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Uncovering the Structure of and Gender and Developmental Differences in Cyber Bullying

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ABSTRACT. Although literature on traditional bullying is abundant, a limited body of sound empirical research exists regarding its newest form: cyber bullying. The sample comprised Australian secondary students (N = 803) and aimed to identify the underlying structure of cyber bullying, and differences in traditional and cyber bullying behaviors across gender and grade. Reliability analyses, confirmatory factor analyses, and factorial invariance testing demonstrated that the newly extended measure of traditional and cyber bullying was psychometrically sound. Multiple-Indicators-Multiple-Causes models demonstrated gender, grade, and gender by grade interaction effects for traditional and cyber forms of bullying and being bullied. Findings were interpreted in the context of bullying theory. Moreover, potential limitations of the investigation and implications for theory, research, and practice were discussed.

Keywords: cyber bullying, gender differences, grade differences, measurement

The immense benefits of the technology available today cannot be disputed; however, a dark side has invariably surfaced as a by-product of such technological advances—the use of technology for the purposes of bullying, termed *cyber bullying* (Strom & Strom, 2005). The new electronic playground of mobile phones and the Internet ensures that adolescents can be potentially targeted (a) 24 hours a day, 7 days a week; (b) by a much wider audience who are aware of the bullying and may even receive enjoyment from viewing/participating in the denigration; and (c) for longer periods of time given the permanency of a created website, profile page on the Internet, or text message (Bamford, 2004; Campbell, 2005). Despite increasing anecdotal evidence, there exists a limited amount of research about the nature of cyber bullying, gender and developmental differences in cyber bullying and target experiences, and its relation to traditional bullying. Therefore, the aim of this study was to critically investigate these issues.

The Definition and Nature of Traditional and Cyber Bullying

Most researchers have asserted that bullying can be conceptualized as "repeated intimidation, over time, of a physical, verbal, and psychological nature of a less powerful person by a more powerful person or group of persons" (Slee, 1996, p. 64). These behaviors are what serve to set bullying apart from other forms of aggressive behavior (Feshbach, 1997; Schuster, 1996). Bullying behavior is typically repetitive in nature and has an inherent power imbalance between the bully and target whereby the targets are incapable of defending themselves from the bully (Lagerspetz, Björkqvist, Berts, & King, 1982; Olweus, 1997; Rigby, 1996, 2001). The fundamental issue is that bullies take advantage of this imbalance of power for their own benefit to continually dominate the target. Simultaneously, the target does not desire this domination and is hurt or disadvantaged because of it (Parada, 2006). Cyber bullying encapsulates these same principles of traditional bullying behaviors, but rather employs a new delivery medium of mobile phone and Internet technology to enact or communicate the bullying behaviors (Williams, Cheung, & Choi, 2000).

Empirical studies have demonstrated that traditional bullying can be conducted in multiple ways, which can be generally conceptualized as physical (e.g., punching), verbal (e.g., name calling), and social (e.g., rumor spreading) forms of bullying (Crick et al., 2001; Rigby & Slee, 1999; Salmivalli, Kaukiainen, & Lagerspetz, 2000). Parada (2000)

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developed the Adolescent Peer Relations Instrument–Bully and Target (APRI-BT), which measured the proposed structure with regard to bullying others and being a target of bullying. Confirmatory factor analysis (CFA) of the APRI-BT items found support for the three types of bully and target behaviors (physical, verbal, and social), thus providing rigorous support for the multidimensional nature of bullying (Marsh, Parada, Craven, & Finger, 2004). However, as yet, it is unknown how cyber bullying relates to this structure.

Cyber bullying can use overt and covert forms simultaneously (Marsh, Parada, Yeung, & Healey, 2001; Shariff, 2005). For example, considering that physical bullying can be recorded in electronic form and then technology can be utilized to further denigrate and communicate the bullying to others, it must be recognized that cyber bullying is indeed a complex phenomenon that cannot be easily classified. Specific cyber bullying behaviors include sending nasty text messages, emails, and instant chat messages; forwarding confidential emails, text messages, or instant chat messages to other students; bombarding a student with hurtful text messages; setting up a derogatory website or profile page about a student and inviting others to comment; or using a mobile phone camera to video or photograph another student to embarrass him or her (Beran & Li, 2005; Finkelhor, Mitchell, & Wolak, 2000; P. K. Smith, Mahdavi, Carvalho, & Tippett, 2006; Ybarra, Mitchell, Finkelhor, & Wolak, 2007). Conceptually, such forms seem to coalesce into two main methods, that is, visual and text. However, there has been little attempt to verify the proposed underlying constructs by addressing within-construct issues through the use of strong statistical methods such as through CFA techniques.

Theory, Research, and Measurement Issues in the Bullying Literature

Limitations of the present empirical cyber bullying literature. Although there have been recent advances in traditional bullying research (e.g., Finger, Marsh, Craven, & Parada, 2005), there are still several problems that continue to plague the field of cyber bullying. One of the more vital problems is that despite an abundance of competing theories and models attempting to explain traditional bullying behaviors, there is limited theory and empirical research to encapsulate the diverse and complex nature of cyber bullying. More fundamentally, little is known about the nature of cyber bullying, as its structure has not been adequately theorized and tested.

The need to first identify sound psychometric measures of cyber bullying is of critical importance, as Craven, Marsh, and Burnett (2003) argued to be the case within other fields of research, it is a logical necessity that within-construct issues (i.e., the nature and measurement of cyber bullying) need to be resolved prior to proceeding to between-construct issues. That is, the psychometric strength of any cyber bullying instrument must be confirmed before this instrument is related to other constructs (e.g., depression). Unfortunately, much of the present cyber bullying literature is plagued with methodological weaknesses including atheoretical approaches; the use of small sample sizes; employing weak measurement instruments with one-item questions and not demonstrating the psychometric properties of instrumentation employed; and applying inadequate statistical analyses that can result in low statistical power and erroneous results.

The problem with single-item instruments. Traditional bullying and now the measurement of cyber bullying behavior has relied on the use of simple surveys that utilize single items (e.g., Li, 2007; Ybarra & Mitchell, 2004a, 2004b; Ybarra et al., 2007) to define multidimensional bullying constructs (Rigby & Slee, 1993; P. K. Smith & Sharp, 1994; Solberg & Olweus, 2003). Using one or two items to measure continuous bullying constructs is inadvisable for several reasons: (a) single items have substantial random error measurement, that is, they are unreliable; (b) single items can only discern moderate to large differences and cannot distinguish fine degrees of an attribute, consequently being likely to overlook differences at the level of the individual; and (c) individual items lack scope and the ability to uncover detail (McIver & Carmines, 1981; Nunally & Bernstein, 1994; Spector, 1992). Indeed, the use of psychometrically strong, valid, and reliable measurement instruments in traditional bullying research is the exception rather than the norm (Farrington, 1993; J. D. Smith, Schneider, Smith, & Ananiadou, 2004). Reliance on single-item measures may have led to the inconsistency in present empirical attempts to uncover the specific nature of cyber bullying behaviors, differences according to gender and grade, and its relation to negative psychosocial outcomes. Indeed, all forms of bullying utilize multiple behaviors, which can only be captured by having multiple items for each form of bullying (Parada, 2000).

Rethinking bipolar classification schemes and the misuse of dichotomous variables. Cyber bullying research has inherited the historic tendency of traditional bullying research to classify students as bullies or victims, a factor underlying all the problems of classification and measurement in the bullying literature (Marsh, Parada, Craven, et al., 2004). The utilization of this classification system is founded on an intrinsic model in which being a bully and being a target were mutually exclusive or bipolar opposite patterns of behaviors. However, an emergent body of contemporary bullying research (Finger et al., 2005; Ma, 2001; Marsh et al., 2004) has clearly demonstrated that the two variables have a tendency to be positively correlated. Although debate still remains regarding the magnitude, nature, and fundamental processes underlying this correlation, it is apparent that the correlation is not the −1.0 correlation that would be reflective of a mutually exclusive or bipolar opposite classification schemes (Finger et al., 2005; MacCallum, Zhang, Preacher, & Rucker, 2002). Furthermore, Finger et al. (2005) emphasized that when data are organized into categories (i.e., bully

or victim), it is the children, as opposed to the behavior, that becomes unavoidably classified. Bullying is an intricate and complex phenomenon that cannot be accurately understood with the simple dichotomous classification into a bully or victim group, and as a result, it is essential that any cyber bullying instrument assess the potential reciprocal nature of such bullying by tapping perceptions of being targeted and perpetrating cyber bullying.

Gender, Age, and Bullying

Gender effects in traditional and cyber bullying. An extensive body of research has suggested that boys are more likely than girls to bully and be bullied in traditional forms (Boulton & Smith, 1994; Boulton & Underwood, 1992; Wolke, Woods, Bloomfield, & Karstadt, 2000). Rigby and Slee (1993) identified 10% of boys 7–13 years old were bullied as compared with 8% of girls. However, some researchers have postulated that girls may engage in more indirect forms of covert bullying, such as rumor spreading, exclusion, and rejection (Craig & Pepler, 2003; Rigby, 2002; Sullivan, 2000). Moreover, research has suggested that boys more frequently engage in physical bullying than girls, and boys and girls are equally likely to be involved in verbal bullying (Munro, 1999; Sourander, Helstela, Helenius, & Piha, 2000; Whitney & Smith, 1993). Research as to whether girls bully and are bullied relationally more than boys has yielded inconclusive results. However, Parada (2006) used methodologically robust statistical techniques and found that girls did not have higher scores than boys on the Social scale, and boys were found to both bully and be bullied to a larger degree than girls, for all three forms of traditional bullying.

The cyber bullying literature is plagued with inconsistency regarding the gender differences present. Data from studies conducted by Li (2005, 2007) and P. K. Smith et al. (2006) showed that the majority of students who were cyber bullied were girls (60%). Similarly, Li (2006) reported that boys were significantly more likely than girls to cyber bully others. Li (2005, 2007) reported no significant difference between genders for cyber bullying others. Beran and Li (2005) found nonsignificant results for cyber bullies and targets, which indicated that across gender, students have similar experiences of and engagement in cyber bullying. In recognition of these somewhat inconsistent findings, it is necessary that research seeks to further extrapolate gender differences involved in cyber bullying behaviors utilizing psychometrically sound instrumentation.

Developmental effects in traditional and cyber bullying. Age has proven to be an influential risk factor in bullying and being bullied in the traditional bullying literature. Although traditional bullying rates have been demonstrated to increase with age in primary school (Hanish & Guerra, 2004), and begin to substantially decline as students get older and reach the later years of secondary school (Rigby, 1996), for those students that do continue to bully or are targets, their status is much more stable and permanent over time (Hanish & Guerra, 2000, 2004). Specifically, older students are targeted more discerningly and repetitively than their younger counterparts. It has been demonstrated that traditional bullying in secondary school tends to decrease with age, being at its peak at the beginning high school years (Parada, 2006; Pellegrini, 2004).

To date, few cyber bullying studies have investigated the relation between cyber bullying and age. Ybarra and Mitchell (2004a) evaluated the relation between Internet harassment, defined as making rude and nasty comments online and using the Internet to embarrass or harass someone, and age. The study found that 7.8% of those respondents who engaged in Internet bullying were in the 10–12-year-old age bracket, followed by 27.4% in the 13–14-year-old age bracket, and 64.8% in the 15–17-year-old age bracket. Thus, this study suggested that cyber bullying steadily increased across the high school years. However, such results may be reflective of the unidimensional measurement scale used that did not adequately address the multidimensional nature of cyber bullying, and the weak statistical analyses applied. Furthermore, P. K. Smith et al. (2006) found no significant differences related to age. Consequently, more rigorous research is needed to further our understandings of cyber bullying behavior across age groups.

The Present Investigation

In the present investigation we aimed to (a) test and evaluate a theoretical model and the psychometric properties of a multidimensional measure to assess levels of cyber bullying and being cyber bullied with regards to reliability, factor structure, and factorial invariance; and (b) utilize rigorous statistical techniques to elucidate differences in types of traditional and cyber bullying and victimization as a function of sex (male and female) and year level in school (junior level and senior level). With regards to the first aim, it was hypothesized that: (a) the subscales of the Revised Adolescent Peer Relations Instrument–Bully/Target (RAPRI-BT) would be a reliable measure of its latent structure, whereby the reliability estimates would be sound; (b) CFA would support the hypothesized factor structure; and (c) the factor structure would remain invariant across gender and grade. With regard to the second aim, it was hypothesized that (a) boys would engage in and be the target of all forms of traditional bullying significantly more than girls; and (b) students in the junior level would indicate higher levels of all forms of traditional bullying and being bullied than students in the senior level. It was not possible to state directional hypotheses in regards to cyber bullying on the basis of previous research, so a number of research questions were posed to elucidate the following: (a) to what extent will gender and grade differences emerge for the first-order and higher order cyber bully and target factors; and (b) to what extent will gender and grade interactions be found for the first-order and higher order traditional and cyber bully and target facets?

Method

Participants

Participants ($N = 803$) were drawn from one Western Sydney Catholic secondary school in Year 7 ($n = 176$), Year 8 ($n = 186$), Year 9 ($n = 157$), Year 10 ($n = 156$), and Year 11 ($n = 128$). Only those students who consented, or who had parental consent to participate, were included in the study. Students' ages ranged from 12 to 17 years, with a mean age of 14.03 years ($SD = 1.40$ years). In total, 53% of students were boys ($n = 427$), and 47% were girls ($n = 376$). With regard to cultural background, 61% ($n = 489$) of respondents identified their culture as Australian, 22% ($n = 177$) reported their culture as containing Australian and another culture (e.g., Greek Australian), and 17% ($n = 137$) reported belonging to a culture other than Australian.

Measures

The RAPRI-BT was specifically developed for the present study. The original APRI-BT (Parada, 2000) was extended to include cyber bullying in its measurement of interpersonal relationships between secondary school students (see the Appendix for cyber bullying items). The original APRI-BT contained two 18-item scales that measured three forms of traditional bully and target behaviors (physical, verbal, and social). The APRI-BT has demonstrated excellent psychometric properties (Finger et al., 2005; Marsh et al., 2004; Parada, 2006). The RAPRI-BT was extended to include an additional 13 items on each scale, which, consistent with the RAPRI scale, consisted of two forms of bully and target behaviors. More specifically, within the cyber bullying context, a priori visual and text factors were formulated across both the Bully and Target scales (Griezel, Craven, Yeung, & Finger, 2009). Thus, the first scale comprised 31 items that asked students to state how often, on a 6-point Likert-type scale ranging from 1 (*never*) to 6 (*every day*), they engaged in a series of behaviors. The second scale section also contained 31 items and asked how often students experienced behaviors occurring to them.

Procedure

The University of Western Sydney Human Ethics Panel, the Catholic Education Office, and the principal of the participating school approved the present study. Students with parental consent were instructed verbally of the purpose of the study, of their voluntary and anonymous participation, and their right to withdraw at any time with lack of penalty. Signed student consent was obtained prior to the commencement of the study. The questionnaire was read aloud to students in year groups and took approximately 45 min to complete.

Statistical Analyses

Data screening. The data was screened for missing values, univariate and multivariate outliers, and assessed for normality, linearity, and homoscedasticity using SPSS 14.0. In dealing with missing data, the Expectation Maximization (EM) algorithm in SPSS, which predicts replacement values based on available information attained from data not missing for the particular item, was used in the present investigation (Schafer & Graham, 2002).

Univariate outliers were initially identified via the presence of extreme scores on stem-and-leaf plots and dealt with according to the recommendations of Tabachnick and Fidell (2007). Multivariate outliers were identified by those observations that exhibited a large Mahalanobis distance score ($p < .001$), and were subsequently removed from the analysis (Hills, 2005).

Reliability analyses. Reliability analyses, using Cronbach's alpha, were conducted on the five first-order and two higher order factors of the Bully and Target scales of the RAPRI using SPSS 14.0. Although no universal consensus regarding acceptable reliability estimates exists, internal consistency reliability estimates should be ideally above .70 or .80 (Anastasi & Urbina, 1997; Hills, 2005). Thus, for the present study, coefficients greater than .90 were deemed excellent, above .80 were considered good, and above .70 were considered acceptable.

Confirmatory factor analysis. To examine the factor structure and validity of the RAPRI-BT, CFA was performed using PRELIS and LISREL 8.72 (Joreskog & Sorbom, 2004). Four CFAs were conducted to assess the psychometric properties of the first-order and higher order structures of the RAPRI for the Bully and Target models. CFA allows the researcher to test the extent to which theoretically derived relationships represent relationships actually observed in the data (Byrne, 2001). In CFA, the researcher hypothesizes a model that is said to describe or account for the data in terms of relatively few parameters. An a priori structure is proposed and through CFA the researcher is able to test the ability of a model to fit the data based on the proposed structure by demonstrating the following: the parameter estimates are consistent with theory and a priori predictions; the solution is well defined; and the indices of fit are acceptable (Byrne, 1998; Marsh, Balla, & McDonald, 1988; McDonald & Marsh, 1990).

In evaluating goodness of fit for each model the following indices were emphasized, consistent with present practice (Byrne, 2001; Marsh, Balla, & Hau, 1996): the root mean square error of approximation (RMSEA; Browne & Cudeck, 1993), the Tucker-Lewis index (TLI; Bentler & Bonett, 1980), and the comparative fit index (CFI; Bentler, 1990). For the RMSEA, values below .05 represent excellent fit and values as high as .08 indicates acceptable

errors of approximation (Browne & Cudeck, 1993). The TLI and CFI yield values that range from 0 to 1, with values greater than .95 indicative of excellent fit, and values greater than .90 indicative of good model fit (Hu, Bentler, & Kano, 1992; Marsh et al., 1996; Schumacker & Lomax, 1996). The CFI statistic contains no penalty for lack of parsimony, so that excellent model fit may be due to the specification of more parameters and thus a capitalization on chance (Parada, 2006). The RMSEA and TLI statistics include a penalty for lack of parsimony. However, significance and fit indices are a guide to aid model evaluation, and ultimately a degree of subjectivity and professional judgment must be used in the selection of the best fitting model (Marsh, 2007).

Invariance testing. In addition to assessing the fit of a hypothesized model to observed data, CFA allows the researcher to establish whether the model factor structure remains the same across different groups (Byrne, 2003; Martin, 2007). In the present study, tests of invariance were conducted across gender and grade for the first-order and higher order RAPRI for the Bully and Target scales. Invariance tests were carried out using LISREL 8.72 (Joreskog & Sorbom, 2004). Following the specification of a hypothesized factor structure of an instrument, a succession of logically structured and increasingly stringent models is carried out whereby any one, or set, of parameters is held invariant across groups and compared to a model of no constraints (Byrne, 2004).

The first model contained no constraints, being completely free across groups, and was thus used as the baseline model. The second model held factor loadings invariant across groups. This model is considered to be the minimal requirement for factorial invariance (Cheung & Rensvold, 2002; Martin, 2007), and was therefore emphasized in the present study. The third model held factor loadings and factor variances and covariances invariant, although the fourth model held factor loadings and uniquenesses invariant across groups. In the fifth and final model, all parameter estimates (i.e., factor loadings, factor variances and covariances, and uniquenesses) were held invariant across groups. The baseline model is compared with the four successive models, and changes in the goodness-of-fit indices, with emphasis on the CFI statistic, between the models must not exceed .01 to meet the requirements of factorial invariance across groups (Cheung & Rensvold, 2002).

Multiple-Indicators-Multiple-Causes modeling. Multiple-Indicators-Multiple-Causes (MIMIC) models were conducted to assess the effects of gender, grade, and the gender by grade interaction on the first-order and higher order traditional and cyber factors of the RAPRI-BT. Years 7, 8, and 9 were combined to form a junior-year group and Years 10 and 11 were combined to form a senior-year group. MIMIC modeling is a particular application of structural equation modeling (SEM), which contains one or more latent variables (e.g., dimensions of bullying and victimization) that are concurrently identified by multiple endogenous observed indicators (i.e., items comprising the latent variables), and by multiple exogenous causal variables (e.g., gender, grade, gender by grade interactions; Kaplan, 2000). A MIMIC model is able to simultaneously evaluate the factor structure of a particular measure, as well as the effects of observed exogenous causal variables on the latent factors (Kline, 2005). MIMIC model outcomes are evaluated with the same goodness-of-fit criteria outlined in the CFA analyses.

Results

Preliminary

Preliminary analyses resulted in the imputation of missing data values through the EM algorithm in SPSS 14.0, the percentage of missing data remained below 3% of all responses. Following the recommendations of Tabacknick and Fidell (2007), all univariate outliers were modified and multivariate outliers were deleted from analysis. Consequently, the sample size was reduced from 803 to 790 participants (in consideration of the small number of deletions, no alternative sample estimates were run). The examination of tests of normality indicated some departure from normality; however, the maximum likelihood estimation method used in subsequent analyses is robust to such violations of normality (Joreskog & Sorbom, 1993; Muthen & Kaplan, 1982); thus, the data were deemed suitable for LISREL analysis.

Analysis 1: Reliability

Descriptive statistics and Cronbach's alpha estimates for the subscales of the RAPRI-BT are presented in Table 1. Cronbach's alpha estimates for the Physical, Verbal, Social, Visual, and Text subscales of the Bully model were good, ranging from .80 to .88. Additionally, sound reliability estimates were obtained for the higher order traditional bully (Cronbach's $\alpha = .93$) and cyber bully (Cronbach's $\alpha = .88$) factors. For the Target model, Cronbach's alpha estimates for the Physical, Verbal, Social, Visual, and Text subscales were good to excellent, ranging from .80 to .91. Moreover, the higher order traditional target (Cronbach's $\alpha = .94$) and cyber target (Cronbach's $\alpha = .87$) factors exhibited good to excellent reliability estimates.

In an examination of the overall mean scores, it can be noted that on average the students were not frequently involved in bullying orientated behaviors or targeted by bullying (with no mean score being above 2.10, thus closely to a monthly frequency in occurrence). This is especially the case with cyber bullying (both perpetrator and target) as the average score sat very to the lower limit of the Likert-type scale (1 [*never*]).

TABLE 1. Descriptive Statistics and Reliability Estimates for RAPRI-BT

Higher order factor	First-order factor	M	*SD*	Cronbach's α
RAPRI-Bully				
Traditional bully				.93
	Physical	1.78	0.91	.86
	Verbal	2.10	0.96	.88
	Social	1.43	0.63	.83
Cyber bully				.88
	Cyber visual	1.12	0.39	.84
	Cyber text	1.13	0.33	.80
RAPRI-Target				
Traditional target				.94
	Physical	1.71	0.85	.84
	Verbal	2.09	1.12	.91
	Social	1.55	0.81	.87
Cyber target				.87
	Cyber visual	1.03	0.21	.80
	Cyber text	1.15	0.35	.84

Note. RAPRI-BT = Revised Adolescent Peer Relations Instrument–Bully/Target.

Analysis 2: CFA of Psychometric Properties and Factor Relations

A first-order CFA was conducted on the Bully scale in order to examine the structure of the five factors (physical, verbal, social, visual, and text). The results of the CFA presented in Table 2 demonstrated an acceptable to good fit with the data, as indicated by an RMSEA of .078, CFI of .96, and TLI of .96. Second, a higher order CFA was conducted for the Bully model in order to identify the loadings of the five first-order factors onto two higher order factors (traditional bully and cyber bully). Again, goodness-of-fit indices showed acceptable to good model fit with the data, as indicated by an RMSEA of .079, CFI of .96, and TLI of .95 (see Table 2).

Factor loadings (see Table 3) indicated that the factors were well defined by their corresponding items, and all loadings were significant, positive, and substantial in size ranging from .55 to .93. The intercorrelations between the five first-order factors (see Table 3) indicated that the factors that represented traditional bullying (physical, verbal, and social) were more highly correlated with each other (median $r = .72$) than with the two factors that represented cyber bullying (visual and text; median $r = .44$). Similarly, the correlation between the two cyber bullying factors ($r = .75$) was substantially higher than the correlation between these cyber factors and the traditional factors (median $r = .44$). Such results supported the formation of two higher order factors, namely traditional bully and cyber bully. In

TABLE 2. Goodness-of-Fit Indices for RAPRI-Bully Scale First-Order and Higher Order CFAs

	χ^2	*df*	CFI	TLI	RMSEA
First-order CFA	2484.90	424	.96	.96	.078
Higher order CFA	2617.34	429	.96	.95	.079

Note. RAPRI = Revised Adolescent Peer Relations Instrument; CFA = confirmatory factor analysis; CFI = comparative fit index; TLI = Tucker-Lewis index; RMSEA = root mean square error of approximation.

TABLE 3. Factor Loadings and Factor Correlations for the Subscales of the RAPRI-Bully Scale

Item	Physical	Verbal	Social	Visual	Text
Factor loadings					
1	.80	.77	.70	.93	.82
2	.73	.80	.73	.81	.59
3	.59	.72	.66	.59	.55
4	.71	.74	.70	.93	.62
5	.76	.62	.64	.57	.66
6	.69	.79	.63		.56
7					.57
8					.68
Factor correlations					
Physical	—				
Verbal	.87	—			
Social	.65	.72	—		
Visual	.43	.42	.45	—	
Text	.42	.48	.59	.75	—

Note. RAPRI = Revised Adolescent Peer Relations Instrument.

addition, the factor loadings of the five first-order factors onto the two higher order factors were also sufficient for the higher order model. Physical, verbal, and social loaded onto the traditional bully factor with values of .91, .96, and .76 respectively, and visual and text loaded on the cyber bully factor with values of .80 and .95, respectively. Again, the higher order factor loadings were highest among factors within each higher order factor group than those between factor groupings. The correlation between the two higher order factors was .56, and significant at the .001 level.

A first-order CFA was conducted on the Target scale in order to examine the structure of the five target factors (physical, verbal, social, visual, and text). The results of the CFA displayed in Table 4 demonstrated acceptable goodness-of-fit-indices, with an RMSEA of .062, CFI of .97, and TLI of .97. Second, a higher order CFA was conducted for the Target model in order to identify the loadings of the five first-order factors onto two higher order factors (traditional target and cyber target). Again, goodness-of-fit indices showed good model fit with the data, as indicated by an RMSEA of .066, CFI of .97, and TLI of .97 (see Table 4).

Furthermore, examinations of the factor loadings for the first-order model revealed the factor structure was well defined, with all items loading significantly and positively onto their appropriate factors, and being substantial in size ranging from .54 to .85. On examination of the intercorrelations between first-order and higher order factors (see Table 5), it could be seen that the factors which represented being a target of traditional bullying (physical, verbal, and social) were more highly correlated with each other (median r = .77) than with the two factors that represented being a cyber target (visual and text; median r = .38). Correspondingly, the correlation between the two cyber target factors (r = .79) was substantially higher than the correlation between these cyber factors and the traditional factors (median r = .38). Such results supported the formation of two higher order factors, namely traditional target and cyber target. Moreover, the factor loadings of the five first-order factors onto the two higher order factors (traditional target and cyber target) were also sufficient for the higher order model. Physical, verbal, and social loaded onto the traditional target factor with values of .84, .92, and .85, respectively, and visual and text loaded on the cyber target factor with values of .86 and .91, respectively. Again, the higher order factor loadings were highest among factors within each higher order factor group than those between factor groupings. The correlation between the two higher order factors was .50, and significant at the .001 level.

TABLE 4. Goodness-of-Fit Indices for RAPRI-Target Scale First-Order and Higher Order CFAs

	χ^2	*df*	CFI	TLI	RMSEA
First-order CFA	1704.66	424	.97	.97	.062
Higher order CFA	1943.20	429	.97	.97	.066

Note. RAPRI = Revised Adolescent Peer Relations Instrument; CFA = confirmatory factor analysis; CFI = comparative fit index; TLI = Tucker-Lewis index; RMSEA = root mean square error of approximation.

TABLE 5. Factor Loadings and Factor Correlations for the Subscales of the RAPRI-Target Scale

Item	Physical	Verbal	Social	Visual	Text
Factor loadings					
1	.81	.85	.80	.76	.63
2	.68	.81	.68	.71	.71
3	.73	.77	.79	.66	.55
4	.54	.74	.69	.75	.54
5	.68	.78	.68	.81	.75
6	.68	.77	.71		.66
7					.68
8					.58
Factor correlations					
Physical	—				
Verbal	.77	—			
Social	.71	.78	—		
Visual	.36	.39	.36	—	
Text	.38	.41	.38	.79	—

Note. RAPRI = Revised Adolescent Peer Relations Instrument.

Analysis 3: Tests of Factorial Invariance

Invariance testing was conducted to determine whether the factor structure of the first-order and higher order Bully scales were equivalent in their measurement properties across gender and grade. As can be seen from Table 6, the factor loadings only were invariant for the first-order and higher order models across gender. However, as previously outlined, this is the minimum requirement that must be met for invariance (Byrne, 1998). As shown in Table 6, the change in the goodness-of-fit indices for the first-order model across grade did not exceed .01 in the CFI for the fourth model in which factor loadings and uniquenesses were held invariant. Moreover, the factor loadings and factor variances and covariances were invariant for the higher order model across grade.

Invariance testing was carried out in order to evaluate the goodness-of-fit indices for the first-order and higher order Target scales across the five models of progressively stricter parameter restrictions. As can be seen from Table 7, the factor loadings and factor variances and covariances only were invariant for the first-order and higher order Target models across gender. As shown in Table 7, the change in goodness-of-fit criteria for the first-order and higher order Target models across grade did not exceed .01, at least for the second model in which factor loadings only were held invariant.

TABLE 6. Invariance Tests Across Gender and Grade for the First-Order and Higher Order RAPRI-Bully Models

Model	χ^2	*df*	CFI	TLI	RMSEA
First-order Bully model across gender					
NO INV	3819.64	848	.942	.937	.077
FL	4200.22	874	**.935**	.930	.079
FL, FC	4548.43	889	.927	.924	.079
FL, UN	5050.82	905	.913	.910	.088
FL, FC, UN	5444.32	920	.904	.902	.091
Higher order Bully model across gender					
NO INV	4086.13	858	.938	.933	.077
FL	4573.52	886	**.929**	.926	.079
FL, FC	4663.10	894	.925	.922	.079
FL, UN	5375.29	917	.907	.906	.080
FL, FC, UN	5563.31	925	.902	.901	.081
First-order Bully model across grade					
NO INV	3869.47	848	.940	.934	.078
FL	4105.56	874	.935	.931	.078
FL, FC	4237.72	889	.931	.928	.079
FL, UN	4531.92	905	**.930**	.926	.080
FL, FC, UN	4640.71	920	.923	.922	.080
Higher order Bully model across grade					
NO INV	4059.88	858	.937	.931	.078
FL	4374.71	886	.931	.928	.078
FL, FC	4420.30	894	**.928**	.925	.078
FL, UN	4758.25	917	.924	.923	.079
FL, FC, UN	4772.88	925	.920	.920	.082

Note. Bold indicates one step before a change in acceptable goodness-of-fit indices. RAPRI = Revised Adolescent Peer Relations Instrument; NO INV = no invariance restraints; FL = factor loadings; FC = factor variances and covariances; UN = uniquenesses; CFI = comparative fit index; TLI = Tucker-Lewis index; RMSEA = root mean square error of approximation.

TABLE 7. Invariance Tests Across Gender and Grade for the First-Order and Higher Order RAPRI-Target Models

Model	χ^2	*df*	CFI	TLI	RMSEA
First-order Target model across gender					
NO INV	2852.50	848	.956	.952	.077
FL	3315.82	874	.948	.945	.080
FL, FC	3362.85	889	**.947**	.945	.084
FL, UN	3850.96	905	.932	.930	.089
FL, FC, UN	3924.15	920	.930	.929	.091
Higher order Target model across gender					
NO INV	3107.87	858	.951	.947	.069
FL	3351.70	886	.944	.941	.071
FL, FC	3577.78	894	**.943**	.941	.076
FL, UN	4174.20	917	.927	.926	.081
FL, FC, UN	4215.45	925	.926	.926	.081
First-order Target model across grade					
NO INV	2759.17	848	.957	.953	.076
FL	3233.51	874	**.948**	.943	.077
FL, FC	3271.60	889	.945	.942	.078
FL, UN	3759.44	905	.928	.926	.088
FL, FC, UN	3767.84	920	.925	.924	.089
Higher order Target model across grade					
NO INV	3006.23	858	.953	.949	.073
FL	3499.56	886	**.943**	.941	.075
FL, FC	3506.68	894	.940	.938	.075
FL, UN	4040.80	917	.923	.923	.086
FL, FC, UN	4002.74	925	.921	.920	.091

Note. Bold indicates one step before a change in acceptable goodness-of-fit indices. RAPRI = Revised Adolescent Peer Relations Instrument; NO INV = no invariance restraints; FL = factor loadings; FC = factor variances and covariances; UN = uniquenesses; CFI = comparative fit index; TLI = Tucker-Lewis index; RMSEA = root mean square error of approximation.

Analysis 4: MIMIC Modeling

Two MIMIC models were conducted to examine the main effects of gender and grade and the gender by grade interaction on the five first-order and two higher order RAPRI-Bully models. The derived goodness-of-fit indices for the two models displayed in Table 8 showed that both MIMIC models adequately fit the data.

Table 9 displays the beta coefficients for the Bully first-order and higher order MIMIC models, any significant main effects for gender and grade as well as significant interaction effects are indicated. The results indicated that boys scored significantly higher than girls on the physical, verbal, and visual scales. In addition, boys scored significantly higher than girls on the traditional bully higher order factor, meaning that in general boys used traditional forms of bullying more than girls. For grade, only one significant main effect was found, whereby the senior grade (Years 10 and 11) evinced significantly higher scores than the junior grade (Years 7, 8, and 9) on the Verbal Bully scale.

However, it was recognized that the main effects for the physical and verbal bully and traditional bully factors were qualified by an interaction effect. It is necessary to plot any significant interaction effects in order to gain an accurate picture of their effect on outcome variables. It can be seen from Figure 1 that at the junior level, boys ($M = 2.02$, $SD = 1.01$) reported engaging in more physical bullying

TABLE 8. Goodness-of-fit Indices for First-Order and Higher Order RAPRI-Bully MIMIC Models

	χ^2	*df*	CFI	TLI	RMSEA
First-order model	2673.58	505	.96	.95	.073
Higher order model	2951.20	519	.95	.95	.077

Note. RAPRI = Revised Adolescent Peer Relations Instrument; MIMIC = Multiple Indicators Multiple Causes; CFA = confirmatory factor analysis; CFI = comparative fit index; TLI = Tucker-Lewis index; RMSEA = root mean square error of approximation.

TABLE 9. Standardized Beta Coefficients for Gender, Grade, and Gender by Grade Interactions for RAPRI-Bully First-Order and Higher Order Factors

	Gender	Grade	Gender by grade interaction
Physical	−.38***	.03	−.07*
Verbal	−.28***	.11**	−.08*
Social	−.02	−.06	−.04
Visual	−.09*	.02	−.05
Text	−.02	−.02	−.04
Traditional bully	−.30***	.07	−.08*
Cyber bully	−.02	−.01	−.05

*$p < .05$. **$p < .01$. ***$p < .001$.

than girls ($M = 1.47$, $SD = 0.64$), however by the senior level the scores diverged further whereby boys ($M = 2.19$, $SD = 1.04$) reported even higher physical bullying scores and girls ($M = 1.38$, $SD = 0.15$) reported even lower scores. As depicted in Figure 2, boys ($M = 2.19$, $SD = 1.02$) reported higher scores than girls ($M = 1.83$, $SD = 0.83$) on the verbal bully factor at the junior level, but by the senior level boys ($M = 2.56$, $SD = 1.07$) experienced a larger rise than girls ($M = 1.88$, $SD = 0.71$).

Examination of Table 9 also demonstrated a significant gender by grade interaction effect for the higher order traditional bully factor. The interaction can be viewed pictorially in Figure 3. As with the previous interactions, boys ($M = 1.89$, $SD = 0.81$) reported higher scores on overall traditional bullying than girls ($M = 1.59$, $SD = 0.65$) at the junior level. However, by senior level the scores diverged further, whereby boys ($M = 2.06$, $SD = 0.80$) reported even higher scores, and girls slightly lower scores ($M = 1.54$, $SD = 0.47$).

Two MIMIC models were conducted to examine the effects of gender, grade, and gender by grade interactions on the five first-order and two higher order factors of the RAPRI-Target scale. The derived goodness-of-fit indices for the first-order and higher order Target models displayed in Table 10 indicated an acceptable fit to the data.

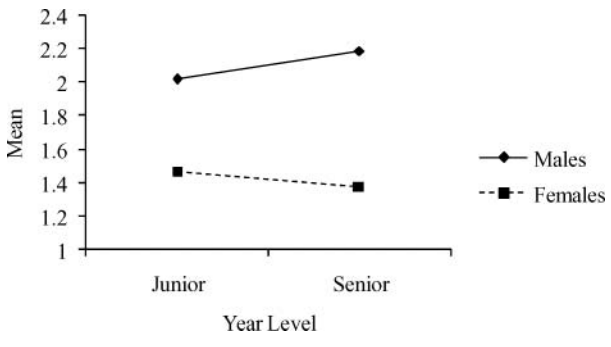

FIGURE 1. Physical bully gender by grade interaction.

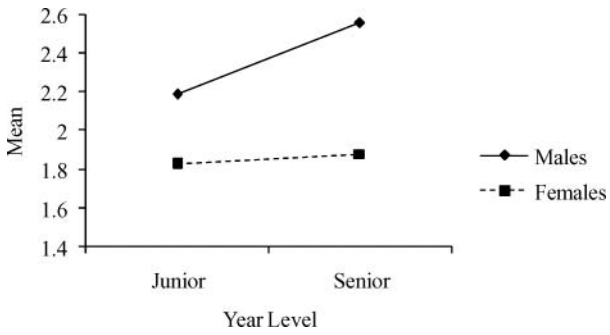

FIGURE 2. Verbal bully gender by grade interaction.

Derived beta coefficients are presented in Table 11 and significant main effects for gender and grade are indicated. For the gender main effects, boys reported higher scores than girls on the Physical and Verbal Target scales. Furthermore, boys evinced higher scores than girls on the overall traditional target factor, which indicated boys reported being the target of all forms of traditional bullying more than girls.

For grade, two significant main effects were found for the first-order Target model whereby the junior grade had significantly higher scores on the Physical and Social Target scales than the senior grade. In addition, a significant main effect was also evident for the higher order traditional target factor; the junior-year group reported significantly higher overall experience of being a target of traditional forms of bullying than the senior-year group.

Discussion

The present findings supported the prediction that the newly extended RAPRI-BT was a psychometrically sound measure of the bullying constructs it was specifically

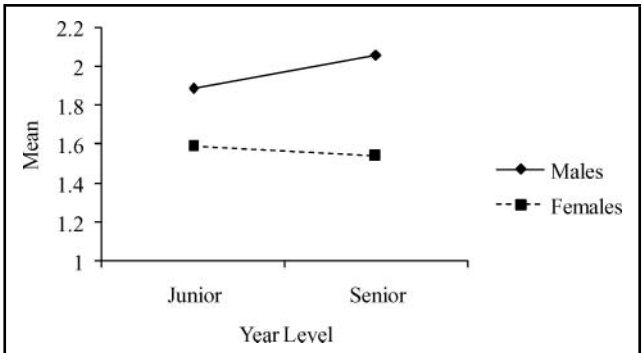

FIGURE 3. Traditional bully gender by grade interaction.

TABLE 10. Goodness-of-Fit Indices for First-Order and Higher Order RAPRI-Target MIMIC Models

	χ^2	*df*	CFI	TLI	RMSEA
First-order CFA	1869.79	505	.97	.97	.058
Higher order CFA	2217.52	519	.96	.96	.064

Note. RAPRI = Revised Adolescent Peer Relations Instrument; CFA = confirmatory factor analysis; CFI = comparative fit index; TLI = Tucker-Lewis index; RMSEA = root mean square error of approximation.

designed to measure. Specifically, the CFA results supported the hypothesized a priori five first-order and two factor higher order factor structure of the RAPRI for the Bully and Target models. Moreover, as predicted, tests of invariance demonstrated that the factor structure of the scales held the same meaning for boys and girls, and juniors and seniors. These findings were consistent with previous traditional bullying research that postulated the multidimensional three-factor structure of bullying (i.e., physical, verbal, and social; Crick et al., 2001; Parada, 2000; Rigby & Slee, 1999). Furthermore, although researchers had postulated the existence of cyber bullying (Beran & Li, 2005; Finkelhor et al., 2000; P. K. Smith et al., 2006; Ybarra et al., 2007), it was as yet unknown how it related to traditional bullying. In the present investigation we psychometrically verified the proposed underlying cyber bullying constructs (i.e., visual and text) in tandem with a multidimensional traditional bullying measure, and revealed that the cyber bullying factors themselves were distinct yet related constructs when compared with the traditional bullying constructs. This is one of the first steps to creating a sound knowledge from which to inform effective interventional strategies for addressing cyber bullying.

In support of the hypotheses made in relation to gender effects for traditional bullying and being bullied, it was found boys engaged in and were the victim of traditional bullying significantly more than girls for physical and verbal forms. Furthermore, boys reported bullying and being bullied significantly more than girls on the overarching traditional factors. These findings indicated that, overall, boys engaged in and were the target of traditional bullying more than girls for this sample. Specifically, the results of the present study were comparable to the extensive body of traditional bullying research that has found overall, males bully and are bullied to a larger degree than girls (Boulton & Smith, 1994; Boulton & Underwood, 1992; Parada, 2006; Rigby & Slee, 1993). The results ran counter to research that postulated girls engage in more indirect forms of social bullying than boys (Craig & Pepler, 2003; Rigby, 2002; Sullivan, 2000). The finding of no real gender difference on the social factor for the Bully and Target model was consistent with a small body of research that has suggested the sexes are equally involved in social bullying (e.g., Wolke et al., 2000) and concluded assumptions about girls' relational use of bullying is based on outmoded artifacts from aggression literature.

TABLE 11. Standardized Beta Coefficients for Gender, Grade, and Gender by Grade Interaction for RAPRI-Target First-Order and Higher Order Factors

	Gender	Grade	Gender by grade interaction
Physical	−.27***	−.12**	−.05
Verbal	−.09*	−.07	−.06
Social	.04	−.12**	−.03
Visual	−.02	−.05	−.02
Text	.05	−.06	−.07
Traditional target	−.11**	−.12**	−.06
Cyber target	.02	−.06	−.06

Note. RAPRI = Revised Adolescent Peer Relations Instrument.
*$p < .05$. **$p < .01$. ***$p < .001$.

In response to the research questions related to gender effects for cyber bullying and being bullied, only one significant main effect for gender was found. For the Bully model, males showed significantly higher scores than females on the visual factor. The general consistency in bullying and being bullied across the genders could potentially be explained by the theoretical similarities between textual bullying and the traditional social and relational form. In particular, cyber bullies hide behind the technology to enact their behaviors at a covert distance, this is comparable to the indirect methods such as rumor spreading utilized in social bullying (Marsh et al., 2001; Shariff, 2005). These findings added to the small body of cyber bullying literature that has found few gender differences (Beran & Li, 2005; Li, 2007).

Inconsistent with the hypothesis made in regard to grade differences in traditional bullying, we found only one significant effect whereby the senior level reported higher involvement in verbal bullying than the junior year, which was in the opposing direction to that predicted. Furthermore, although not significant, grade effects on the remaining traditional bullying factors were mostly suggestive of higher involvement by the senior year level. Such results were counter to that of previous research that has shown bullying rates being at their peak in the beginning high school years and subsequently leveling out across the later high school years (Parada, 2006; Pellegrini, 2004; Rigby, 1996). The higher scores reported by the senior students may be explained by adolescents' increase in physical size as they grow older; these older and bigger students that are established within the school social hierarchy may utilize such factors to bully their younger, physically smaller, and less established counterparts.

Perhaps the latter was evidenced in the significant grade effects for the physical, social, and traditional target factors whereby, as predicted, the junior group reported significantly higher scores than the senior group. Although the outcome

for the Verbal scale was not significant, the result was in the predicted direction. This finding coincides with that of previous traditional bullying research, which has found students in the beginning years of secondary school report the highest levels of being bullied, such that experiences decreased considerably following Years 10 and 11 (Parada, 2006; Pellegrini, 2004). Such results may be explained by Lagerspetz et al.'s (1982) findings that targets tend to be physically weaker as well as young, physically smaller, and new students uneducated in the social ethos of the school. As a result, they may be appealing targets for those who bully as opposed to older and physically bigger senior students. Another potential explanation could relate the presence of a response bias where students do not want to be perceived as being victims of bullying when they are older. Conversely, as students progress through the year levels, they may come to expect and accept certain behaviors as part of the school norm and as such be less likely to identify them as bullying.

In answer to the research questions that pertained to grade effects for cyber bullying and being bullied, no significant main effects were found. For the Bully model, the results were extremely close to zero values, although the target model had small values mirroring the findings for traditional targets where the junior group reported higher scores than the senior group. In contrast with the present study's findings, Ybarra and Mitchell (2004a) reported an increase in cyber bullying across age; however, it was unknown whether these differences were significant. The nonsignificant findings of the present investigation were consistent with research by P. K. Smith et al. (2006), who also found little variation in rates of cyber bullying across differing age groups. The high level of nonsignificant results found for the cyber form could be a reflection of cyber bullying being only a relatively recent phenomenon that has just begun to establish itself amongst school students (Campbell, 2005; Williams et al., 2000). As such, only subtle grade differences may exist although cyber bullying may be in its infancy.

In exploring the research questions regarding gender by grade interaction effects for traditional and cyber forms for the Bully and Target models, significant effects were found only for the first-order physical bully and verbal bully factors and the higher order traditional bully factor. Of the few interactions found, the general pattern indicated that boys' involvement in bullying tended to rise from the junior to senior year level, although female involvement leveled out or declined. Such findings are consistent with the limited research (Parada, 2006) that has demonstrated the same interaction pattern for traditional bullying. As it was previously reported that boys are more likely to bully than girls and bullying tends to be at higher levels in the senior years, such interaction effects were as expected.

The present study provided a rigorous investigation into traditional and cyber bullying involvement; however, a number of potential limitations need to be considered. First, the sample utilized in the present study was drawn from one Catholic secondary school, which may affect the generalizability of the results to the wider population. Future researchers should consider a broader sample of schools that will not only more accurately represent the Catholic schooling system, but to identify potential differences across varying private and public schooling settings, and to examine how varying socioeconomic variables may impact on the prevalence of cyber bullying. In addition, the sample size in the present study may not have been large enough to fully uncover differences in cyber bullying experiences across grade and gender. Future researchers should include a variety of students from different schools to add further support to and extend on the findings of the present study.

Second, the data in the present study was collected via self-report nature. A possible problem in using self-report measures is the assumption that participants will reliably report their own behavior and posses a direct knowledge of the constructs under study (Pellegrini & Bartini, 2000). Moreover, with specific reference to bullying studies, some adolescents will ultimately choose not to divulge their involvement despite any assurance of confidentiality. Although some individuals are in fact prepared to concede to their involvement, future researchers would be improved by the inclusion of teacher and parent reports.

Given that there is a paucity of reported reliability and validity information for numerous measurement tools utilized in psychology, and in particular for measures of bullying (Hamby & Finkelhor, 2001), the findings of the present study have made a significant contribution to advancing psychological research through the use of strong multidimensional measures. Specifically, the design of the present study attempted to redress many of the problems inherent in the empirical bullying literature by validating utilized measures, and avoiding the use of single-item instruments, and bipolar classification schemes. Moreover, the study provided a rigorous investigation into gender and possible developmental differences in traditional and cyber bullying and target experiences. Consequently, a stronger foundation may have been provided for the development of more effective interventions aimed at seeking prevention to this critical social issue of our time.

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APPENDIX
RAPRI Items

Section A are the cyber bullying items and Section B are the cyber victim (target) items. Bully factor items were preceded by the stem sentence "In the past year at this school I . . . " and Target factor items were preceded by the stem sentence "In the past year at this school . . . " Items were scored on a 6-point Likert-type scale ranging from 1 (*never*) to 6 (*every day*). Scoring is achieved by simply adding the items up.

Section A

Bully Visual

1. Used a mobile phone to send other students a video of a student I knew would embarrass them.
2. Used a mobile phone to forward a video to a student I knew they wouldn't like.
3. Taken a photo of a student on a mobile phone that I knew would embarrass them.
4. Used a mobile phone to send other students a photo of a student I knew would hurt them.
5. Taken a video of a student being mean to another student using a mobile phone and sent it to my friends.

Bully Text

1. Used a student's email account without their permission to send an email, that I knew would get them into trouble.
2. Sent a student an email with a message I knew would hurt their feelings.
3. Made nasty jokes about a student to my friends in an instant chat message.
4. Used a student's instant chat account without their permission to send a message, that I knew would get them into trouble.
5. Wrote nasty things about a student on a profile page (like MySpace or YouTube).
6. Created a profile page (like MySpace or YouTube) about a student knowing it would upset them.
7. Sent a student a mobile phone text message knowing it would hurt their feelings.
8. Deliberately left out a student by sending everyone a mobile phone text message but them.

Section B

Target Visual

1. A rude picture message was sent to my mobile phone.
2. My mobile phone account was used without my permission to send a picture message to other people to get me in trouble.
3. A student got other students to send a rude video message to my mobile phone.
4. A student forwarded a video message to my mobile phone they knew I wouldn't like.
5. My mobile phone account was used without my permission to send a video message to other people to get me in trouble.

Target Text

1. A student sent me a nasty email.
2. A student sent me an email threatening to harm me.
3. A student sent me an instant chat message to hurt my feelings.
4. My instant chat account was used without my permission to send an instant chat message to other students to get me into trouble.
5. A student created a nasty profile page (like MySpace or YouTube) about me.
6. A student put something on a profile page (like MySpace or YouTube) about me to hurt my feelings.
7. I was called names I didn't like through a mobile phone text message.
8. A student sent me a text message to hurt my feelings.