Adolescents' Beliefs About Peers' Engagement in an Online Self-Harm Challenge: Exploring the Role of Individual Characteristics Through a Latent Class Analysis

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Abstract

In the last decade considerable attention has been devoted to the possible contribution of social media, and the Internet generally, to instigating adolescents' engagement in self-harm activities, which are considered the result of a combination of multidimensional variables, such as depression and anxiety. This study aimed to identify, using latent class analysis (LCA), classes homogeneous for adolescents' beliefs about peers' motivations in taking part in the recent Blue Whale Challenge Game, and to analyze the individual predictors (gender, mental health problems, self-harm and risk-taking behaviors, and problematic Internet use) of the adolescent's latent class membership.

We performed an LCA using "perceived attraction" and "perceived constraint" as nominal indicators. Relative fit indices suggested the two class solution as the best measurement model: the first class was mostly composed of adolescents who attributed a central role to the adolescent (internal causality), while the second class mostly composed of adolescents who attributed a central role to the recruiters (external causality).

In addition, we explored some individual characteristics to test whether they could predict adolescents' class membership. Results suggests that it is significantly more likely for adolescents with higher level of stress and risk-taking to attribute a central role to their peers' internal motivation, rather than to the recruiter, in deciding to take part in the online self-harm challenge game. Implications for preventive interventions are discussed.

Keywords: beliefs, descriptive norms, Blue Whale, self-harm, adolescence, suicide

Introduction

THE POSSIBILITY THAT adolescents engage in very risky self-harm behaviors and even commit suicide is a matter of great interest to researchers. Self-harm, defined as intentional self-injury or self-poisoning,¹ usually begins and becomes more frequent between the ages of 13 and 15 years, particularly in girls,² and it is the strongest predictor of suicide among young people.³ Self-harm is considered the result of a combination of multidimensional variables, such as depression, anxiety, a lack of belonging, low self-esteem, perfectionism, social isolation and relationship problems, poor parent-child attachment, and poor emotional regulation abilities.³⁻⁷

In the last decade, considerable attention has been devoted to the possible role of social media and Internet^{8,9} in contributing to self-harm and suicide through contagion, predominantly in adolescence and youth.¹⁰ Nowadays, the contagiousness is amplified by social media, as social contacts on the Internet may normalize self-harm and provide access to suicide content and violent images.¹¹ In particular, a recent review^{12,13}—analyzing the potential influence of the Internet on self-harm/suicidal behavior in young people—found that Internet use (operationalized as Internet addiction, high levels of Internet use, and online access to contents regarding self-harm or suicide) can promote self-harm/suicidal behavior.

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Furthermore, according to the social norms theory,¹⁴ it is important to recognize that several problematic adolescents behaviors are influenced by descriptive peer norms, adolescents beliefs about the frequency of a certain risky behavior among adolescents.^{15–17} In particular, a recent study showed that descriptive norms, related both to suicidal ideation and suicide attempts, were associated with higher rate of suicide ideation and lifetime suicide attempts among adolescents.¹⁸ Moreover, O'Connor et al.¹⁹ found that descriptive norms (as part of a set of volitional factors), together with impulsiveness and negative life stress experiencing, help in distinguish adolescents who have only self-harm thoughts from those who actually enact self-harm. Specifically, beliefs about what others do (descriptive norms) were associated with behavioral enactment, as they can provide a bridge between thoughts and behaviors.

Since accessing social media has become one of the most popular activities carried out by youth and several studies found a relationship between suicidal ideation and the problematic use of the Internet,^{20,21} expanding the knowledge about the relationship between Internet use, attitudes toward self-harm behaviors, and suicide, constitutes a relevant social issue. A recent challenge is represented by the Blue Whale Challenge Game (BWCG), an online game where a mentor gives instructions encouraging children and adolescents to perform minor and relatively safe self-infliction challenges (such as watching horror movies or listening to psychedelic songs), and then gradually escalates to asking them to perform more dangerous tasks (such as carving symbols or words into one's own arms, cutting the lip, and climbing on the roof) up to arrive to the final challenge, attempting suicide.²²

Up to now, there is not a single case of suicide ascribable to the BWCG. Although no authority has established causation, several countries such as England, France, Romania, and Italy are on alert for cases.²² Lupariello et al. recently reported the data from five suspected cases of BWCG.²³ According to the literature, these five patients had a higher risk of self-harm because they were female with a mean age of 14.6 years. Only one of them reported a psychiatric disorder (depression) but all showed relationship problems and four of them exhibited low self-esteem, lack of problem-solving skills, and poor emotion regulation abilities.

As descriptive norms have been shown to be associated with behaviors,^{18,19} it is important to modify harmful descriptive norms to prevent risky behaviors. The modification of descriptive norms can happen in two ways: working directly on the norms and working on individual characteristics that would influence those norms. To this end, the present study aims to analyze the adolescents' beliefs about peers' motivations to engage in an online self-harm challenge,¹⁴ to detect individual factors influencing beliefs about peers' motivation and to inform preventive interventions.

We conducted a survey aimed at (a) describing adolescents' knowledge about BWCG and identifying people with whom the adolescents talked about the phenomenon (friends, parents, or teachers), (b) identifying adolescent groups homogeneous for their beliefs about peers' motivations in taking part in the BWCG (i.e., latent class groups), and (c) analyzing whether individual predictors that are recognized as implicated in self-harm behaviors^{3–7,12,13} (gender, mental health problems, self-harm and risk-taking behaviors, and

problematic Internet use) are also predictive of adolescents' beliefs, by following an approach already taken by studies of other problematic behaviors.^{24,25}

Materials and Methods

Participants and procedure

Participants were 312 upper secondary school students in Northern Italy, attending their first through fifth year of Italian high school in 2018. They were neither referred to social services, nor reported for learning and socio-relational difficulties.

The sample was composed of 312 students (60.8 percent male) aged 14–21 ($M = 16.4$; $SD = 1.67$) and attending a high school (60.2 percent), or a technical institute (39.8 percent). Concerning their use of social media, the 76.5 percent of them used social network sites (like Facebook) daily, and the 90.7 percent of them used instant messaging applications (like WhatsApp) daily.

The recruitment of the sample was preceded by the collection of head teachers' consent to allow their classes to participate. Afterward, parents of underage adolescents and adult students were informed about the objectives and phases of the research and asked to provide their informed consent before proceeding with research procedures. All participants were treated in accordance with the Declaration of Helsinki,²⁶ and with the ethical guidelines for research provided by the Italian Psychological Association.²⁷

The administration of questionnaires was conducted using an online survey platform in students' computer lab classrooms and was followed by 30 minutes of discussion of the treated topics.

Measures

Students were first presented with a brief survey composed of *ad hoc* questions about respondents' knowledge and beliefs concerning peers' motivations to participate in the BWCG. Specifically, we investigated adolescents' knowledge of the BWCG through five questions focusing on the grade of familiarity with the phenomenon itself, on how the adolescent became acquainted with it (predefined responses), and on how much the adolescent talked about the phenomenon with significant people—friends, parents, or teachers (response on a 5-point Likert type scale).

We investigated adolescents' beliefs about peers' engagement in the game by following the typical approach aimed at assessing adolescents' behavioral willingness.²⁸ Thus, we asked adolescents to think about the risky situation (e.g., BWCG) and a typical person of their age who engages in the behavior (participating in the game). This instruction was intended to shift attention away from the self and its context, getting over the initial hurdle of implied responsibility for risky behaviors.²⁸ Adolescents' beliefs about peers' motivations underlying their participation in the game were investigated through two questions (each having four predefined responses) aimed at highlighting the components of attraction toward the “game” (perceived attraction) and of being forced to participate in it (perceived constraint) (Table 1).

We included specific measures of adolescent vulnerability used in prior research about the relationship between Internet

TABLE 1. DESCRIPTIVE DATA FROM QUESTIONNAIRE CONCERNING THE KNOWLEDGE ABOUT THE BLUE WHALE CHALLENGE GAME AND PEERS' POSSIBLE MOTIVATIONS TO PARTICIPATE IN IT

Question	Percentage	M	SD
Adolescents who know about the BWCG	98.1		
Source of knowledge			
TV news	31.6		
Internet news	29.6		
Social networks	6.1		
Friends	24.1		
Parents	2.7		
Teachers	2.4		
People with whom adolescents talked about the BWCG			
Friends	—	2.32	0.88
Parents	—	2.15	0.95
Teachers	—	1.76	0.87
“In your opinion, who participated in the <i>Blue Whale</i> game was attracted by...”			
...belonging to a special group	27.8		
...the ability of the recruiters: they were convinced	24.6		
...the fact of being able to do things that others fear	21.7		
I don't think that they participated because they were attracted by something	11.5		
“In your opinion, who participated in the <i>Blue Whale</i> game was forced by...”			
...their own friends, who were already participating in the <i>Blue Whale</i> game	16.9		
...those who organized and controlled the game: perhaps they threatened to harm them, their families, or their friends	24.6		
...those who organized and controlled the game: perhaps they blackmailed them, threatening to ruin their social or school reputation	23.3		
I don't think that they participated because they were forced by something or someone	29.4		

Note: Mean response (*M*) refers to a 5-point Likert type scale with the following anchor labels: 1 = “Not at all,” 2 = “A little,” 3 = “Enough,” 4 = “More than enough,” 5 = “A lot.”

BWCG, Blue Whale Challenge Game.

use and attitudes toward self-harm behaviors and suicide behaviors.^{3–5,12,13} Specifically, we included the following:

- the Italian version of the *Depression Anxiety Stress Scale-21* (DASS-21).^{29–31} The DASS-21 is a self-report measure composed of three subscales measuring anxiety, depression, and stress with seven items each (the response scale was a 4-point Likert scale);
- the Italian version of the *Risk Taking and Self-Harm Inventory for Adolescents* (RTSHIA).^{32,33} The RTSHIA is a self-report inventory measuring the propensity to engage risk behaviors and propensity for self-harm. The *Risk Taking* subscale is composed of 9 items, while the *Self-Harm* subscale has 18 items (responses are made on a 4-point Likert scale);
- the Italian version of the *Generalized Problematic Internet Use Scale 2* (GPIUS2),^{34,35} composed of 15 items and including 4 dimensions: *preference for online interpersonal interactions* (POSI, 3 items), *mood regulation* (3 items), *deficient self-regulation* (6 items), and *negative outcomes* (3 items) (responses are made on a 8-point Likert scale).

Reliability Cronbach's alpha coefficients of self-report subscales are reported in Table 2.

Data Analyses

Descriptive analyses were performed using SPSS statistical software.³⁶

Latent class analysis (LCA) was performed using Mplus³⁷ to identify groups of adolescents based on their beliefs about peers' motivations in taking part in the BWCG. Two observed variables assessing the motivations underlying the participation in the game were used as indicators of the latent class: perceived attraction and perceived constraint.

TABLE 2. DESCRIPTIVE DATA FROM SELF-REPORT QUESTIONNAIRES

Scale or subscale	Min	Max	M	SD	Cronbach's α
DASS (Total)	21	84	39.16	12.38	0.936
Stress	7	28	15.16	4.69	0.863
Anxiety	7	28	11.48	4.14	0.822
Depression	7	28	12.52	4.96	0.893
RTSHIA					
Risk-taking	9	36	14.85	5.24	0.826
Self-harm	18	72	22	6.94	0.916
GPIUS2 (total)	15	120	37.03	18.09	0.899
POSI	1	8	2.06	1.36	0.777
Mood regulation	1	8	4.08	2.07	0.782
Deficient self-regulation	1	8	2.66	1.61	0.896
Negative outcomes	1	8	1.69	1.14	0.721

DASS, Depression Anxiety Stress Scale; GPIUS2, Generalized Problematic Internet Use Scale 2; POSI, preference for online interpersonal interactions.

TABLE 3. RELATIVE MODEL FIT BY NUMBER OF LATENT CLASSES

Model	Class size	AIC	BIC	SSABIC	Entropy
1-class	299	1537.991	1560.194	1541.165	
2-class	85, 214	1532.942	1581.048	1539.82	0.534
3-class	96, 138, 65	1543.217	1617.226	1553.798	0.523
4-class	104, 52, 49, 94	1557.176	1657.088	1571.46	0.520
5-class	5, 123, 98, 60, 13	1571.176	1696.991	1589.163	0.514

Note: Information criteria values in bold represent the best model fit.

AIC, Akaike information criterion; BIC, Bayesian information criterion; SSABIC, sample-size-adjusted Bayesian information criterion.

To identify the number of groups (i.e., classes) that best described the heterogeneity within the sample, we examined fit indices beginning with one class and adding classes incrementally.³⁸ Both statistical and conceptual standards were taken into consideration when making decisions about the best class solution.³⁸ The statistical indices used to evaluate the class solutions were the following: the Akaike information criterion (AIC),³⁹ Bayesian information criterion (BIC),⁴⁰ and sample-size-adjusted Bayesian information criterion (SSABIC).⁴¹ The indices were interpreted such that the lowest values indicated the best fit.

We also examined entropy values to evaluate the quality of classification, with values closer to 1 indicating better classification of cases.⁴² As suggested by Masyn,⁴³ once the best solution(s) is selected, the precision of this solution in assigning individuals to class can be evaluated by (a) comparing the class proportion (π_k) with the modal class assignment proportion ($mcaP_k$); (b) estimating the average posterior probability ($avePP_k$), and (c) estimating the odds of correct classification (OCC_k).

The precision of the latent class assignment for individuals by a candidate model is good when the $mcaP_k$ (the proportion of participants actually assigned to that class k) for each class is included in the confidence interval (95% CI) of the π_k (proportion of participants that should be in the class k according to the estimated model).⁴³ To suggest well-separated classes,⁴⁴ the $avePP_k$ —corresponding to the average posterior probabilities of all participants modally assigned to class k —should be 0.70 or higher, and the OCC_k —consisting in a class-specific diagnostic that measures the certainty of classification of individuals—should be above 5.⁴⁴

Following the LCA, we used the manual three-step approach⁴⁵ to perform logistic regressions to examine the predictors of class membership. Specifically, we investigated whether gender, the dimensions of the DAAS-21 (Depression, Anxiety, and Stress), the RTSHIA (Risk Taking and Self-Harm), and the GPIUS2 (POSI, Mood regulation, Deficient self-regulation, and Negative outcomes) were significant predictors of the adolescent's latent class membership.

Results

Descriptive data from *ad hoc* questions concerning BWCG are presented in Table 1, whereas descriptive analyses related to validated psychological questionnaires are shown in Table 2.

For what concerns LCA, five different measurement models were compared on their relative fit and entropy (Table 3). Results suggested to select the 2-class model, as it had the lowest AIC and SSABIC, and the highest entropy.

Diagnostics indicating the precision of the latent class assignment for individuals by a 2-class model are reported in Table 4.

Values suggested that the selected measurement solution was sufficiently precise. Both the $mcaP_2$ values were included in the 95% CIs of π_2 and the $AvePP_2$ values were higher than 0.70 for both classes. The only weakness of this latent class solution consisted in the odds of correct classification of the second class (OCC_2) as it was lower than 5. Even if the class assignment for class 2 was better than chance (i.e., $OCC_k = 1.00$),⁴⁴ it was weaker than class 1 in being a well separated class. The profiles of adolescents classified respectively in class 1 and 2 are described in Figure 1.

The first class ($n=85$) identified by the selected measurement solution was labeled “internal causality” as members of this class think that peers who decide to take part in the BWCG are mainly attracted by the personal desire of group belonging (35 percent), nothing was alluring to them (31 percent), and nothing forced them (69 percent). This group of adolescents rarely considers the recruiters as possible sources of attraction (5 percent) or as sources of physical (11 percent) or mental (0 percent) constraint.

On the other hand, adolescents belonging to the second class ($n=214$), labeled “external causality,” attribute a central role to the recruiters. Specifically, members of this group think that BWCG participants are mainly attracted by recruiters' ability (38 percent) and physically or mentally forced by the recruiters (70 percent). For these group members, it is hard to believe that there were no factors (i.e., nothing) that attracted (7 percent) or forced (14 percent) their peers.

TABLE 4. CLASSIFICATION DIAGNOSTICS FOR THE 2-CLASS SOLUTION

Class	π_2 (95% CI)	$mcaP_2$	$AvePP_2$	OCC_2
Internal causality class ($n=85$)	0.23 (0.113–0.346)	0.28428	0.748	9.94
External causality class ($n=214$)	0.77 (0.654–0.886)	0.71572	0.915	3.22

CI, confidence interval.

FIG. 1. Adolescents' groups according to their opinions about motivations underlying the participation in the game.

Finally, we tested which adolescent individual characteristics could predict their class membership (Table 5). Results suggest that adolescents with higher level of stress and risk-taking are significantly more likely to be members of the "internal causality" than the "external causality" class.

Discussion

More and more attention is paid to emerging online risks for adolescents, and the present study aimed to identify the individual predictors of the adolescent's beliefs about peers' motivations underlying the participation in a recent online self-harm challenge (BWCG). Since descriptive norms concerning the perceived behavior of peers resulted a strong predictor of adolescents' engagement in online risky behavior,¹⁵ investigating the role of individual characteristics in predicting adolescents' beliefs is of particular importance.^{24,25}

First, most of the participants referred that they already knew the BWCG and, surprisingly, they reported a low frequency of discussion about it with adults, both teachers and parents. The lack of sharing the phenomenon can be read both in the light of adults' poor familiarity with this particular online game (BWCG), and of their fear of soliciting

problematic behaviors in adolescents. Nevertheless, the role of adults in relation to problematic behaviors is indispensable, and social support from parents and teachers has been found as a robust buffer against self-harm and suicidal behaviors.⁵

Second, we investigated adolescents' groups homogeneous for the beliefs about peers' motivations in taking part in the BWCG and we identified two classes. Adolescents who attributed a central role to the desire of belonging to a group and who did not consider the recruiters as possible source of attraction mostly composed the first class. The desire of belonging to peer group is recognized as one of the major concerns of adolescents and, probably, taking part in the challenge game could be seen as a way to enhance or sustain adolescents' status in the peer group or as a way to conform to peer norms, even if these entail involvement in risky activities.⁴⁶ The second class mostly composed of adolescents who attributed a central role to the recruiters who force peers (physically and/or mentally) to participate or who attract them toward the game.

Although the literature did not lead to conclusive results about the role of internal and external causal attributions on risk behaviors in adolescence,^{47,48} we considered that ascribing the participation to BWCG to peers' own internal motivation (i.e., internal causal attribution) could be associated to the beliefs that others are internally motivated to play (i.e., descriptive norms).

We did not find a difference between boys and girls concerning the motivations to participate in the game, consistently with other studies showing that, although boys and girls are significantly different on measures of risk perception and social anxiety, the relationships between these characteristics and behaviors do not differ between genders, and both boys and girls are equally sensitive to potential rewards.⁴⁹

The two individual factors that significantly identified adolescents who are more likely to attribute a central role to the peers' own characteristics than to the recruiter are the higher level of stress and the higher level of risk-taking. On the one hand, this appears coherent with the primary function of self-harm that is recognized as an emotion regulation strategy, even if maladaptive.⁶ According to Klonsky,⁵⁰ self-harm is preceded by acute negative affect (e.g., anger, anxiety, guilt, and sadness) and is most often performed exactly with the intention of reducing negative affect and achieving temporary emotional relief. Thus, adolescents with difficulties in emotion regulation could be more attracted by a game that gives them the chance to regulate unpleasant emotions through incremental challenges. The individuation of personal characteristics that predict the beliefs of adolescents in terms of internal attribution suggests intervening in the former and expecting a possible effect on the latter: supporting adolescents in the management of stress and in improving self-regulation with respect to risky behaviors—and informing them about the actual statistics describing the distribution and presence of self-harming peers—could reduce the tendency to ascribe peers' risk-taking to their own internal motivations.

On the other hand, the dual systems model affirms that adolescence is a period of life in which can be observed a "growing vulnerability to risky behavior, as this period is characterized by relatively higher reward-seeking in the

TABLE 5. LOGISTIC REGRESSIONS COEFFICIENTS AND ODDS RATIOS

Predictor	Coefficient β	SE	Z	p	Odds ratio
Gender (0 = male, 1 = female)	-0.473	0.431	-1.096	0.273	0.623
Depression	-0.038	0.065	-0.577	0.564	0.963
Anxiety	-0.085	0.083	-1.026	0.305	0.919
Stress	0.180	0.077	2.338	0.019 ^a	1.197
Risk-taking	0.081	0.041	1.988	0.047 ^a	1.084
Self-harm	0.008	0.047	0.171	0.865	1.008
POSI	-0.141	0.222	-0.637	0.524	0.868
Mood regulation	0.307	0.174	1.763	0.078	1.360
Deficient self-regulation	-0.415	0.359	-1.154	0.249	0.661
Negative outcomes	0.331	0.427	0.776	0.438	1.393

^aSignificant results.

context of relatively lower impulse control; heightened reward-seeking impels adolescent toward risky activity, and immature self-regulatory capabilities do not restrain this impulse.”⁵¹ Moreover, teens often take risks in the presence of peers, a phenomenon that has been shown to be connected to increased reward system activation in teens during risk-taking.⁵² Thus, the presence of peers could work as a trigger that can accentuate the adolescent’s poor ability to cognitively control his/her affective impulses toward risky behaviors, such as taking part in the game.

Despite its contribution, it is important to underline two limitations of this study. The first consists of entropy value that was lower than expected. Specifically, the entropy of the 2-class solution was 0.53 while some authors suggest to use a cutoff of 0.70.⁵³ This low entropy appears to be mainly due to the “external causality” class—that had $OCC_k < 5$. Indeed, members of this class were not particularly homogeneous in their opinions about which factors *attracted* Blue Whale participants. At the same time, other authors⁵⁴ argued that the quality of classification as measured by entropy has different impacts in different settings. Furthermore, we overcame the problem of low entropy by performing logistic regression with the *latent* class variable instead of the *observed* variable (i.e., the most likely class membership).

The second limitation consists of having obtained many nonsignificant results. This is in part due to the exploratory intention of this study. Being the first study of this kind, we tested the effect of many potential predictors. Such a choice increased the probability of finding something to be statistically significant, when actually it is not. Future studies have to replicate our results to increase the confidence in our significant results.

As outlined in the introduction, descriptive norms represent an important influence on adolescents’ behavior: in this sense, our presented findings have practical implications for preventive interventions, since they refer to adolescents’ opinions about peer motivations underlying the choice to take on the BWCG. Primarily, as discussed in other works concerning adolescents’ or young adults’ problematics, intervention focusing on descriptive norms to reduce the risk of negative behavioral outcomes is recommended.^{16,17} Second, it would be useful for future studies to investigate the effects of descriptive norms and internal attributions in the actual risky behaviors such as participation in online challenges. If this influence is confirmed, preventive interventions could focus on sustaining adolescent’s emotional competencies, also by taking advantages of new methods and tools, such as video games and mobile applications aimed at helping adolescents in managing their affective states.^{55,56}

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