally, a recent study (Kordyaka et al., 2020) provided a theoretical explanation of the occurrence of TB underlining the relevance of the online disinhibition effect and its antecedents. However, TB remains a sincere problem in a variety of MOBAs and it is important to better understand what factors influence TB to have the chance to adequately deal with it and have curb associated behaviors.

2.2. Theory of the basic desires

Understanding individual motivation has a long history in Information Systems and HCI research [24]. Accordingly, theories and approaches such as Maslow's hierarchy of human needs [16], McClelland's three needs theory [25], and Herzberg's motivation theory[26], have been widely applied. A theory originated from Maslow's [16] hierarchy of human needs and William James' theory of internal desires [27], enjoying less attention up to now due to their data-driven origin and their alternative conceptualization of motivation is the theory of basic desires [12]. However, we argue that the theory of basic desires is a particularly suitable approach within the context of TB because it covers a wide array of potential starting points to curb resulting behaviors such as TB. Opposed to other dualistic motivation theories differentiating intrinsic and extrinsic motivations, the conceptualization of the theory of basic desires postulates a multifaceted theory recognizing a number of genetically distinct motives of individuals [12]. Specifically, the theory states that individuals differ themselves in 16 different basic desires (i.e., power, curiosity, independence, status, social contact, vengeance, honor, idealism, physical exercise, romance, family, order, eating, acceptance, tranquility, and saving). Furthermore, the theory assumes that basic desires represent intrinsic desires that hold the potential to directly motivate a person's behavior due to the triggering of one of the 16 basic desires. The subsequent Table 1 illustrates the definitions of the 16 basic desires.

Table 1. Definition of the 16 basic desires

Motive	Definition
Power	Desire to influence
Curiosity	Desire for knowledge
Independence	Desire to be autonomous
Status	Desire for social standing (including desire for attention)
Social contact	Desire for peer companionship
Vengeance	Desire to get even
Honor	Desire to obey a traditional moral code
Idealism	Desire to improve society (including altruism, justice)
Physical exercise	Desire to exercise muscles
Romance	Desire for sex (including courting)
Family	Desire to raise own children
Order	Desire to organize (including desire for ritual)
Eating	Desire to eat
Acceptance	Desire for approval
Tranquility	Desire to avoid anxiety, fear
Saving	Desire to collect, value of frugality

Sporadically, research dealing with TB already applied the theory of 16 basic desires using the contexts of the two MOBAs LoL and Dota 2 [14]. Specifically, the study only used the three basic motives power, independence, and status while not considering influences of the other 13 basic desires. Results of the study showed a positive relationship between the triggering of the motives and the occurrence of TB, which was attributed to the competitive character of the games under consideration. To the best of our knowledge, holistic insights considering influences of all 16 basic desires simultaneously within the context of TB are missing. Hence, we address this research gap.

3. Methodology

3.1. Research design

To find empirical evidence regarding our first RQ, we used a cross-sectional approach collecting self-reported data from players of the two s LoL and Dota 2 using an online survey. Subsequently, we analyzed the data with covariance-based statistics (i.e., regression analysis) using the software SPSS 28 to better understand what motives explain TB.

To ensure a structured procedure, we used a two-step approach, which is depicted in the subsequent Figure 2. First, in chapter 4.1, we use principal component analysis to identify underlying patterns of the basic desires. Second, in chapter 4.2, we apply regression analysis to better understand the influence of the derived factors on TB.

Step	1	2
Chapter	4.1	4.2
Aim	Identify underlying patterns of the basic desires	Understanding the influence of factors on toxic behavior
Methods	(iterative) Principal component analysis	Regression analysis

Figure 2. Procedure of our study.

3.2. Measurements

A full list of measurements is depicted in the appendix of this study. On a level of content, we used validated scales and items from previous research to ensure comparability and unnecessary confounds on a level of the wording of items.

Toxic behavior. To measure TB, we used an empirically validated scale consisting of five items [28]. The scale used a seven-point Likert scale ranging from

1 ("strongly disagree") to 7 ("strongly agree"). We decided to use the average sum scores of the factors of the relevant items because they could be averaged to reflect the scale, are easy to interpret, and preserve the initial variation in the data. The scale showed good internal consistencies (M = 3.84; SD = 1.74; Cronbach's Alpha = 0.93) and comprised statements such as "If I get mad during a game, I hold others responsible making own mistakes". For descriptives and loadings see Table 2.

Table 2. Descriptives and loadings of the TB items

Item	M	SD	Loading
...intentionally interrupt others while they are writing.	3.85	1.99	.90
...hold others responsible making own mistakes.	4.02	1.90	.85
...take away resources belonging to others.	3.86	2.03	.90
...insult others.	3.50	1.99	.89
...criticize others.	3.99	1.91	.88

Basic desires. To measure the 16 basic desires, we used an existing instrument from previous research that applied a seven-point Likert scale ranging from 1 ("strongly disagree") to 7 ("strongly agree") [12]. Table 3 illustrates the descriptive values of all basic desires.

Table 3. Descriptive values of basic desires

Motive	min.	max.	M	SD
Power	1	7	4.74	1.54
Curiosity	1	7	5.04	1.50
Independence	1	7	4.94	1.54
Status	1	7	4.76	1.67
Social contact	1	7	5.13	1.42
Vengeance	1	7	4.02	1.92
Honor	1	7	4.73	1.62
Idealism	1	7	4.37	1.73
Physical exercise	1	7	3.96	2.06
Romance	1	7	3.73	2.06
Family	1	7	4.34	1.90
Order	1	7	4.64	1.58
Eating	1	7	3.95	2.05
Acceptance	1	7	4.87	1.56
Tranquility	1	7	4.44	1.62
Saving	1	7	4.61	1.73

3.3. Data collection

We conducted a survey collecting data from 335 MOBA players using the crowdsourcing marketplace Mechanical Turk (MTurk). All participants received $1.89 as a reward for participating in the study. To ensure that participants followed the requirement of playing either LoL or Dota 2, we asked them to indicate their three favorite game characters and excluded

participants with spurious or inconclusive answers (27 cases). Consequently, our final sample comprised 308 participants. Most participants were male (n = 208), the mean age was roughly 29 years (M = 29.19; SD = 6.92), and most held a bachelor's degree (62%). In addition, participants were either North American (n = 160) or Indian (n = 122), reported playing video games for approximately over 8 hours per week (M = 8.62; SD = 9.03), their playing experience was more than 3 years as an average (M = 3.47; SD = 2.59), and 138 participants primarily played LoL and 170 Dota 2. In relation to previous research the sample seemed to be representative.

4. Results

4.1. Identifying underlying patterns of the basic desires

In a first step, we derived descriptive statistics of the basic desires to check for implausible answers and missing cases. Answers of all 16 basic desires used the whole scale available ranging from 1 ("strongly disagree") to 7 ("strongly agree") and the majority of showed average values slighty above the center of the scale (M = 3.73 < M = 5.04). Consulting recommendations from previous research, we found the answers to all 16 basic desires suitable to carry out a principal component analysis (PCA) to identify underlying patterns [29]. The subsequent Table 3 illustrates the descriptive values of all 16 basic desires.

In order to identify underlying patterns of the basic desires, we inserted all 16 basic desires into a principal component analysis (PCA). After inspecting the eigenvalues, the scree-plot, and the results of a parallel analysis we decided to extract two factors using varimax rotation. The first iteration of the PCA showed significant cross-loadings regarding three of the basic desires (i.e., idealism, tranquility, saving). Accordingly, we excluded them from the further analyses and re-ran the PCA with the remaining 13 basic desires. Indicators suggested a two-factor solution once again. This time two of the basic desires showed substantial cross-loadings (i.e., curiosity, order). Consequently, we excluded both basic desires and ran another PCA. The PCA yielded two factors explaining a total of 63% of the variance for the entire set of basic desires. Despite the desire of power there were no substantial cross-loadings. After discussing the case across authors, we decided to not exclude the item due the low cross-loading and to ensure diversity of content. The communalities of the variables included exceeded the recommended threshold of .40 and the KMO (.92) and Bartlett's Test of Sphericity (.001) both indicate that the

set of variables are at least adequately related for conducting a PCA [30].

Table 4. PCA loadings of the basic desires

	Factor	
Basic desires	1	2
Power	.42	.57
Independence		.72
Status		.70
Social contact		.64
Vengeance	.68	
Honor		.72
Physical exercise	.84	
Romance	.86	
Family	.75	
Eating	.82	
Acceptance		.75

Note: Loadings < .40 are suppressed

To find suitable labels for the two factors, we consulted Maslow´s Hierarchy of Needs, which states that five categories of human needs dictate an individual's behavior ranging from physiological needs on the lowest level up to needs of self-actualization on the highest level [16]. Accordingly, we called factor 1 physiological desires (M = 3.47; SD = 2.59) due to high loadings on romance, physical exercise, eating, family, and vengeance because most of the desires describes rather fundamental physiological desires. This first factor explained 52% of the variance. We labelled the second factor derived social desires. This factor was labeled as such due to the high loadings on acceptance, independence, honor, status, and social contact that all show references to social entities of the Hierarchy of Needs. The variance explained by this factor was 11%. Since we used an orthogonal rotation technique (i.e., varimax) both factors can be considered independent of one another (i.e., they are not correlated). Taken together, we were able reduce the information included in the 16 basic desires into two efficient factors we labelled physiological and social factors, while maintaining the majority of variance. The subsequent Figure 3 illustrates the rotated factor solution.
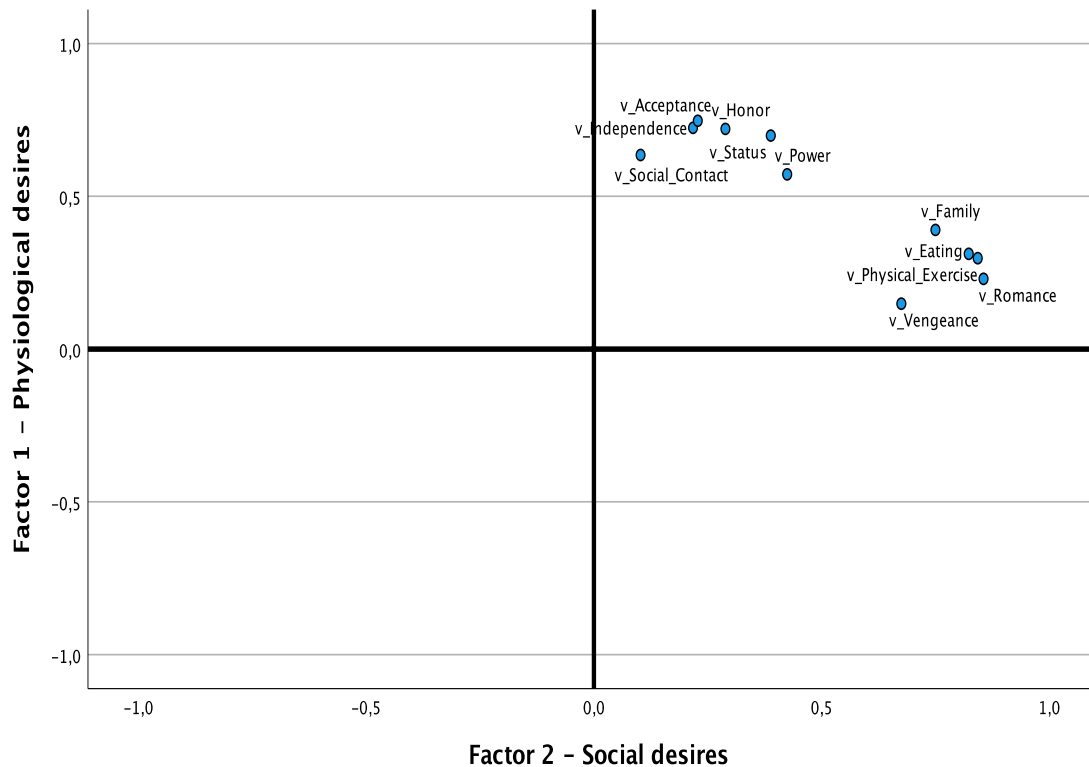

Figure 3. Rotated factor solution

4.2. Understanding the factor influence on toxic behavior

To better understand the occurrence of toxicity, we conducted a multiple regression analysis with the two factors derived previously (i.e., physiological desires and social desires) and several predispositions (i.e., age, gender, education, hours a week, experience of play, country) as predictors of the dependent variable TB. The regression equation showed a significant result ($F(8;299) = 33.51$; $p = .001$) and explained 46% of the variance of TB. After applying the Bonferroni correction, the predictor weights of physiological desires ($\beta = .58$; $p = .01$), social desires ($\beta = .16$; $p = .01$), and age ($\beta = -.15$; $p = .02$) had significant influences on TB (all others $p \geq .32$).

Based on the insights derived, we carried out additional analysis. Specifically, we wanted to explore patterns between the two factors of the basic desires and TB in relation to age. For this, we split the dataset into a young and an old group using the mean average of the variable age. Afterwards, we inserted the two factors of basic desires (i.e., physiological and social desires) and the predispositions (i.e., age, gender, education, hours a week, experience of play, country) as predictors of the dependent variable TB into two regression analyses. The subsequent Table 5 comprises the regression analyses for both groups.

Table 5. Regression analyses explaining TB in relation to age

Predictor	Younger group		Older group	
	b	*p*	*b*	*p*
Physiological desires	.53	.01	.57	.01
Social desires	.22	.01	.05	.99
Age	-.09	.80	-.15	.48
Gender	-.02	.99	-.12	.99
Education	.13	.32	.03	.99
Hours a week	-.03	.99	.10	.99
Experience of play	.12	.24	-.02	.99
Country	-.10	.48	.12	.96
R^2	.44		.38	

Note: We adjusted the significance levels using the Bonferroni correction method

In line with our finding that the empirical indicator age is negatively connected with TB in the previous step, the regression model of the younger group ($R^2 = .44$) explained more variance than the model of the older group ($R^2 = .38$). Despite no significant influences of any of the predispositions in both groups ($p \geq .24$), physiological desires showed a meaningful influence in the young ($\beta = .53$; $p = .01$) as well as the old group (β

$= .57$; $p = .01$). Opposed to this, social desires were only relevant for members of the younger group ($\beta = .22$; $p = .01$) and not for members of the older group ($\beta = .05$; $p = .99$).

5. Discussion

5.1. Key findings

Based on our results, we summarize our key findings with the following three points:

First, we reduced the original set of 16 basic desires into two orthogonal factors, which we called physiological (comprising basic desires such as vengeance, physical exercise, romance, family, eating) and social desires (comprising desires such as power, independence, status, social contact, acceptance). The two-factor solution provides an innovative, efficient, and practical opportunity to add value through the usage of the theory of basic desires in the context of TB.

Second, we showed that both factors identified hold the potential to disjunctively predict substantial shares of TB in a positive manner. Whereby, the influence of the factor of physiological desires was more meaningful. Accordingly, satisfying basic desires of both factors before playing should reduce the probability of the occurrence of TB postulating a satiation of basic desires [31]. Corresponding findings provide concrete points of reference to buffer TB.

Third, we identified the predisposition age to have a relevant influence on the occurrence of TB. Additional analyses splitting the dataset into a young and an old group revealed that the physiological factor was relevant for both groups opposed to the social factor that was only relevant for participants in the younger group predicting TB. The insight allows the application of techniques of market segmentation and to target specific clusters of players in a differentiated manner.

5.2. Implications for theory

Results of our study allow for several implications relevant on a level of theory as well. Subsequently, we will elaborate on the most important of them.

First, results of our study extend the status quo of current research by allowing more granular insights regarding the role of basic desires in the context of TB. To the best of our knowledge the only study that already used parts of the theory of basic desires (which they called motives within their study) as an antecedent to

explain TB was a conducted by Kordyaka et al. (2020). Specifically, they showed that the basic desires of power, independence, and status predicted TB in a positive manner. Adding to this, we substantially extended the existing body of research by deriving two underlying factors (i.e., physiological and social) including all 16 basic desires in relation to TB showing that romance, physical exercise, and eating had the biggest influences on TB. However, our findings although indicate room for improvement regarding the fit between the theory of basic desires and TB since we had to exclude five of the basic desires as part of the iterations of the application of the principal component analysis. Based on our findings and the relevance of physiological desires, we suggest that it would be worth to derive a taxonomy of desires specific to the context of TB. This could be achieved by including components related to human territoriality behavior [32].

Second, to the best of our knowledge, our study is the first one using a multifaceted theory of motivation postulating a full set of 16 genetically distinct motives (i.e., basic desires) in the context of TB [12]. Accordingly, our findings can be understood as a complementary understanding of motivation indicating valuable insights that can be merged with existing findings related to the technological environment of TB [11] and personal dispositions of players [7, 14] to enable a more holistic understanding of the occurrence of toxicity.

Third, results of our study underlined the relevance of the predisposition of age indicating a negative relationship, which is a finding increasing the external validity of previous work on TB [14]. We understand this finding as an indicator of the added value to explore the exploratory potential of variables related to the personality of players in relation to TB. Potential avenues in which this could be addressed would be to test and compare influences of the big five personality inventory (consisting of the personality traits openness, conscientiousness, extraversion, agreeableness, neuroticism) [33] or the self-concept of individuals (consisting of the dimensions academic, social, family, peer, game, ability, physical) [34, 35] and explore what best predicts TB.

5.3. Implications for practice

From our findings, we also can derive some implications that are relevant for practitioners related to MOBAs. Subsequently, we will discuss some of them.

First, with our study and for the first time, we revealed the full potential of the theory of basic desires in the context of MOBAs and TB. Corresponding insights can be used to build interventions to reduce the probability of the occurrence of TB. Based on the assumption of satiation of basic desires [31] and our findings, we suggest practitioners of the industry of MOBAs to evaluate possibilities to reduce the saliency of physiological desires of players during their games. This could be achieved by nudging players towards desired behaviors by selected overlays before games. Exemplary, the identified physiological desires of physical exercise and eating could be addressed by nudging players to do some minor home workouts (such as going for a short walk or doing some pushups) or eat something (healthy) before the start of a game. The credibility of such actions could be increased by setting up collaborations with sports and nutrition companies providing opportunities to use currencies that are earned while playing the game to get discounts for activities that promise to reduce the saliency of physiological desires.

Second, we understand the relevant predisposition of age as an indicator that practitioners designing countermeasures against TB need to focus not only on in-game aspects, but also need to consider the offline personality of players to design measures against TB in a user-centered manner to increase effect seizes of those measures. This finding adds to previous work that showed the relevance of cultural differences in relation to TB (Kordyaka et al., 2022). Predispositions such as age as a determinant seem to be particularly promising because this data can be easily collected. On a more general level, we argue that practitioners should expand the scope of available data on players' personalities to develop more accurate user-centered solutions to reduce TB within their games. In reference to our results and the relevance of age, that would mean that we recommend including basic desires of the social factor (such as acceptance, independence, honor) should be predominantly used in cases of interventions aimed at younger players.

5.4. Limitations

In the following, regarding our empirical approach, we point out several limitations that also provide starting points for future research.

First, and foremost, our study relies on psychometric, self-reported data. Although these data are valuable, we believe that supplementing our findings with behavioral metrics could increase the robustness of our findings. One fruitful starting point could be contrasting self-reports of TB with log data from behavioral TB. This could be achieved getting in contact

with Riots (the publisher of LoL) research and development unit and establish a collaboration.

Second, we only looked at players of the two MOBAs LoL and Dota 2 so the generalizability of the identified relationships to other contexts relevant to the phenomenon of TB may be questioned. However, we tried to balance between a high external validity on the hand (which is why we used two of the most successful MOBAs) and unnecessary confounds due to the inclusion of too heterogenous games on the other hand (which is why we picked two MOBAs with comparable game play patterns). Therefore, our work should be understood as a starting point to better understand TB, and we argue that there is great potential for further work including other stages of TB testing the external validity of our insights in relation to other multiplayer online games.

Third, we measured the 16 basic desires with a single item each. Despite being an accepted approach from previous work such a procedure is limiting possibilities to derive indicators of validity such as the convergent validity of every desire. Consequently, we encourage future research to use richer and more holistic operationalizations measuring the basic desires with multiple items.

6. Conclusions

In this study, we attempted to better understand the relationship between the 16 basic desires and TB in the context of MOBAs. To this end, we examined players of the two popular MOBAs LoL and Dota 2 and proceeded in two subsequent steps. First, we identified two underlying factors of the 16 basic desires, which we called a physiological and a social factor. The identification of the two factors provides an efficient and innovative opportunity to better handle TB. Second, we used the information derived and tested the explanatory potential of the two factors in relation to TB, while controlling for demographic and control variables. Results showed significant influences of both factors increasing the probability of the occurrence of TB. Additionally, the demographic variable age indicated a significant negative influence on TB. Additional analysis using this information and splitting the data set in two groups of players (young vs old) revealing that the physiological factor was still relevant for both groups while the social factor was only relevant for the younger group. Taken together, we consider the results of our study as a starting point to better understand the explanatory potential of the 16 basic desires in relation to TB and how this information can be used to derive interventions to better handle TB.

References

[1] Dufva, T., and M. Dufva, "Grasping the future of the digital society", Futures 107, 2019, pp. 17–28.

[2] Rauterberg, M., "Positive effects of entertainment technology on human behaviour", In Building the information society. Springer, 2004, 51–58.

[3] Nimrod, G., "Technostress in a hostile world: Older internet users before and during the COVID-19 pandemic", Aging & Mental Health 26(3), 2022, pp. 526–533.

[4] Wang, X., S.C. Tan, and L. Li, "Technostress in university students' technology-enhanced learning: An investigation from multidimensional person-environment misfit", Computers in Human Behavior 105, 2020, pp. 106208.

[5] Barlett, C.P., D.A. Gentile, and C. Chew, "Predicting cyberbullying from anonymity.", Psychology of Popular Media Culture 5(2), 2016, pp. 171.

[6] Neto, J.A.M., K.M. Yokoyama, and K. Becker, "Studying toxic behavior influence and player chat in an online video game", ACM Press (2017), 26–33.

[7] Kordyaka, B., J. Krath, S. Park, H. Wesseloh, and S. Laato, "Understanding toxicity in multiplayer online games: The roles of national culture and demographic variables", (2022).

[8] Consalvo, M., Cheating: Gaining advantage in videogames, mit press, 2009.

[9] Kou, Y., "Toxic behaviors in team-based competitive gaming: The case of league of legends", Proceedings of the annual symposium on computer-human interaction in play, (2020), 81–92.

[10] Adinolf, S., and S. Turkay, "Toxic Behaviors in Esports Games: Player Perceptions and Coping Strategies", Proceedings of the 2018 Annual Symposium on Computer-Human Interaction in Play Companion Extended Abstracts - CHI PLAY '18 Extended Abstracts, ACM Press (2018), 365–372.

[11] Kordyaka, B., and B. Kruse, "Curing toxicity – developing design principles to buffer toxic behaviour in massive multiplayer online games", Safer Communities 20(3), 2021, pp. 133–149.

[12] Reiss, S., "Multifaceted Nature of Intrinsic Motivation: The Theory of 16 Basic Desires.", Review of General Psychology 8(3), 2004, pp. 179–193.

[13] Bengtsson, S., K. Fast, A. Jansson, and J. Lindell, "Media and basic desires: An approach to measuring the mediatization of daily human life", Communications 46(2), 2021, pp. 275–296.

[14] Kordyaka, B., K. Jahn, and B. Niehaves, "Towards a unified theory of toxic behavior in video games", Internet Research, 2020.

[15] de Mesquita Neto, J.A., and K. Becker, "Relating conversational topics and toxic behavior effects in a MOBA game", Entertainment Computing 26, 2018, pp. 10–29.

[16] Maslow, A.H., "A Dynamic Theory of Human Motivation.", 1958.

[17] Kordyaka, B., "Digital Poison – Approaching a Theory of Toxic Behavior in MOBA Games", 2018.

[18] Lowry, P.B., J. Zhang, C. Wang, and M. Siponen, "Why do adults engage in cyberbullying on social media? An integration of online disinhibition and deindividuation effects with the social structure and social learning model", Information Systems Research 27(4), 2016, pp. 962–986.

[19] Lowry, P.B., J. Zhang, G.D. Moody, S. Chatterjee, C. Wang, and T. Wu, "An Integrative Theory Addressing Cyberharassment in the Light of Technology-Based Opportunism", Journal of Management Information Systems 36(4), 2019, pp. 1142–1178.

[20] Kwak, H., "Understanding toxic behavior in online games", Proceedings of the 23rd International Conference on World Wide Web - WWW '14 Companion, ACM Press (2014), 1245–1246.

[21] Kwak, H., J. Blackburn, and S. Han, "Exploring Cyberbullying and Other Toxic Behavior in Team Competition Online Games", ACM Press (2015), 3739–3748.

[22] Blackburn, J., and H. Kwak, "STFU NOOB!: predicting crowdsourced decisions on toxic behavior in online games", ACM Press (2014), 877–888.

[23] Shores, K.B., Y. He, K.L. Swanenburg, R. Kraut, and J. Riedl, "The identification of deviance and its impact on retention in a multiplayer game", ACM Press (2014), 1356–1365.

[24] Koivisto, J., and J. Hamari, "The rise of motivational information systems: A review of gamification research", International Journal of Information Management 45, 2019, pp. 191–210.

[25] McClelland, D.C., Human motivation, CUP Archive, 1987.

[26] Gawel, J.E., "Herzberg's theory of motivation and Maslow's hierarchy of needs", Practical Assessment, Research, and Evaluation 5(1), 1996, pp. 11.

[27] James, W., F. Burkhardt, F. Bowers, and I.K. Skrupskelis, The principles of psychology, Macmillan London, 1890.

[28] Kordyaka, B., M. Klesel, and Jahn, "Perpetrators in League of Legends: Scale Development and Validation of Toxic Behavior", 2019, pp. 10.

[29] Cattell, R.B., "The screen test for the number of factors", Multivariate behavioral research 1(2), 1966, pp. 245–276.

[30] Osborne, J.W., "Sweating the small stuff in educational psychology: how effect size and power reporting failed to change from 1969 to 1999, and what that means for the future of changing practices", Educational Psychology 28(2), 2008, pp. 151–160.

[31] Redden, J.P., "Desire over time: The multi-faceted nature of satiation", The psychology of desire, 2015, pp. 82–103.

[32] Laato, S., B. Kordyaka, A.N. Islam, and K. Papangelis, "Landlords of the Digital World: How Territoriality and Social Identity Predict Playing Intensity in Location-based Games.", HICSS, (2021), 1–10.

[33] Barrick, M.R., and M.K. Mount, "The big five personality dimensions and job performance: a meta-analysis", Personnel psychology 44(1), 1991, pp. 1–26.

[34] Hattie, J., Self-Concept, Taylor & Francis, 2014.

[35] Kordyaka, B., K. Jahn, M. Müller, and B. Niehaves, "The Comparative Self: Understanding the Motivation to Play and the Subsequent Video Game Use.", DiGRA Conference, (2019).