On- and Off-Line Bullying Victimization, Self-Esteem and Perceived Popularity as Predictors of Bullying Perpetration among Adolescents

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ABSTRACT

Bullying victimization in adolescence is a significant risk factor for developing reactive aggressive behavior. One such behavior, bullying perpetration, has penetrated cyberspace in recent years, with continuity and overlap between cyberbullying and bullying. Despite a large body of research on the topic more specific data is needed to explain how adolescent cyberbullying and bullying victims are at a distinct risk of becoming aggressive perpetrators. Also lacking is an understanding of how personal characteristics such as perceived popularity and self-esteem serve as resilience or risk factors in the relationship between exposure to cyberbullying and bullying as victims and then as perpetrators. The current survey was conducted among 427 public high school students in 10th to 12th grade (53% females) in Israel using a self-administrated questionnaire. In line with the study hypothesis the results reveal that students with negative perceived popularity and low self-esteem are more exposed to cyberbullying and bullying. The findings also showed that high school students who were victims of cyberbullying and bullying tended to respond by bullying perpetration. Furthermore, negative perceived popularity and low self-esteem, together with higher rates of exposure to cyberbullying or bullying, contributed to increased bullying perpetration among bully-victim youth. Limitations of the study and implications of the results are discussed.

Literature Review

Bullying among children is a significant worldwide public health problem (Craig et al. [1,2]). Bullying is usually defined as repeated, intentional aggression perpetrated by a more powerful individual or group against another person perceived to be physically or psychologically weaker, i.e., who have difficulty defending themselves (Olweus et al. [3-5]). Bullying can take on many forms, including physical, e.g., punching or kicking, seizing or damaging other people's belongings; verbal, e.g., ridiculing, insulting, repeatedly mocking someone, making racist remarks, name-calling, threatening; relational, i.e., leaving one or more peers out of aggregation groups; and indirect, i.e., spreading rumors or gossip about another person (Nansel et al. [6,3]). While communication technology developments present many advantages for adolescents (Mishna et al. [7-9]), along with the widespread use of smartphones and internet access, bullying has penetrated cyberspace, conceptualized as cyberbullying (e.g., Aizenkot et al. [10-17]). Cyberbullying is an emerging form of bullying and is defined as harm inflicted through threatening, harassing, taunting, and/or intimidating a peer, using an electronic medium, such as a computer, cell phone, and other electronic devices (Hinduja et al. [18,19,16]).

Similar to definitions of traditional bullying, cyberbullying definitions include aggressive perpetration with the intent to harm (Kiriakidis et al. [19]). Cyberbullying uses online media to send cruel, threatening, embarrassing, vicious messages in private or group chats. It also includes creating websites with pictures or jokes about victims and inviting other classmates to participate in ridiculing victims online, and tricking victims into revealing sensitive information through instant messaging and then forwarding it to others (Kiriakidis et al. [19]). Cyberbullying is manifested in

(a) Verbal violence (mockery, curses, insults, derogatory names, threats);

(b) Group violence (opening a group against someone, group shunning or group selectivity - opening a group without a person against their will, preventing entry into a group, forced removal from a group); and,

(c) Visual violence (using photos or videos offensively) (Aizenkot et al. [10,20,21]).

Unlike traditional bullying, cyberbullies do not see the distress of their victims (Kiriakidis et al. [19]), and cyberbullying quickly reaches a wide audience (Hinduja et al. [18]), and is hard to erase (Pieschl et al. [22]). Bullying and cyberbullying have several characteristics in common, among them the imbalance of power between the aggressor and the victim and the intentionality and replication of the violent perpetration (Navarro et al. [23,15]). Bullying and cyberbullying mainly consist of relational aggression, including social exclusion or injuring the victim's reputation, gossiping, slandering and sabotage (Hinduja et al. [18,24,25]). Bullying and cyberbullying most often occur in spaces with little adult supervision, and since they are difficult to detect or trace (Kiriakidis et al. [19]). bullies are less wary of being identified. Accordingly, off- and on-line bullying actions usually take place in front of bystanders (Cantone et al. [26]). These similarities led some researchers to consider cyberbullying a modality of traditional bullying (Erdur Baker et al. [27-29]). For school students cyberbullying is a particularly insidious form of bullying, as it can occur at school and at home (Hinduja et al. [18]). In fact, numerous studies have found continuity between school bullying and cyberbullying (Aizenkot et al. [14,20,30-34]). Thus, for example, Hinduja and Patchin [18]. showed that over 60% of adolescents were involved in both forms of bullying. Therefore, it is common for aggressors emerging in the classroom to continue their perpetration outside the school, through the smartphone and on the internet (Aizenkot et al. [20]).

Perceived Popularity and Self-Esteem of Bullying Victims

Popularity is generally conceptualized as a shared recognition among peers that a particular person has achieved prestige, visibility or high social standing (Adler et al. [35]). Popularity can be assessed either by sociometric or perceived popularity. These constructs are distinct, as sociometric popularity is a measure of how well liked (vs. disliked) a child is by peers, whereas perceived popularity reflects a child`s popularity (vs. unpopularity) and dominance within the social hierarchy (Parkhurst et al. [36]). Perceived popularity is considered as more predictive of adjustment in adolescence than sociometric popularity (Litwack et al. [37]), as growing empirical and qualitative evidence indicates that perceived popularity is highly valued in adolescence (de Bruyn et al. [38-40], and prized above achievement, friendship and romantic relationships (LaFontana et al. [41]). Sullivan [42] theorized that group-level acceptance is important for development. More specifically, attaining high popularity may contribute to a notable sense of accomplishment and satisfaction and bolster self-esteem (De Bruyn et al. [37,38,41]), which is defined as the individual's subjective evaluation of his or her worth as a person (e.g., Gjerde et al. [43-46]). Self-esteem was found to be highly responsive to social evaluation and external feedback (Crocker et al. [47,48]). Litwack et al. [37] found that perceived popularity uniquely contributed to adolescent adaptation and well-being, predicting less depressive affect and higher self-esteem. This may be explained by the fact that high social status affords adolescents peer reinforcement in which they are sought out as friends, provide support, admired, and emulated (Sandstrom et al. [49]).

In general, bullying victims have low self-esteem, low social status, and experience greater social marginalization and feelings of social rejection and isolation (Brown et al. [50-56]). Most often, adolescents who are not socially accepted tend to be socially incompetent (Shetgiri [2]) and may be characterized by high levels of aggression (Pouwels et al. [57]). In a recent meta-analysis which evaluated 40 independent studies that examined the association between bullying perpetration and self-esteem, Tsaousis [58] reported a significant, negative association between the two constructs. Youth characterized by high perceived popularity usually behave pro-socially (LaFontana et al. [41]) and have well-developed social skills, although they may sometimes use bullying to gain or maintain dominance in their peer group. The bully usually aims to undermine the victim's social status and their sense of personal security, while at the same time raising their own self-esteem and social status (Barker et al. [59,25]). In Research indicates

that conventional bullying is positively associated with perceived popularity but negatively associated with social preference of the bully (Berger et al. [60-63]). Bullying has been described as a dynamic process involving reciprocity between perpetration and victimization (Rose et al. [64]). Research has demonstrated that not all students involved in the bullying cycle are either bullies or victims, as some of the victims fight back against the bullies or bully other targets, thus adopting the role conceptualized as bully-victim (Kozasa et al. [65-67]), also known as reactive bullies or provocative/aggressive victims (Smokowski et al. [25]).

These may be impulsively aggressive children who respond with aggression to being bullied, or victims who transition from victimization to bullying perpetration over a period of time (Barker et al. [59]). There is less information about bully-victims compared to the other groups (Shetgiri [2]). The victims' reprisals may be aroused when their negative victimization experiences accumulate to a critical point, and when they cannot receive effective assistance from others to improve their situation (Sung et al. [67]). Victims may fight back against their bullies or bully other peers to satisfy their needs, such as enhancement of self-esteem (Kozasa et al. [65,68]), security, emotional ventilation (Lam et al. [69]), and prevention of further bullying (Sekol et al. [70]). Rose et al. [71] found that students with low self-esteem who experienced bullying victimization engaged in higher rates of bullying perpetration when compared with low self-esteem youth who did not experience victimization. The social information processing model (Crick et al. [72-74]) may provide an explanation of how the victim becomes a bully-victim and is based on a five-step process. First, victims notice the social situation in which bullies continually attack them. Second, based on previous experience, the victims may think that they will remain victims if they do not find a way to deal with the situation. Third, the victims may think that imitating bullies by attacking others may be a useful way to achieve their goal. Fourth, the victims evaluate the feasibility of executing their plan, for example of attacking more vulnerable targets. Fifth, the victims may decide to follow through with attacks on these vulnerable targets – thus becoming bully-victims. A recent qualitative study (Sung et al. [67]) provided empirical evidence supporting this model.

The Present Study

The main goal of the present study was to explore the conditions under which exposure to bullying and cyberbullying as a victim is connected to use of violence as a bullying perpetrator. It was assumed that self-esteem and perceived popularity are positively associated with and serve as moderators in the relationship between exposure to bullying as a victim and bullying perpetration. The study also empirically examined the associations

between bullying in the physical space and bullying in the virtual space, cyberbullying, among adolescents. Although bullying and cyberbullying have been widely studied in recent decades, many knowledge gaps remain regarding individual and contextual factors that could potentially be the cause or consequence of this aggressive perpetration (Zych et al. [75]). To the best of our knowledge no study to date has examined the relationship between the variables among adolescents. The importance of the research lies in the fact that both off- and on-line, bullies and victims alike have a significantly amplified risk of anxiety, depressive symptoms, drug use and suicidal ideation compared to children who are not bullied or bullies (e.g., Ortega-Barón et al. [76-78,12,29]). The findings of this study may contribute to the debate about bullying and cyberbullying and may have implications for the development of intervention programs in the school setting.

Hypothesis

a) **Hypothesis 1:** Students who were bullying/cyberbullying victims are more likely to be bullying/cyberbullying perpetrators.

b) **Hypothesis 2:** There is a strong positive linear relationship between bullying victimization and bullying perpetration in the physical space and the virtual space.

c) **Hypothesis 3:** Students with perceived popularity and low self-esteem are more likely to be bullying/cyberbullying perpetrators.

d) **Hypothesis 4:** Negative perceived popularity is negatively correlated with self-esteem.

e) **Hypothesis 5:** Perceived popularity and self-esteem will moderate the relationship between bullying victimization and bullying perpetration.

Method

Participants and Procedure

Data were collected from 427 students (53% females) from 39 classes in 16 public high schools (average of 11 students from each class) in 10th (50%), 11th (36%) and 12th (14%) grade. All schools are located in lower to middle socio-economic status neighborhoods. The study was based on data collected for an extensive follow-up evaluation survey conducted by the Ministry of Education in Israel and overseen by a regional Ministry supervisor which aimed to measure the effectiveness of a large-scale preventive intervention program. The intervention goal was to reduce WhatsApp cyberbullying and develop optimal online communication between students. Data used for this study were taken from the first measurement (Time 1) and were collected

before the intervention began. Intervention effects are not reported in the current article. Identifying details except for gender were not collected about the students at the individual level. However, identifying details at the class and school levels were used, among them school name, grade, and class number. It should be noted that the data collected were not sent to the schools, which only received overall information about the school and its students. Students filled the questionnaires voluntarily, there were no mandatory questions and penalties were not imposed on students who chose not to complete the questionnaire or not to participate at all. A teacher was present in the classroom to maintain order while the students filled the questionnaire. Despite the teacher's presence, student privacy was strictly observed since the teacher was not permitted to walk among the students while they completed the survey questionnaires and was specifically requested to respect the privacy of the information they provided. Students completed the survey online at school and had the option of completing it at home.

Measures

Bullying and Cyberbullying Behaviors Between Students

The questionnaire was comprised of 12 items representing bullying and cyberbullying behaviors which may appear between classmates in the school space and between students on social media. It was based on previous questionnaires that examined bullying and cyberbullying (Aizenkot et al. [20,10,79,80,21]) and was used and validated in previous studies of Israeli children and adolescents (Aizenko et al. [79,10,20]). The 12 items were divided into four dimensions: The first dimension refers to the space where the bullying occurred: 6 items measured bullying in the physical school space and 6 items measured cyberbullying between students in the virtual space. The second dimension addressed the role of the student in the bullying event, as a bully or a bully-victim. This was performed using a response scale as follows: for every bullying and cyberbullying behavior the student was asked whether they had been the victim of bullying/cyberbullying and whether they had bullied others. It should be emphasized that for each item the student could simultaneously state that they had been bullied and had bullied others. Sample item: "Did a student in your class verbally attack another student on social media this year?" The responses were scored as follows: "I experienced this once" (1 Point); "I experienced this more than once" (2 Points); "I did this to another student" (1 Point); "It didn't happen this year" (0 Points). Four bullying scores were calculated:

(1) Score for cyberbullying victims;

(2) Score for bullying victims in the physical space;

(3) Score for cyberbullying perpetrators; and

(4) Score for bullying perpetrators in the physical space.

The possible scores for the victims ranged from 0 to 12, with a higher score indicating a higher frequency of bullying victimization, and the possible scores for the bullying perpetrators ranged from 0 to 6, with a higher score indicating a higher rate of bullying perpetration.

Popularity in Class

The Piers-Harris 2 Children's Self-Concept Scale Popularity Subscale (Piers et al. [81]) was originally developed to provide a brief, self-report instrument for assessing self-concept in children and adolescents. Self-concept refers to a relatively stable set of attitudes reflecting both description and evaluation of one's own perpetration and attributes. Since its introduction the Piers-Harris Scale has enjoyed widespread acceptance among clinicians and researchers. The subscale was translated into Hebrew for the present study using the back translation method. The original popularity subscale included 12 items, 9 of which were selected for the current study as they were found to be specifically suitable for examining perceived popularity in the classroom. Moreover, the subscale items were adapted for the present study in order to specifically examine the respondent's sense of social acceptability in the classroom. Items that refer to the student's perceived social competence, for example "I am shy, were omitted". The items were rated on a 5-point Likert scale from 1 (not true at all) to 5 (very true). Principal component factor analysis with varimax rotation indicated the distribution of items into two factors, one included positive perceived popularity in the classroom (4 items, eigenvalue =1.71) and the other negative perceived popularity in the classroom (5 items, eigenvalue = 3.85) with a total of 62% explained variance (Table 1). Negative and positive popularity scales were mean scored such that a higher score indicates greater agreement with the content of each scale (Table 1).

Table 1: Factor loads of popularity questionnaire and internal reliability results for each factor.

Eigenvalue	Popularity scales	
	Negative	**Positive**
	3.85	**1.71**
2. Kids in my class mock me	0.80	-0.06
8. Kids in my class are bullied	0.78	-0.01
5. I am usually among the last ones selected in games	0.74	-0.12
4. I am not socially acceptable in my class	0.72	-0.25
3. It is hard for me to connect with kids in my class	0.61	-0.38
6. I have a lot of friends in class	-0.21	0.85
7. The kids in my class care about me	-0.23	0.81
1. During breaks I usually spend time with kids from my class	0.12	0.74
9. Most of my classmates like me	-0.32	0.73
Explained variance	32%	30%
Cronbach Alpha	.82	.82

Self-Esteem Scale

The Rosenberg Self-Esteem Scale (Rosenberg [82]) assesses normative feelings of self-worth. The scale includes 10 items, for example, "On the whole, I am satisfied with myself", rated from 1 (strongly disagree) to 5 (strongly agree). The scale was translated into Hebrew by Zak [83]. (The scale presented high ratings in reliability areas; internal consistency was 0.77 and minimum coefficient of reproducibility was at least 0.90 (Hobfoll et al. [84,82]). A varied selection of independent studies, each using samples such as – parents, men over 60, high school students and civil servants – showed alpha coefficients ranging from 0.72 to 0.87. Internal reliability in the present study was .86. Test-retest reliability for the 2-week interval was calculated at 0.85, and 0.63 for the 7-month interval (Silber et al. [85,86]). Principal component factor analysis with varimax rotation indicated the convergence of items into one factor with a total of 79% explained variance. The self-esteem scale was mean scored, so that a higher score represents more positive self-esteem.

Statistical Analysis

Initial SPSS descriptive statistics, correlations and multiple hierarchical regression analysis were used to examine the distribution of study variables in the study sample and to confirm the direct relationship between bullying victimization and bullying perpetration (Hypothesis 1-2) and between perceived popularity and self-esteem (Hypothesis 3-4). Also used was regression analysis with PROCESS (Hayes [87]), a macro for SPSS to examine multivariate models such as mediation, moderation, and moderated mediation using robust estimation based on bootstrapping techniques. We also used PROCESS following the instructions in Hayes and Montoya [88], to test the slope differences and for probing and plotting the interaction effects involving multi-category moderators. The

Hayes Process (Hayes [87]), model 2 was used to test the proposed model in Figure 1 (Hypothesis 5), which predicts that perceived popularity and self-esteem will moderate the relationship between bullying victimization and bullying perpetration. Student grade level and gender were controlled due to previous findings showing significantly reduced bullying during adolescence (Pepler et al. [89]) and gender differences showing a higher probability that boys will be bullies compared to girls (Juvonen et al. [53]) but higher relational bullying among girls compared to boys (Lamb et al. [24]).
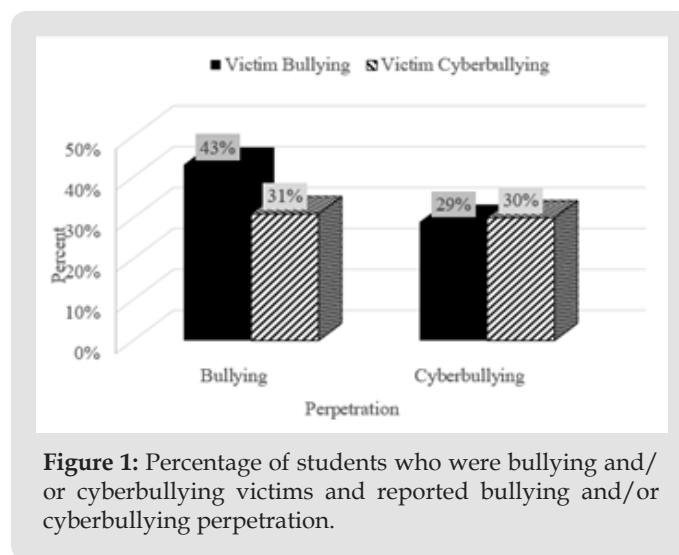

Figure 1: Percentage of students who were bullying and/or cyberbullying victims and reported bullying and/or cyberbullying perpetration.

Results

Descriptive Analysis and Correlations

The means, standard deviations and correlations of the variables are summarized in Table 2. The results reveal a significant, positive, and moderate to strong intensity correlation between bullying victimization and bullying perpetration, supporting the

first two study hypotheses. In accordance with the third study hypothesis, the dependent variables of bullying and cyberbullying perpetration were positively and significantly associated with negative perceived popularity, meaning that the more negative the student's perceived popularity the more they perpetrated bullying and cyberbullying and vice versa. In line with the fourth research hypothesis, self-esteem was significantly, negatively, and weakly to moderately intensively correlated to negative perceived popularity. Furthermore, self-esteem was found to have a negative, although weak, correlation with bullying and cyberbullying victimization, but not with bullying and cyberbullying perpetration. The correlations also indicated convergence in relation to bullying in both spaces, with relatively strong links between on- and off-line bullying victimization and on- and off-line bullying perpetration.

The controlled variables of gender and grade were found to have a significant, weak and positive association with bullying victimization and bullying perpetration. Descriptive analysis results showed that participants of the current study reported

a high level of self-esteem and relatively low negative perceived popularity. The bullying victimization and bullying perpetration rates were not high. Calculating the percentage of bullying victims and bullying perpetrators showed that 26% of the students reported being victims of bullying and 25% of cyberbullying. Also, 15% of the students reported being bullying perpetrators and 13% cyberbullying perpetrators. These percentages express the proportion of students who were bullying victims or bullying perpetrators at least once. Furthermore, 60% of the students who reported being cyberbullying victims also reported being off-line bullying victims. Similarly, 61% of the students who stated that they were bullying perpetrators in the virtual space also reported bullying in the physical space. As shown in Figure 1 below, about one-third of the students who reported cyberbullying perpetration reported simultaneously being victims of bullying in the physical and / or the virtual space. By comparison, nearly half the students reported bullying perpetration simultaneous with bullying victimization in the physical space i.e., responded in kind (Table 2) (Figure 1).

Table 2: Means, standard deviations and Person correlations among all variables (N = 427).

	M	*SD*	1	2	3	4	5	6	7
1. Self-esteem[a]	4.04	0.96	1						
2. Negative perceived popularity[b]	1.98	0.89	-.32 *	1					
3. Cyberbullying – victim[c]	0.89	2.14	-.12*	.36**	1				
4. Cyberbullying – perpetrator[d]	0.27	0.91	-0.09	.28**	.55**	1			
5. Bullying – victim[e]	0.97	2.27	-.15**	.47**	.76**	.52**	1		
6. Bullying – perpetrator[f]	0.32	0.93	-0.04	.25**	.49**	.66**	.56**	1	
7. Gender (1 = male)	0.47	0.5	-0.04	0	.13**	.10*	.14**	.16**	1
8. Grade[g]	10.4	0.53	0.07	-0.04	.10*	.13**	0.06	0.06	0.07

Note: [a]Self-esteem scores ranged from 1 to 5, the higher the score the higher the self-esteem.

[b]Negative perceived popularity scores ranged from 1 to 5, the higher the score the more negative the perceived popularity.

[c]Cyberbullying – victim scores ranged from 0 to 12, the higher the score the higher the level of cyberbullying victimization.

[d]Cyberbullying perpetration scores ranged from 0 to 6, the higher the score the higher the level of cyberbullying perpetration.

[e]Bullying - victim scores ranged from 0 to 12, the higher the score the higher the level of bullying victimization in the physical space.

[f]Bullying perpetration scores ranged from 0 to 6, the higher the score the higher the level of bullying perpetration in the physical space.

[g]Spearman correlations.

*p < .05; **p < .01; ***p < .001, 2-tail.

Regression Models

Two 2-step hierarchical linear regression models were constructed to predict bullying perpetration among high school students, one for bullying and one for cyberbullying. The need to separate the statistical analyses for each space was due to the strong correlations obtained between the bullying indices in both

spaces. Concerning the threat of multicollinearity within each model, no variance inflation factor was greater than 1.40, indicating that this is not a concern (Tabachnick et al. [90]). Final Models 1 & 2 regression analyses for predicting student cyberbullying and bullying perpetration were significant, $F_{(5,421)}$ = 39.48, p < .001, R^2 = 0.32, p < .000; , $F_{(5,421)}$ = 39.66, p < .001, R^2 = 0.31, p < .000,

respectively. Hypothesis 1 stated that students who were bullying or cyberbullying victims were more likely to perpetrate bullying and cyberbullying. Results from Models 1 & 2 support Hypothesis 1, showing that bullying and cyberbullying perpetrations are positively related to bullying and cyberbullying victimization, b = .21, SE = .02, β = .50, t = 11.05, p < .001; b = .22, SE = .02, β = .54, t = 11.52, p < .001, respectively. Hypothesis 3 stated that students with negative perceived popularity will be positively correlated with bullying and cyberbullying perpetration. The results received from Models 1 & 2 support Hypothesis 3 in the virtual space, but not in the physical space, b = .11, SE = .05, β = .10, t = 2.27, p = .024; b = .01, SE = .05, β = .00, t = 0.09, p = .926, respectively. This shows that bullying perpetration in the virtual space is positively related to student's perceived popularity in the classroom. The more they perceived their popularity to be negative, the more likely they were to perpetrate cyberbullying. (Table 3) below shows the regression results obtained (Table 3).

Table 3: Regression models for bullying and cyberbullying perpetration (N = 427).

Dependent variable	Model 1 Cyberbullying perpetration		Model 2 Bullying prepetraion	
	Model 1	Model 2	Model 1	Model 2
Gender (1 = male)	0.16	0.06	0.28***	0.16*
(se)	-0.09	-0.07	-0.09	-0.08
Age	0.33***	0.12	0.26**	0.07
(se)	-0.08	-0.07	-0.08	-0.07
Victim of cyberbullying		0.21***		-
(se)		-0.02		-
Victim of bullying		-		0.22***
(se)		-		-0.02
Negative perceived popularity		0.11*		0.01
(se)		-0.05		-0.05
Self-esteem		0		0.05
(se)		-0.04		-0.04
R^2	0.05	0.32	0.05	0.31
ΔR^2	-	0.27		0.26
F	10.43***	39.48***	10.45***	39.66***
ΔF	-	56.14***		56.40***

Note: *$p < .05$; **$p < .01$; ***$p < .001$.

se = standard error

Process

Process analysis aimed to examine the moderating role of perceived popularity and low self-esteem in the relationship between bullying victimization and bullying perpetration, while controlling for gender and student grade level. Two models were tested, the first model for cyberbullying and the second model for bullying. The findings for Model 1 (Table 4) reveal a significant general model for cyberbullying perpetration, $F_{(7, 419)} = 38.43$, p < .001, R2 = 0.39. The regression coefficients indicate a direct positive significant main effect of cyberbullying victimization (b = 0.22; SE = 0.07; p = .001; 95% CL 0.35 to 0.08), and a negative significant main effect of self-esteem (b = -0.11; SE = 0.04; p = .015; 95% CL -0.19 to -0.22). Furthermore, in line with research hypothesis 5, two significant interactions were found between negative perceived popularity and cyberbullying victimization (b = 0.09; SE = 0.01; p < .001; 95% CL 0.06 to 0.12), and between self-esteem and cyberbullying victimization (b = 0.05; SE = 0.01; p < .001; 95% CL 0.02 to 0.07) on cyberbullying perpetration. Figures 2 & 3 show that when bullying victimization increases in the virtual space then cyberbullying perpetration also increases, across perceived popularity and self-esteem. However, it appears that when perceived popularity is more negative and self-esteem is lower, the tendency to cyberbullying perpetration increases.

Nonetheless, among students who were never cyberbullying victims, as self-esteem declines cyberbullying perpetration significantly increases to some extent. The findings for Model 2 (Table 4) reveal a significant general model for bullying perpetration, $F_{(7, 419)} = 35.79$, p < .001, R2 = 0.37. The regression

coefficients indicate direct positive significant main effects of bullying victimization (b = 0.17; SE = 0.07; p = .010; 95% CL 0.04 to 0.30) and of negative perceived popularity (b = 0.15; SE = 0.06; p = .010; 95% CL 0.04 to 0.25). Furthermore, two significant interactions were found between negative perceived popularity and bullying victimization (b = 0.06; SE = 0.01; p < .001; 95% CL 0.04 to 0.09) and between self-esteem and bullying victimization (b = 0.06; SE = 0.01; p < .001; 95% CL 0.03 to 0.08) on bullying perpetration. Figures 4 & 5 show that high exposure to bullying increases bullying perpetration, both in the virtual and the physical space, beyond perceived popularity and self-esteem. An examination of the moderating role of perceived popularity in relation to bullying victimization and bullying perpetration showed that students affected by bullying who perceive their popularity as negative are more likely to use bullying perpetration relative to students affected by bullying but whose perception of their popularity is less negative. This phenomenon is similarly observed in both the virtual and the physical space. Furthermore, among students who were not affected by bullying, and their perceived popularity was relatively positive, their tendency to bullying perpetration in the physical space was higher than among students with greater negative perceived popularity.

Table 4: Results for the mediation effect of perceived popularity and self-esteem on the relationship between bullying/cyberbullying victimization and bullying/cyberbullying perpetration.

	Coeff	SE	t	p	LLCI	ULCI
Model 1: Bullying perpetration in the virtual space						
Constant	0.23	0.76	0.3	0.77	-1.27	1.73
Cyberbullying – victim	0.22	0.07	3.24	0	0.09	0.35
Negative perceived popularity	0.06	0.05	-1.13	0.26	-0.04	0.15
Victim X perceived popularity	0.09	0.01	6.51	0	0.06	0.12
Self-esteem	-0.11	0.04	-2.45	0.01	-0.19	-0.02
Victim X self-esteem	0.05	0.01	3.8	0	0.02	0.07
Grade	0.03	0.07	0.5	0.62	-0.1	0.17
Gender (1 = male)	0.12	0.07	1.63	0.1	-0.02	0.26
$F(7, 419) = 38.43, p < .001, R^2 = 0.39$						
Model 1: Bullying perpetration in the virtual space						
Constant	0.23	0.76	0.3	0.77	-1.27	1.73
Cyberbullying – victim	0.22	0.07	3.24	0	0.09	0.35
Negative perceived popularity	0.06	0.05	-1.13	0.26	-0.04	0.15
Victim X perceived popularity	0.09	0.01	6.51	0	0.06	0.12
Self-esteem	-0.11	0.04	-2.45	0.01	-0.19	-0.02
Victim X self-esteem	0.05	0.01	3.8	0	0.02	0.07
Grade	0.03	0.07	0.5	0.62	-0.1	0.17
Gender (1 = male)	0.12	0.07	1.63	0.1	-0.02	0.26
$F(7, 419) = 38.43, p < .001, R^2 = 0.39$						

Note: **$p < .001$.

N = 1633; Bootstraps Sample Size = 5000.

By comparison, in the virtual space students who were not victims of cyberbullying tended to less cyberbullying perpetration regardless of their perceived popularity. Examining the moderating role of self-esteem in relation to bullying victimization and bullying perpetration revealed a slightly different picture of bullying in the virtual space and in the physical space. The study found that in the virtual space, among students exposed to cyberbullying, self-esteem was not found to moderate cyberbullying perpetration. In other words, cyberbullying perpetration in this group is higher relative to the group of students who were not victims of cyberbullying. In relation to bullying in the physical space, bullying perpetration among bullying victimization students was found to be higher among students with positive self-esteem compared to students with low self-esteem. By comparison, among students who were not bullying victims, when self-esteem is lower their tendency to bullying perpetration relative to students with more positive self-esteem increases in both spaces (Table 4) (Figures 2-5).
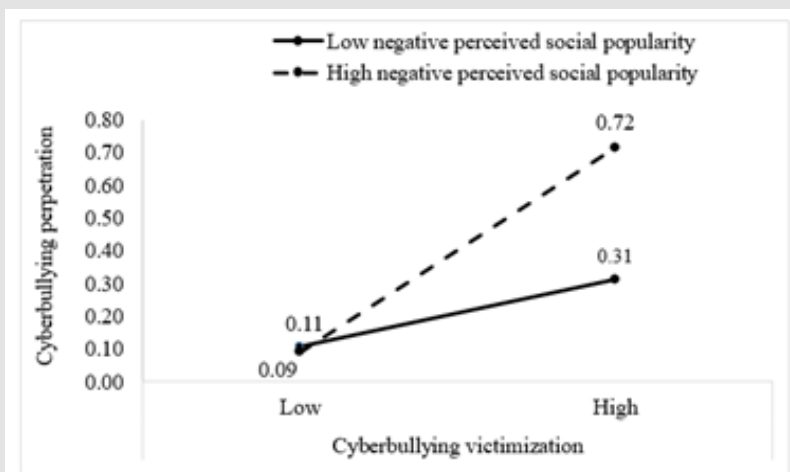
Figure 2: Interaction effect of cyberbullying victimization and perceived popularity on cyberbullying perpetration.
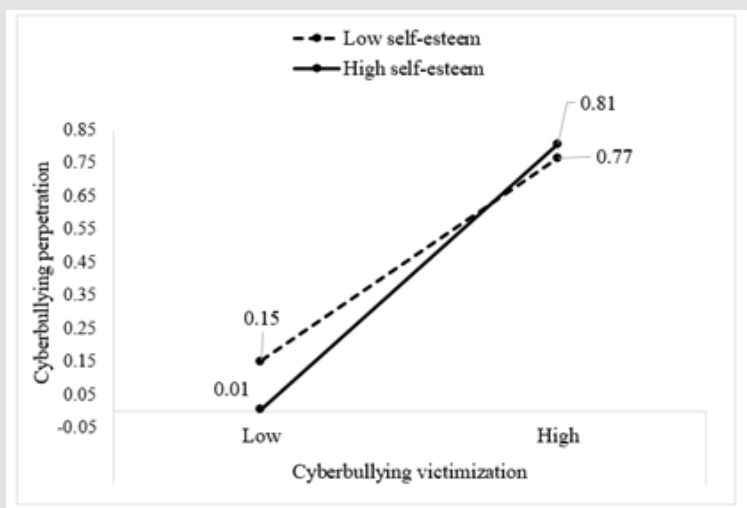

Figure 3: Interaction effect of cyberbullying victimization and self-esteem on cyberbullying perpetration.
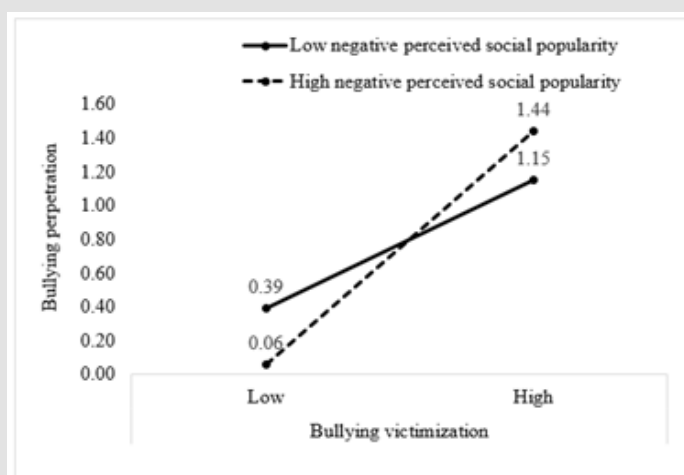

Figure 4: Interaction effect of bullying victimization in the physical space and perceived popularity on cyberbullying perpetration.
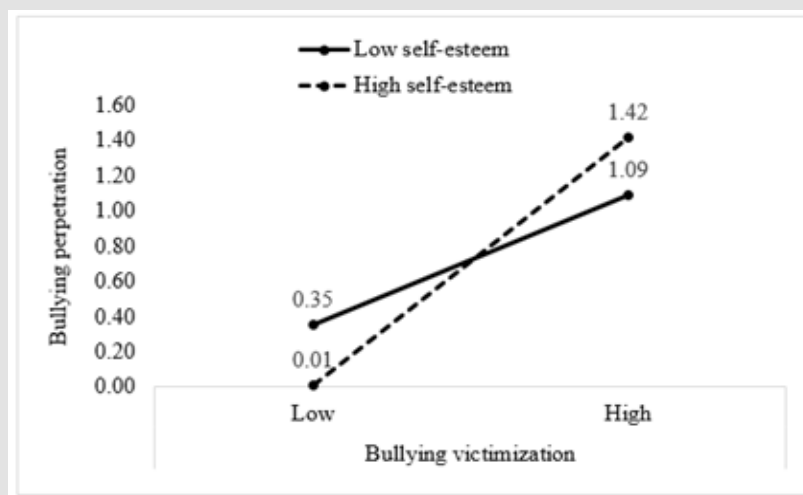
Figure 5: Interaction effect of bullying victimization in the physical space and self-esteem on cyberbullying perpetration.

Discussion

Findings of the present study may contribute to a better understanding of the relationship between bullying perpetration as a response to bullying victimization, perceived popularity and self-esteem. The research hypotheses were mostly confirmed. In accordance with the first research hypothesis the study found that students who were victims of bullying and cyberbullying were more likely to use bullying and cyberbullying perpetration. The study findings provide empirical support for the idea of bullying perpetration as an aggressive reaction to bullying victimization (Kozasa et al. [65-67,25]) and the conceptualized role of the bully-victim. As such, bullying perpetration may be an impulsive aggressive reaction to being bullied, or of victims who made a transition from victimization to bullying perpetration over a period of time (Barker et al. [59,67]). Thus, the study findings support the notion of a dynamic process that involves reciprocity between victimization and perpetration (Rose et al. [64]).

This fight-back strategy may stem from the need to improve their self-esteem (Kozasa et al. [65,68]). or their social status (Crick et al. [72-74,67]), restore their security and enable emotional ventilation (Lam et al. [69]) and prevent further bullying (Crick et al. [72-74,70,67]). Cyberbullying and bullying, and the link between them, have very damaging consequences. While studies on the topic have increased, knowledge gaps remain regarding factors that could protect children from becoming cyberbully perpetrators or victims (Zych et al. [91]). According to the current study findings as well as other studies, not all students who were involved in bullying as victims responded in kind (O'Moore et al. [66]). The study findings contribute to our understanding of the relationship between on- and off- line bullying victimization and bullying perpetration, and of how self-esteem and perceived popularity serve as risk or protective factors with respect to bullying victimization and perpetration in both the physical and the virtual space. The negative correlations found in the current study between perceived popularity and bullying victimization reinforce the view of bullying as relational aggression (Hinduja et al. [18,24,25]).

Bullying and cyberbullying mainly consists of a power imbalance between aggressor and victim reflecting social status differences (e.g., Crick et al. [72-75,92,67]). Bullying victims are more anxious and less popular than bullies, have poorer social skills and fewer means of preventing or effectively coping with bullying, and may thus feel powerless (Barker et al. [59,25]). The study results show a strong relationship between bullying in the virtual space and the physical space. More than half the students reported that they were simultaneously involved in cyberbullying and bullying. These findings are similar to those reported in previous studies which showed that over 60% of adolescents were involved in both forms of bullying (Hinduja et al. [18,19]). Involvement in cyberbullying can, however, indicate involvement in other types of bullying perpetration and victimization (Wang et al. [93,94]) and continuity between school bullying and cyberbullying (Aizenkot et al. [20,30-34,14]).

These findings reinforce the argument of an overlap between bullying behavior in the physical space and in the virtual space and similarities in the behavioral characteristics of bullying in both spaces. The behavior similarities in both spaces are reflected in the intentionality of the behavior and in the imbalance of power between the aggressor and the victim (Navarro et al. [23,15,9]). This commonality between the spaces reinforces the claim that cyberbullying is a modality of traditional bullying (Erdur-Baker et al. [27-29]). The present study findings offer empirical support for possible explanations of the connection between bullying

victimization and bullying perpetration, however these findings should be treated with caution in light of several methodological weaknesses. First, the fact that the findings do not offer causal explanations as they are based on subjective self-report questionnaires and not on objective measurements. This data collection technique may be biased and, moreover, when it comes to data collection of offensive behavior it may suffer from missing reporting.

Furthermore, the study respondents may have other behavioral problems, organic or personality characteristics, such as attention problems or low empathy. These factors were found in a meta-analytical review of 25 studies related to cyberbullying perpetration (Zych et al. [91]). These factors were not taken into consideration in the current study, but could interact with the relationships between the study variables. To complete the picture it is important to examine the study findings in light of other characteristics and background variables and in additional groups of students. Finally, the present study findings do not provide an in-depth explanation of why bullying victims also tend to perpetrate bullying. Possible explanations should be considered in further studies. The importance of the present study is borne out by the fact that these theoretical constructs are critical to adolescent emotional development and mental well-being. It is also found in the negative impact of bullying victimization and perpetration on student well-being (Machimbarrena et al. [77,29]), self-esteem (Extremera et al. [95-97]) and perceived popularity (Cook et al. [51,61]), especially in adolescence. The results have important implications for policy and practice and may be very useful in designing specifically tailored programs to prevent cyberbullying and bullying [98].

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