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Assessing Peer Victimization Across Adolescence: Measurement Invariance and Developmental Change

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Abstract

An upward extension of the Revised Social Experience Questionnaire (Paquette & Underwood, 1999) was tested in a sample of adolescents followed longitudinally from seventh through tenth grade. We hypothesized that a two-factor model with overt and social victimization factors would fit the data better than would a unidimensional model (a single general victimization factor) or a three-factor model (separately examining verbal, physical, and social victimization). The two-factor model best represented the data, and we found support for longitudinal invariance of this model across seventh through tenth grades for both boys and girls. Such findings of temporal invariance are important for further longitudinal comparisons, and we suggest future directions for using the Revised Adolescent Social Experience Questionnaire to examine stability and change in victimization as well as evaluating the effectiveness of intervention programs.

Keywords

measurement invariance; overt victimization; social victimization

Being the victim of peer aggression in adolescence confers risk for myriad health and adjustment problems. Adolescents who are victimized by their peers report greater feelings of loneliness and social anxiety than nonvictimized youth (Storch, Brassard, & Masia-Warner, 2003; Storch & Masia-Warner, 2004). Peer victimization also relates to low self-esteem and depression (Brunstein Klomek, Marrocco, Kleinman, Schonfeld, & Gould, 2007; Crick & Grotpeter, 1996; Paquette & Underwood, 1999; Prinstein, Boergers, & Vernberg, 2001). Although less research has examined the relation between peer maltreatment and externalizing problems, initial investigations suggest that victimization predicts aggression, delinquency, and substance use (Sullivan, Farrell, & Kliewer, 2006). Victimization has also been associated with physical symptoms, and this relation may result from the chronic stress of peer maltreatment suppressing the immune system (Nishina, Juvonen, & Witkow, 2005).

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These negative outcomes highlight the importance of ensuring that assessments of victimization demonstrate favorable psychometric properties in adolescence so that researchers may examine which youth are most at risk as well as to evaluate the success of interventions designed to reduce the prevalence of peer maltreatment.

The junior high school years (early adolescence) are often seen as extremely difficult to navigate socially, and many studies of peer maltreatment have focused on this period given that this is when victimization is thought to be at its highest level (e.g., Kaufman et al., 2000; Nishina & Juvonen, 2005). However, few studies have examined peer victimization longitudinally, and the existing longitudinal research has yet to examine the transition from junior high school to high school (Kochenderfer-Ladd & Wardrop, 2001; Paul & Cillessen, 2003; Pellegrini & Bartini, 2000; Pellegrini & Long, 2002; Schafer, Korn, Brodbeck, Wolke, & Schulz, 2005). The current study seeks to extend this previous research by examining the factor structure of a self-report measure of peer victimization, the Revised Adolescent Social Experience Questionnaire (adapted from Paquette & Underwood, 1999), for a sample followed from seventh through tenth grade. As some individuals continue to be victimized through adolescence and into adulthood, it is important to ensure that developmentally appropriate assessments are available (Chapell et al., 2004; Smith, Singer, Hoel, & Cooper, 2003). The present investigation examines the use of the Revised Adolescent Social Experience Questionnaire across adolescence.

Recently, there has been a call for developmental research to examine the equivalence of assessments across time (see Knight & Zerr, 2010). Widaman and colleagues (2010) go as far as to say that “one of the more vexing problems in assessing development- and one that deserves greater attention- is the problem of measurement invariance” (p. 10). Despite such assertions, many studies of peer relations have not examined measurement invariance, which is necessary to show comparability of assessments across developmental periods. Given that peer relations are among the strongest predictors of adult adjustment (Bukowski, Buhrmester, & Underwood, 2011; Ladd, 2005), additional research is needed to examine the equivalence of assessments commonly used to study peer relations across adolescence.

Establishing measurement invariance is necessary to understand how a construct such as peer victimization changes over time (Buhs, McGinley, & Toland, 2010; Chan, 1998; Dishman et al., 2010). The term *measurement invariance* is often used interchangeably with *measurement equivalence* and *factorial invariance*, and in longitudinal research refers to the extent to which measurement properties are similar at different assessment points (Dishman et al., 2010; Knight & Zerr, 2010). Specifically, examining measurement invariance in developmental research requires documenting that the relations between latent variables and their indicators remains the same across time. Findings of measurement invariance allow for stronger conclusions given that a critical assumption has been met – “we are measuring the same thing in the same metric on each occasion” (Widaman, Ferrer, & Conger, 2010, p. 11). Thus, to interpret properly changes in mean levels of peer maltreatment across adolescence, we sought to establish measurement invariance by testing the factorial structure of our victimization measure at each grade level examined. Demonstrating measurement invariance would imply that changes on the Revised Adolescent Social Experience Questionnaire reflect true differences rather than measurement artifacts (Dishman et al., 2010; Knight & Zerr, 2010).

Similarly, establishing measurement invariance across gender is necessary to make meaningful inferences about differences between the victimization experiences of girls and boys. If boys and girls interpret aggressive behaviors perpetrated by their peers differently, then little will be gained by describing mean level gender differences because the items do not hold the same meaning (Kim, Kim, & Kamphaus, 2010). However, examining whether

females and males interpret peer aggression differently still has the potential to guide future research and intervention efforts. Consequently, we also sought to determine whether the Revised Adolescent Social Experience Questionnaire was invariant across gender.

One of the only known investigations examined measurement invariance for an assessment of peer victimization between fifth and sixth grades for boys and girls (Buhs et al., 2010). A two-factor model of victimization – overt and social victimization – was supported using confirmatory factor analyses that established measurement invariance across the grades examined. The current study builds on this research to examine whether similar support was found for separate overt and social victimization constructs in grades seven through ten, and whether the measurement models underlying these constructs were temporally invariant across grades. Further, we tested whether parameter estimates for boys and girls were statistically indistinguishable across all grades. Such confirmation of measurement invariance across time and gender would allow for examination of change in mean levels of victimization across adolescence. We further describe our assessment of victimization and its hypothesized factor structure below.

Dimensions of Peer Victimization

Victimization has been defined as repeated exposure to peer maltreatment (Olweus, 1995), and following Buhs et al. (2010) and others, we examined a two-factor model of peer victimization with overt and social victimization factors (see also Crick & Grotpeter, 1996 and Paquette & Underwood, 1999). Overt victimization refers to experiencing physical victimization (e.g., hitting and shoving) or verbal (e.g., hostile teasing and name-calling) attacks intended to inflict direct harm (Buhs et al., 2010). Physical victimization, which is a form of overt victimization, includes both physical harm and threats of physical harm (Casas, 2004). Some youth are also targeted by behaviors intended to harm their social status, relationships, or self-esteem, including: social exclusion, malicious gossip, and friendship manipulation. We refer to these types of experiences as social victimization (Galen & Underwood, 1997; Underwood, 2003), but other researchers use the terms indirect victimization (Lagerspetz, Bjorkqvist, & Peltonen, 1988; Miller & Vaillancourt, 2007; Owens, Shute, & Slee, 2000) and relational victimization (Crick & Bigbee, 1998; Crick, Casas, & Nelson, 2002) to refer to similar constructs. Overt and social victimization have been found to be highly correlated, but each factor has been found to predict adjustment uniquely (Crick & Grotpeter, 1996; Prinstein et al., 2001; Sullivan et al., 2006).

Based on previous research (e.g., Buhs et al., 2010; Paquette & Underwood, 1999), we hypothesized that a two-factor model with overt and social victimization factors would best fit the data at each grade level examined, but we also evaluated a unidimensional model (a single general victimization factor) and a three-factor model (separately examining verbal, physical, and social victimization). Numerous self-report measures have been developed to assess peer victimization; many of which yield two factors (e.g., Buhs et al., 2010; Crick & Grotpeter, 1996; Paquette & Underwood, 1999). However, other measures average across different types of behaviors to create a general victimization score (e.g., Ladd & Kochenderfer-Ladd, 2002; Nishina et al., 2005). Still, some measures further break down overt victimization to examine verbal victimization and physical victimization in addition to social victimization (e.g., Mynard & Joseph, 2000). In the current study we evaluated whether the unidimensional, two-factor, or three-factor model best fit the data at each grade level.

Longitudinal Investigations of Victimization

Demonstrating measurement invariance across grade levels for assessments of peer victimization will enable researchers to better understand changes in mean levels of

victimization that occur with development. Although issues of measurement invariance over time have largely been ignored in the study of victimization, there have been a few longitudinal investigations of peer maltreatment. It has been proposed that peer victimization may be at its highest level in junior high school (Kaufman et al., 2000), and then decrease with age as children develop more effective social skills (Smith, Madsen, & Moody, 1999). There is some support for a decline in peer maltreatment across time (Camodeca et al., 2002; Sweeting et al., 2006). However, others have found that victimization may increase following school transitions, such as entry to middle school (Pellegrini & Long, 2002). Establishing measurement equivalence for peer victimization assessment measures is important for determining growth and change in victimization and whether individuals follow different trajectories.

Gender and Victimization

In addition to documenting invariance across grades, establishing equivalence of victimization measures for boys and girls is needed to enable researchers to understand better gender differences in peer victimization. Many studies have examined gender differences in mean levels of different forms of victimization, even though little work has considered equivalence of existing measures across gender (for an exception, see Buhs et al., 2010). Boys experience more physical victimization than do girls; however, there do not appear to be consistent gender differences in the frequency with which boys and girls experience social victimization (Crick & Grotpeter, 1996; Prinstein et al., 2001; Sullivan et al., 2006). Although experiencing social victimization is painful for both genders, girls report being more upset following such incidents (Paquette & Underwood, 1999), perhaps, because female friendships are extremely close and intimate (Lagerspetz et al., 1988; Maccoby, 1998). Given these differences, boys and girls might interpret aggressive behaviors differently, which points to the importance of examining assessments of peer maltreatment to determine if items are equivalent across gender.

Current Research

The purpose of the present investigation was three-fold. We first examined whether support was found for our hypothesized two-factor model of victimization (separate overt and social constructs) from grades seven through ten. Second, we tested whether the measurement models underlying the constructs of overt and social victimization were invariant across grades and gender. Third, if evidence was found for temporal and gender invariance, we sought to examine changes in mean levels of the overt and social victimization factors across seventh through tenth grades for both boys and girls.

To test these questions we administered the Revised Adolescent Social Experience Questionnaire annually from seventh through tenth grade. This measure was adapted from the Revised Social Experience Questionnaire (Paquette & Underwood, 1999) for use with adolescents by changing the wording of questions to be more appropriate for teenagers and also adding some new items to capture behaviors that might first appear in adolescence (e.g., sending mean or hurtful text or online messages).

Methods

Participants

Participants were enrolled in a longitudinal investigation of the development and outcomes of social aggression. We originally recruited participants from third grade classrooms in a large suburban school district, and have continued to follow these children into adolescence with annual research visits. In the summer following participants' eighth grade year,

adolescents were provided with BlackBerry devices as a part of the larger longitudinal study to allow for examination of their electronic communication with peers (see Underwood, Rosen, More, Ehrenreich, & Gentsch, 2012). At this point, some families chose to no longer participate in this study. However, many families that had participated at one time but had not completed yearly visits returned with the introduction of this new component of the investigation.

The Revised Adolescent Social Experience Questionnaire was first administered in seventh grade. At this time, 206 seventh graders (102 girls) participated. Child ethnicity was 55.3% European American, 18.0% Hispanic, 17.5% African American, and 9.2% other ethnicities, which was representative of the participating school district. Across grades 7 through 10, 125 participants had completed the RASEQ at each assessment point. There were no significant differences in seventh grade social or overt victimization scores ($ps > 0.1$) between those with partial and complete victimization data.

Procedures

Participants were recruited from classrooms in a diverse school district following the end of their third grade year and have since participated in annual research visits. Letters introducing the study were sent home with students in third grade public school classrooms. Approximately 55% of these letters were returned with consent to participate in the study, which included yearly laboratory visits with a parent and a mutually nominated close friend. This consent rate is commensurate with similar investigations that recruit representative samples from schools (Betan, Roberts, & McCluskey-Fawcett, 1995; Sifers, Warren, Puddy, & Roberts, 2002).

During their yearly visits in the summers after their seventh, eighth, ninth, and tenth grade years, participants completed the Revised Adolescent Social Experience Questionnaire. Although only the Revised Adolescent Social Experience Questionnaire is relevant to the current study, participants also completed other measures related to the aims of the larger longitudinal investigation.

Measure

We developed an upward extension of the Revised Social Experience Questionnaire (Paquette & Underwood, 1999) for use with adolescents, which we now refer to as the Revised Adolescent Social Experience Questionnaire (RASEQ). Wording was changed to make this measure more appropriate for adolescents; for example, "How often do other kids leave you out on purpose when it is time to play or do an activity?" was changed to "How often do other kids exclude you or leave you out on purpose?" Additional items were also added to capture aggressive behaviors that might be increasingly evident in adolescence, some of which were adapted from the Indirect/Social/Relational Aggression Scale (Coyne, Archer, & Eslea, 2006). Examples of items that were added include "How often do other kids befriend your enemies for revenge against you?", and "How often do other kids send you mean or hurtful text or online messages?".

Participants were instructed that "Here is a list of things that sometimes happen to people your age", and then asked to indicate "how often do they happen to you?". The response options were not framed by a given time period, but rather participants were asked to indicate how often they experienced each form of aggressive behavior on a 1 (*never*) to 5 (*all the time*) scale. However, given that participants rarely indicated experiencing particular forms of aggressive behavior *almost all the time* (4) or *all the time* (5), we collapsed these sparse highest categories for our analyses. The three categories considered in our analyses were: 1 (*never*), 2 (*almost never*), and 3 (*sometimes, almost all the time, or all the time*).

The Revised Social Experience Questionnaire includes an overt victimization subscale and a social victimization subscale. We examined the corresponding social victimization and overt victimization subscales for the RASEQ for each grade level examined (see Table 1 for items). Reliabilities of scores of the social victimization subscale were in the excellent range at all assessment points (α 's > .90). Reliabilities of scores of the overt victimization subscale were in the acceptable or good ranges at assessments (α 's > .78).

Although the Revised Social Experience Questionnaire was a two-factor model, we also tested a unidimensional and three-factor model to determine if these better fit the data. The unidimensional model represented a single general victimization factor, whereas the three-factor model separately examined verbal victimization (e.g., teasing), physical victimization, and social victimization (see Table 1 for items).

Analytic Plan

Our general approach was to use confirmatory factor analysis (CFA) to (a) assess the fit of our data on the individual factors discussed earlier (i.e., verbal, social, and physical), (b) based on these results test a multifactor model, (c) refine this model in light of our analysis, and then (d) test our refined model for longitudinal and gender invariance. As previously detailed, evidence of temporal invariance is necessary for longitudinal comparisons because the absence of this invariance makes it unclear as to whether changes found are true or the result of a change in the construct over time (Chan, 1998).

The survey data used in the analysis were ordinal. One approach to estimation is to ignore the metric and treat the data as continuous, but non-normal, and adjust the standard errors and chi-square (e.g., Buhs, et al., 2010). However, given the number of categories, particularly with the sparse extreme categories collapsed to make three categories, we chose to use a categorical variable methodology that accounted directly for the ordinal nature of the data by using a robust weighted least squares procedure rather than maximum likelihood (Finney & DiStefano, 2006). This also required that likelihood ratio tests used to evaluate nested models be calculated to account for the estimator not being distributed as chi-square.

As with maximum likelihood, all available data were used in the estimation without pairwise or listwise deletion. Thus, though the number of participants in the study varied across grades, as shown in Table 2, all information on each participant was used. For example, if a participant provided information in both the seventh and ninth grades, but not the eighth or tenth, then those two years were included in the analysis. The number of observations within a grade that had any missing data was quite small, less than six percent having any missing data. Estimation was done with Mplus version 6.1 (Muthén & Muthén, 2010).

We began by constructing single factor models of verbal, physical, and social factors at each grade and tested their fit separately at each assessment point from 7th through 10th grades. Thus, twelve separate CFAs were conducted, comprised of the verbal victimization, physical victimization, and social victimization factors at the four different grades examined. The assessments of fit were based on recommendations for analyses involving categorical data and were the Tucker-Lewis Index (TLI), Comparative Fit Index (CFI), and Root Mean Square Error of Approximation (RMSEA), along with the chi-square (Muthén & Muthén, 2010). Nonsignificant chi-square values, although ideal, are often not found, leading to greater weight being paid to the fit indices. However, in a number of cases the estimations did result in nonsignificant chi-square values, providing additional evidence. Our judgment as to what constituted an acceptable fit was derived from recent and generally conservative compilations of research reported by Brown (2006). These were that for excellent fit the CFI and TLI exceed 0.96 and with moderate fit exceed 0.90, and that the RMSEA be 0.06 or less for excellent fit with moderate fit being 0.08 or less. We then tested a three-factor model of

verbal, physical and social against a one-factor model combining all three of these at each grade level (7th-10th), and based on the results, tested the three-factor model against a two-factor model where verbal and physical were combined into an overt construct.

The model that best fit that data was then tested in a longitudinal context across all four grades. We began by examining both boys and girls together testing an unconstrained model. In the literature this is often described as evaluating the configural invariance of the model – examining whether the pattern of the factors is similar across grades regardless of whether the actual loadings are similar (Widaman et al., 2010). We then used a χ^2 difference test, $\Delta\chi^2$, to assess measurement invariance across all grades, searching for support for longitudinal invariance; $\Delta\chi^2$ is a likelihood ratio test that is calculated as the difference between a nested model χ^2 and a maintained model χ^2 , where the difference follows a form of χ^2 . As described below, the reported $\Delta\chi^2$ s were modified from their usual form to account for our categorical data. A nonsignificant $\Delta\chi^2$ was evidence of no statistical difference between the models. Finally, we examined the evidence for changes in the mean values of the factors over the four grades, both for the pooled sample (i.e., boys and girls together) and then whether there were differences by sex.

Two points need to be clarified at the outset. The first concerns how to test for measurement invariance when the factor indicators are ordinal. In the much more common case in the literature where indicators are, or are treated as if they were, continuous, there is generally a progression of first testing whether the factor loadings are invariant across time (weak factorial invariance) and then adding in an invariance restriction on the intercepts (strong factorial invariance), the minimum type of longitudinal invariance generally recommended (Widaman et al., 2010). However with ordinal indicators the focus is on the underlying probability distribution of the categories rather than the observed values. The probability of a particular outcome (Likert scale value) is determined both by the factor loadings and, simultaneously, the threshold that is crossed that leads to observing the outcome. Thus, invariance testing with categorical indicators is from configural invariance directly to strong factorial invariance, which we accomplish by holding both the factor coefficients and the thresholds used to determine the item probability curve, essentially the distribution assumed underlying the observed values, constant in the constrained model (Muthén & Muthén, 2010). Therefore we report only unconstrained (configural invariance) and constrained (strong factorial invariance) results.

The second issue to highlight is that, as mentioned earlier, the likelihood ratio tests we use are specific to dealing with the categorical indicators that are part of our estimated models. In most literature using continuous indicators a difference in χ^2 s is distributed χ^2 with the difference in parameters estimated being the degrees of freedom for a likelihood ratio test. With the estimator we use that accounts for ordinal data this is no longer the case. That is, the difference in the χ^2 s is not χ^2 . Instead, the unconstrained (configural invariance) model and the constrained (strong factorial invariance model) are separately estimated and, from each estimation, the derivatives are retained as is the asymptotic covariance matrix. Using these degrees of freedom are estimated (i.e., it is not simply the difference in parameters estimated), and a χ^2 test is constructed. For details see Asparouhov and Muthén, 2006.

Results

For analyses, response options were categorized as 1 (*never*), 2 (*almost never*), and 3 (*sometimes, almost all the time, or all the time*). For the social victimization items averaged across grade level, 48.92% of participants endorsed category 1 (*never*), 34.15% endorsed category 2 (*almost never*), and 16.93% endorsed category 3 (*sometimes, almost all the time, and all the time*). For the verbal victimization items averaged across grade level, 41.84% of

participants endorsed category 1 (never), 38.56% endorsed category 2 (almost never), and 19.61% endorsed category 3 (sometimes, almost all the time, and all the time). For the physical victimization items averaged across grade level, 62.98% of participants endorsed category 1 (never), 26.19% endorsed category 2 (almost never), and 10.82% endorsed category 3 (sometimes, almost all the time, and all the time).

Individual CFAs of the verbal, social, and physical factors for each grade were constructed with fit results presented in Table 2. For every model and grade either the fit indices, or nonsignificant chi-squares, or both suggest generally good or excellent fit. Two specific issues should be highlighted. The social factor has significant chi-squares for each grade. However given the number of estimated parameters, 42, and the number of covariance and mean elements available, 119, the power of the chi-squares is not surprising. However, the corresponding fit indices are strong, leading us to feel comfortable with the models. The second issue relates to the slightly higher than acceptable RMSEAs for the 7th and 10th grade physical factor. Again, the weight of the evidence from the other fit indices, coupled with the nonsignificant chi-squares for these models, gives us confidence in these models.

We then combined these individual factor models into three-factor models at each grade and examined the fit. At each assessment point, the estimated correlation between verbal and physical scales exceeded 1, though the population correlation is bound at 1, and the estimated correlation is statistically indistinguishable from 1. The correlation between the social and physical scales ranged from .91 to .98, and the correlation between the social and verbal scales ranged from .89 to .97 across the four assessment points.

The three-factor models generally fit the data well, as seen in the rows of Table 3 listed as “Three-factor.” The one-factor and two-factor models were compared to the three-factor model (see Table 3). First, we tested whether the three factors could be statistically distinguished from a single factor model. The likelihood ratio tests across grades, labeled $\Delta\chi^2$, shown in the rows of Table 3 as “One-factor,” provided no support for a unidimensional construct. Thus, we rejected the one-factor model over the three-factor model. Then, the three-factor model was tested against a two-factor model where the verbal and physical factors were combined into an overt factor. The likelihood ratio tests across grades, labeled $\Delta\chi^2$, shown in the rows of Table 3 as “Two-factor,” support the two-factor model over the three-factor model. Given the two-factor model best fit the data, this model is adopted for further analysis. Further, each of the three-factor models estimated the correlation between the verbal and physical factors to be high enough that they were statistically indistinguishable ($r_s=1$, $p_s<.01$; Byrne, 2010), at least as assessed with the RASEQ. Also the two-factor model was favorable given it was more balanced than the three-factor model; the physical and verbal factors each had four items whereas the combined overt factor had 8 items in comparison to the 14 items of the social factor.

Factor loadings for the two-factor model are presented in Table 4. Although we found support for the two-factor model, we also examined factor loadings for the three-factor model. In general, the physical victimization items loaded more strongly, though the difference was slight, on an overt factor than a separate physical factor.

As discussed previously, we tested the model for configural invariance and then strong factorial invariance. We had begun grade by grade by factor to assess whether the three individual factor models, combining boys and girls, fit the data at each grade (Table 2). After establishing that these three models individually fit, we then evaluated, for each grade and combining boys and girls, a three-factor model with a two-factor or one-factor model (Table 3). After finding support for the two-factor model at each grade, a multiple group model was estimated where each grade was a group, again pooling boys and girls together,

to determine the fit of this model (Table 5). No longitudinal (group) constraints were put on the model initially. Then, after finding general support for this model – excellent fit indices though with a significant chi-square – the longitudinal model was constrained using the strong factorial invariance assumptions across all four grades. A likelihood ratio test supported the invariance assumptions.

We then tested separately a girls' model and a boys' model following the group approach outlined above to test whether the boys and girls parameter estimates can be statistically distinguished across all grades. All four grades were first treated as unconstrained groups and the model for each sex assessed. Then constrained models, by sex, were estimated combining all four grades. Again, as with the pooled model, the strong invariance assumption was supported separately for boys and for girls. Finally we assessed whether the invariance assumptions held across boys and girls, that is, whether there was support that the model was the same for boys and girls across all grades (Table 6). We constructed eight groups, separating each grade by sex, and tested an unconstrained against the constrained model. Support for the estimated parameters being the same was found using a likelihood ratio test, providing evidence that boys and girls can be pooled in the analysis, ($\Delta\chi^2(252)=287.75, p>.05$). However, as a test of how robust the results are, we present findings separately by sex as well, for comparison.

We then examined differences in the mean levels of the latent social and overt victimization factors across grades. There was evidence that the mean of the latent social victimization factor increased from grades seven through nine ($p<.05$) before dropping in grade ten to the seventh grade level ($p>.05$; see Table 7). However, no evidence was found of any change in the mean of the latent overt factor ($ps>.05$; see Table 7). To examine the average social and overt victimization factor results in more detail we reran the analyses subsetting on sex; fit was acceptable for the longitudinal models for both boys and girls (see rows three through six of Table 5), and strong factorial invariance was supported in both cases based on the χ^2 difference test ($ps>.05$). The mean of the latent social victimization factor showed an increase only for girls from seventh grade through ninth grade ($p<.05$). For both girls and boys, there were no significant changes in the mean of the latent overt victimization factor from grades seven through ten ($p>.05$).

Discussion

Results provided support for our hypothesized two-factor model of victimization with overt and social victimization factors. Confirmatory factor analyses demonstrated that the two-factor model fit the data well at all time points, which included annual assessments from seventh through tenth grades, for both girls and boys. These findings highlight the importance of assessing both overt and social forms of victimization to understand more fully the types of peer maltreatment some adolescents experience.

Before adopting the two-factor model, we also tested a one-factor and a three-factor model. We did not find support for the unidimensional model. Although some measures of peer victimization used in previous research yield a single general victimization score (e.g., Ladd & Kochenderfer-Ladd, 2002; Nishina et al., 2005), our findings suggest the importance of examining specific forms of victimization when using the RASEQ.

The three-factor model differed from the two-factor model in that it further broke down overt victimization to separately examine both verbal and physical victimization in addition to social victimization. The three-factor model fit the data better than did the unidimensional model. However, closer inspection revealed that the correlation between the verbal and physical victimization factors was estimated to be one, suggesting that these forms of peer

maltreatment were not statistically distinguishable. Although some measures of peer victimization have separately examined verbal and physical victimization factors (e.g., Mynard & Joseph, 2000), there has been much discussion as to whether these are statistically separable factors (see Mynard & Joseph, 2000). Consistent with our findings, some previous studies have found that verbal and physical forms of aggression are not statistically separable, and therefore examine these as a single, overt victimization dimension (Bjorkqvist, Lagerspetz, & Kaukiainen, 1992; Campbell, Sapochnik, & Muncer, 1997).

The two-factor model best fit the data, and we examined this model in a longitudinal context across seventh through tenth grades. We found evidence for strong factorial invariance, suggesting that our overt and social victimization constructs were invariant over the period of adolescence that we assessed. Findings of strong factorial invariance are necessary for further longitudinal comparisons; the absence of invariance results in uncertainty as to whether changes found are true or rather stem from changes in the construct over time (Chan, 1988). If, on the other hand, we had found the factorial structure changed across time points, this would have indicated that our victimization constructs changed over time. Although we found strong factorial invariance across the time frame we examined, it is possible that future studies that examine victimization over a wider period of time with the RASEQ may find the constructs change, which would be an interesting developmental phenomenon in its own right.

Given our finding of strong factorial invariance, we proceeded to examine changes in the mean values of the social and overt victimization factors across seventh through tenth grades. The mean of the social victimization factor increased from seventh through ninth grade and then fell in tenth grade. This finding builds on previous longitudinal research that has examined victimization across fifth through seventh grade, and found that mean levels of victimization increased over seventh grade such that levels of victimization reported at the end of seventh grade were greater than those reported at the end of sixth grade (Pellegrini & Long, 2002). Our results suggest that social victimization may continue to increase through ninth grade, and then fall in tenth grade. It is interesting to note that for this sample, ninth grade was the first year of high school. School transitions, such as the entry to high school, may be periods during which status is renegotiated resulting in increased aggression (Pellegrini & Long, 2002). The decrease in victimization from ninth to tenth grade may result from developing social skills and increased assertiveness that enable adolescents to better cope with victimization, which in turn, helps them to avoid future experiences of victimization (Smith et al., 1999).

Conversely, we did not find evidence of any change in the mean levels of overt victimization across seventh through tenth grade. Physical aggression may be most common in the preschool years, and then decreases for the majority of youth with development (Dodge, Coie, & Lynam, 2006; Tremblay et al., 1999). A decline in the use of physical aggression across middle childhood and adolescence is evident for most youth, with many no longer engaging in this type of behavior (Dodge et al., 2006). Some have proposed that children may engage in less overt aggression but more social aggression as they mature because there is greater risk of punishment for overt aggression (Bjorkqvist, 1994). Limited use of physical aggression across adolescence may explain the stability in the average levels of overt victimization factor, and the increase in use of social aggression may be reflected in the increasing levels of social victimization from seventh through ninth grade.

To examine gender differences, we reran the analyses separately for girls and boys. Evidence of strong factorial invariance was found when examining these models separately for girls and boys. For mean levels of overt victimization, we found similar patterns for both

boys and girls; for males and females there were no significant changes in the average overt victimization factor across time. Examination of the mean levels of the social victimization factor over time revealed gender differences, with girls showing the same pattern as the pooled sample (i.e., increasing from seventh through ninth grade) and no significant changes in social victimization factor over time for boys. That there was an increase in mean levels of the social victimization factor across grades seven through nine for only girls may be consistent with the suggestion that girls become especially likely to use social aggression and probably direct such behavior toward other girls (Bjorkqvist, 1994; Bjorkqvist et al., 1992).

All these results must be interpreted in light of methodological limitations. We relied on a self-report measure to assess social and overt victimization. Some researchers have suggested that self-reports of victimization may be biased by pre-existing adjustment problems, differing views of what constitutes peer maltreatment, ability to recall victimization episodes, and willingness to share negative experiences on questionnaires (Ladd & Kochenderfer-Ladd, 2002; La Greca, 1990). Thus, it is important to note that the RASEQ assesses adolescents' perceptions of social and overt victimization. Peer reports and self-reports of victimization do not always converge (Graham, Bellmore, & Juvonen, 2003), and adolescents' self-reports of peer maltreatment may be overestimates or underestimates of their actual experiences. Another limitation was that we did not have a corresponding peer measure of social and overt victimization, which could have been used to establish convergent validity of scores on the RASEQ. A third possible shortcoming is that the RASEQ did not frame response options with a given time period. The time frame specified can influence responding; it is often easier to remember what one experienced last week as compared to last year (Merrell, 2003). However, experiences of peer victimization may be easily remembered given that these episodes "satisfy many criteria for good recall; the events are emotion-provoking, consequential for well-being, and so far as victimization is concerned may have been unexpected" (Smith et al., 2003, p. 184). Further, the RASEQ is limited in that it did not include items to assess attacks on property, which some have suggested may be still a separate form of peer victimization (e.g., Mynard & Joseph, 2000).

Despite these limitations, this study had many strengths. There have been critiques of developmental research for ignoring issues of measurement invariance, and there has been a call for more attention to such measurement issues in longitudinal investigations (Knight & Zerr, 2010; Widaman et al., 2010). The current investigation answers this call and is among the first to examine measurement invariance across adolescence for a peer victimization measure (see also Buhs et al., 2010). This study also followed adolescents from seventh through tenth grade, and thus was able to examine temporal invariance of the RASEQ across the transition to high school.

Our findings of strong factorial invariance support the use of the RASEQ to assess social and overt forms of victimization across junior high school and high school for both boys and girls. The RASEQ may therefore be a useful tool for future research examining risk factors for and consequences of victimization across adolescence. For instance, future research might use the RASEQ to examine stability and change in experiences of peer victimization over time, and how this in turn, relates to adjustment. Further work may also use the RASEQ to examine developmental trajectories of social and overt forms of victimization across adolescence as well as predictors to potentially rising or falling trajectories. Perhaps, one of the most useful applications of the RASEQ may be to assess the effectiveness of interventions designed to reduce school bullying. As bullying has become increasingly recognized as a topic of public concern worldwide, a greater number of programs have been implemented to reduce the occurrence of bullying in schools (Smith, Ananiadou, & Cowie, 2003; Smith, Schneider, Smith, Ananiadou, 2004). However, the efficacy of these programs

should be documented, and the RASEQ offers a potentially helpful tool to assess victims' experiences prior to and following the implementation of antibullying interventions.

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Table 1**Self-Reported Victimization Items**

Item	Two Factor Model	Three Factor Model	Source
How often do other kids ignore you or stop talking to you when they are mad at you?	S	S	ISR
How often do other kids gossip or spread rumors about you to make other students not like you?	S	S	RSEQ
How often does another kid roll their eyes, turn up their nose, or give you dirty looks?	S	S	RSEQ
How often do other kids imitate you behind your back?	S	S	
How often do other kids exclude you or leave you out on purpose?	S	S	RSEQ
How often do other kids try to turn people against you for revenge or exclusion?	S	S	ISR
How often do other kids try to embarrass you in public?	S	S	ISR
How often do other kids befriend your enemies for revenge against you?	S	S	ISR
How often are you the victim of mean pranks or practical jokes?	S	S	ISR
How often do other kids send you mean or hurtful text or online messages?	S	S	
How often do other kids try to manipulate adults so that you get into trouble?	S	S	
How often does a kid who is mad at you try to get back at you by not letting you be in their group anymore?	S	S	RESQ
How often does a kid tell lies about you to make other kids not like you anymore?	S	S	RESQ
How often does another kid say they won't like you unless you do what they want you to do?	S	S	RESQ
How often does another kid yell at you or call you names?	O	V	RSEQ
How often do your friends argue with you?	O	V	
How often do other students threaten you?	O	V	
How often do other kids tease you?	O	V	ISR
How often do other kids start fights with you?	O	P	
How often do you get hit or shoved by other kids?	O	P	RSEQ
How often do other students try to dominate or bully you?	O	P	
How often does another kid say they will beat you up if you don't do what they want you to do?	O	P	RESQ

Note: Participants were asked to indicate how often they experienced each form of aggressive behavior on a 1 (*never*) to 5 (*all the time*) scale, which was collapsed into three categories considered in our analyses were: 1 (*never*), 2 (*almost never*), and 3 (*sometimes, almost all the time, or all the time*).

All items were included to test the unidimensional model. For the two-factor model, *S* indicates social victimization item and *O* indicates overt victimization item. For the three-factor model, *S* indicates social victimization, *P* indicates physical victimization, and *V* indicates verbal victimization.

For the source of the item, RSEQ refers to the Revised Social Experience Questionnaire (Paquette & Underwood, 1999) and ISR refers to the Indirect/Social/Relational Aggression Scale (Coyne, Archer, Eslea, 2006).

Table 2

Fit Indices for Individual Factors Across Grades

Factor	Grade	χ^2	df	CFI	TLI	RMSEA
Verbal						
	7 (N =206)	0.22	2	1.00	1.00	0.00
	8 (N = 163)	1.67	2	1.00	1.00	0.00
	9 (N = 197)	0.80	2	1.00	1.00	0.00
	10 (N =183)	0.73	2	1.00	1.00	0.00
Social						
	7 (N =206)	116.87*	77	0.99	0.98	0.05
	8 (N = 163)	103.48*	77	0.99	0.99	0.05
	9 (N = 197)	114.08*	77	0.99	0.99	0.05
	10 (N =183)	149.43*	77	0.97	0.97	0.07
Physical						
	7 (N =206)	4.97	2	0.99	0.98	0.09
	8 (N = 163)	1.99	2	1	1.00	0.00
	9 (N = 197)	2.16	2	1	1.00	0.02
	10 (N =183)	5.17	2	1	0.99	0.09

* p<.05

Note: We estimated 14 loadings for each of the variables and two threshold holds for each of the variables, leading to 42 estimated parameters. Our covariance matrix from the 14 variables had 105 elements, plus the 14 means, gave us an augmented covariance matrix with 119 elements. The difference is the 77 degrees of freedom for the social factor.

Table 3
Fit Indices for Three Compared with One and Two Factor Models Across Grades

Model	Grade	χ^2	df	$\Delta\chi^2^a$	Δdf	CFI	TLI	RMSEA
Three-factor	7 (N=206)	335.42	206			0.97	0.97	0.06
One-factor	7	386.04	209	42.96*	3	0.96	0.96	0.07
Two-factor	7	339.22	208	5.15	2	0.97	0.97	0.06
Three-factor	8 (N = 163)	328.85	206			0.98	0.97	0.06
One-factor	8	367.39	209	29.98*	3	0.97	0.97	0.07
Two-factor	8	327.16	208	0.85	2	0.98	0.97	0.06
Three-factor	9 (N = 197)	342.33	206			0.98	0.98	0.06
One-factor	9	352.06	209	13.84*	3	0.98	0.98	0.06
Two-factor	9	344.19	208	2.5	2	0.98	0.98	0.06
Three-factor	10 (N = 183)	457.71	206			0.95	0.94	0.08
One-factor	10	464.26	209	12.8*	3	0.95	0.94	0.08
Two-factor	10	459.17	208	3.86	2	0.95	0.94	0.08

* $p < .05$

^aThe one- and two-factor models are compared to the three-factor models, and the change in chi-square values reflect a likelihood ratio test that is calculated as the difference between a nested model χ^2 and a maintained model χ^2 , where the difference follows a form of χ^2 . A nonsignificant $\Delta\chi^2$ was evidence of no statistical difference between the models. Note that given the estimator used for analysis with the categorical indicators (WLSMV), the Chi-square must be corrected because the difference in Chi-square values is no longer Chi-square. Therefore simply subtracting the individual Chisquares will not directly match the differenced Chi-square values reflect these comparisons.

Table 4

Factor Loadings for Two-Factor Model

	7 th Grade	8 th Grade	9 th Grade	10 th Grade
Overt				
Yell at you or call you names	.82	.78	.82	.81
Start fights with you	.72	.77	.78	.78
Get hit or shoved by other kids	.72	.82	.81	.91
Argue with you	.62	.63	.55	.50
Threaten you	.81	.92	.88	.88
Try to dominate or bully you	.88	.89	.92	.82
Tease you	.78	.80	.73	.76
Say they will beat you up	.81	.84	.89	.93
Social				
Ignore you or stop talking to you when they are mad at you	.70	.70	.54	.62
Gossip or spread rumors	.77	.73	.83	.74
Roll their eyes, turn up their nose, or give you dirty looks	.79	.78	.74	.67
Imitate you behind your back	.80	.72	.85	.78
Exclude you or leave you out on purpose	.79	.69	.76	.78
Try to turn people against you for revenge or exclusion	.83	.88	.84	.86
Try to embarrass you in public	.73	.79	.79	.76
Befriend your enemies for revenge against you	.76	.87	.89	.83
Victim of mean pranks or practical jokes	.61	.71	.78	.69
Send you mean or hurtful text or online messages	.61	.71	.74	.63
Try to manipulate adults so that you get into trouble	.70	.71	.75	.78
Try to get back at you by not letting you be in their group	.79	.79	.72	.76
Tell lies about you to make others not like you anymore	.75	.88	.84	.82
Say they won't like you unless you do what they want	.81	.81	.91	.84

Table 5

Fit Indices for Two-Factor Longitudinal Models

Model	Grades	χ^2	df	$\Delta\chi^2^a$	Adf	CFI	TLI	RMSEA
Two-factor unconstrained longitudinal model - pooled	7 – 10	1496.41 *	844			0.97	0.97	0.06
Two-factor constrained longitudinal model - pooled	7 – 10	1573.84 *	952	114.73	108	0.97	0.97	0.06
Two-factor unconstrained longitudinal model - girls	7 – 10	1098.29 *	844			0.97	0.97	0.06
Two-factor constrained longitudinal model - girls	7 – 10	1182.45 *	952	102.90	108	0.98	0.98	0.05
Two-factor unconstrained longitudinal model - boys	7 – 10	1182.01 *	844			0.97	0.97	0.06
Two-factor constrained longitudinal model - boys	7 – 10	1290.99	952	128.83	108	0.97	0.98	0.06

* p<.05

^a Likelihood ratio test where nonsignificant supports invariance. Note that given the estimator used for analysis with the categorical indicators (WLSMV), the Chi-square must be corrected because the difference in Chi-square values is no longer Chi-square. Therefore simply subtracting the individual Chi-squares will not directly match the differenced Chi-square.

Table 6

Fit Indices for Multiple-Group Two Factor Model

Model	Grades	χ^2	df	$\Delta\chi^2^a$	Δdf	CFI	TLI	RMSEA
Two-factor unconstrained longitudinal model – allow girls and boys to have separate loadings and thresholds	7 – 10	2346.12 *	1692			0.97	0.97	0.07
Two-factor strong factorial invariance longitudinal model – constraining girls and boys to have identical loadings and thresholds	7 – 10	2579.25 *	1944	287.75	252	0.97	0.97	0.06

* p<.05

^aLikelihood ratio test where nonsignificant supports invariance. Note that given the estimator used for analysis with the categorical indicators (WLSMV), the Chi-square must be corrected because the difference in Chi-square values is no longer Chi-square. Therefore simply subtracting the individual Chi-squares will not directly match the differenced Chi-square.

Table 7

Means of the Latent Social and Overt Victimization Factors

	Mean of Latent Social Factor				Mean of Latent Overt Factor			
	Estimate	S.E.	Estimate/S.E.	Two-tailed P-value	Estimate	S.E.	Estimate/S.E.	Two-tailed P-value
Grade 7								
Grade 8	.22	.11	1.90	.06	.22	.12	1.73	.08
Grade 9	.35	.12	3.03	.00	.15	.11	1.31	.19
Grade 10	.17	.12	1.48	.15	.12	.12	.98	.33

Note: Grade 7 is the reference grade to which all other grades are compared. The mean of the latent social victimization factor increases in eighth and ninth grades ($p < .06$). However, the mean of the latent social victimization factor in tenth grade is not significantly different from the seventh grade level ($p > .10$). The means of the latent overt victimization factor in eighth, ninth, and tenth grades are not significantly different from the mean of the latent overt factor in seventh grade level ($p > .10$).