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The role of cognitive appraisals in the relationship between peer-victimization
and depressive symptomatology in adolescents: A longitudinal study.

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Abstract

Underpinned by the transactional model of stress (Lazarus & Folkman, 1984), the aim of this pre-registered study was to test the role of cognitive appraisals (threat, challenge, control, blame, and perceived social support) in the longitudinal relationship between peer-victimization and depressive symptomatology. Measures of peer-victimization, cognitive appraisal (threat, challenge, control, blame, and perceived social support), and depressive symptomatology were included in a self-report questionnaire, and data were collected at three-time points each one month apart. Participants were 530 adolescents aged 11 to 14 who reported experiencing peer-victimization at the beginning of this study. Results of the cross-lagged panel analyses found both an association between peer-victimization and depressive symptomatology after three months, alongside an association between depressive symptomatology and later peer-victimization. Perceived social support from parents/guardians, teachers, or close friends did not significantly moderate this relationship. Peer-victimization at the start of the study was significantly associated with challenge, but not threat, appraisals one month later. Both threat and challenge appraisals in the second month of the study were related to depressive symptomatology at the end of the study, one month later. A small significant total indirect effect via threat and challenge appraisal was found, though neither was a significant mediator on its own. This study highlights the role of challenge and threat appraisals in adolescents' adaptation to peer-victimization.

Peer-victimization is a common experience for many adolescents (Söderberg & Björkqvist, 2020). While the relationship between peer-victimization and depression is well established in the research literature (e.g. Schoeler et al., 2018), not all adolescents who experience victimization develop symptoms of depression. Understanding these individual differences in adolescents' adaptations to peer-victimization is fundamental to the development of theoretically informed explanations of this effect and of appropriate interventions to support those experiencing victimization. The Transactional Model of Stress (TMS) (Lazarus & Folkman, 1984) proposes that individuals' cognitive appraisals of an event, such as their appraisal of threat and perceived social support, may explain individual differences in the outcomes to similar stressful experiences. To date, research with adolescents has demonstrated an association between cognitive appraisals and depressive symptomatology following experiences of peer-victimization (e.g. Taylor et al., 2013). However, longitudinal data are lacking. Therefore, the aim of this study is to examine the role of cognitive appraisals in the longitudinal relationship between peer-victimization and depressive symptomatology.

The relationship between peer-victimization and depressive symptomatology

Peer-victimization is a form of aggressive behavior that occurs within peer-groups. Bullying is a specific form of peer-victimization where a power imbalance and intention to harm are core definitional constructs (Hunter et al., 2007). The aggressive behaviors experienced can include direct aggression, such as being hit, kicked or called names, indirect aggression, such as being left out of a social group, and cyber-victimization, such as being sent nasty or threatening text messages (Björkqvist et al., 1992; Hinduja & Patchin, 2008; Marini et al., 2006). While identifying prevalence rates of peer-victimization can be difficult due to the range of methods used (Volk et al., 2017), a recent survey of 110,788 UK

adolescents identified that approximately 30.3% of youth had been bullied in the previous two months (Przybylski & Bowes, 2017).

Being victimized is related to a range of negative outcomes, including lower self-esteem, higher levels of anxiety and depression, and suicidal thoughts (Hawker & Boulton, 2000; Klomek et al., 2007; Reijntjes et al., 2010). The relationship between victimization and negative outcomes has been found in both cross-sectional and longitudinal studies, is evident in adolescence, and continues into adulthood (Rigby, 2003; Ttofi et al., 2011). Meta-analyses of longitudinal studies also indicate that internalising symptoms such as depressive symptomatology may be both a cause and consequence of peer victimization, with the effect of peer-victimization on internalising symptoms stronger than the effect of internalising symptoms on peer-victimization (Reijntjes et al., 2010).

The transactional model of stress

Although evidence supports a relationship between peer-victimization and negative outcomes, this is not the case for all youth who are victimized (Newman et al., 2005). To understand why this is the case, it may be informative to consider peer-victimization as a stressful experience (Östberg et al., 2018). In such a context, theoretical models of stress may appropriately be applied to aid our understanding of this relationship and the TMS (Lazarus & Folkman, 1984) is a helpful candidate in this respect. Lazarus and Folkman (1984) proposed that following an event (such as peer-victimization) an individual goes through a process of cognitive appraisal where they evaluate the importance and relevance of the situation to their wellbeing (primary appraisals) while also evaluating the resources they have available to manage this situation (secondary appraisals) (Folkman et al., 1986; Lazarus & Folkman, 1984). Although originally termed ‘primary’ and ‘secondary’ appraisals, the appraisal processes occur simultaneously and can be mutually influential in determining whether an event is evaluated as stressful (Folkman et al., 1986; Lazarus & Folkman, 1984).

Evidence suggests that cognitive appraisals of threat, challenge, control, blame, and perceived social support play a role in the relationship between peer-victimization and adverse outcomes (Noret et al., 2018a).

Primary appraisals of threat and challenge

Threat appraisals reflect an anticipation of possible loss or harm (Lazarus & Folkman, 1984) while challenge appraisals focus on the potential for personal gain or growth in response to the situation (Lazarus & Folkman, 1984). Threat and challenge appraisals are forms of primary appraisal and may differ in the adaptive role they play in the relationship between peer-victimization and depressive symptomatology. Peer relationships increase in importance in adolescence (Espelage et al., 2003). Peer-victimization is a direct challenge to these relationships and therefore may be more likely to be appraised as a significant threat, rather than as a challenge that can be easily overcome (Taylor et al., 2013).

Evidence to date suggests that threat appraisals mediate the relationship between peer-victimization and depressive symptomatology, where peer-victimization is associated with depressive symptomatology due to an increase in threat appraisals (Giannotta et al., 2012; Hunter et al., 2010; Taylor et al., 2013). To date, there is no evidence of the role of challenge appraisals in this relationship. However, challenge appraisals are adaptive, relating to coping styles such as wishful thinking, problem-focused coping, and more active help-seeking (Hunter & Boyle, 2004; Hunter et al., 2004). Such findings suggest that if those experiencing peer-victimization evaluate their experiences as a challenge as opposed to a threat, this may relate to more adaptive outcomes.

Secondary Appraisals: Control and blame appraisals

Secondary appraisals can involve the evaluation of personal control and personal blame following a stressful experience. Control appraisals focus on an individual's perception of a situation as manageable based on their abilities, as being important to them,

and as being one where they are able to do something about the situation (Grob et al., 1995; Terranova et al., 2011). Blame appraisals reflect the extent to which individuals feel responsible for the situation (Gerard et al., 2005). Research to date has highlighted that control and blame appraisals may mediate the relationship between peer-victimization and negative outcomes. Control appraisals have been found to relate to the choice of coping style employed (Hunter & Boyle 2002; Terranova et al., 2011), and retrospective studies suggest that those adolescents with a greater sense of control over their experiences of bullying in school reported lower levels of distress in adulthood (Hunter et al., 2004). Although limited, evidence suggests that control appraisals mediate the relationship between peer-victimization and negative outcomes of loneliness and depression, where peer-victimization is associated with a lower appraisal of control which is, in turn, related to negative outcomes (Noret et al., 2018a). Like control, threat, and challenge appraisals, there is an important role for blame appraisals in relation to adolescents' adaptation following a range of stressful events (e.g. Kim et al., 2008). Yet, to date, evidence for the role of self-blame appraisals in the relationship between peer-victimization and negative outcomes is limited (Noret et al., 2018a).

Secondary Appraisals: Perceived social support

Perceived social support can also be defined as a cognitive appraisal, one which reflects an individual's evaluation of the resources they have to manage an event (Cobb, 1976; Lakey & Cohen, 2000). The Stress Buffering Hypothesis (Cohen & Wills, 1985) suggests that perceived social support can function in two possible ways. It can be independently associated with adjustment (the main effect hypothesis), where a greater perception of available support is associated with more positive adjustment (Cohen, 2004; Cohen & Wills, 1985). Alongside the main effect for this support, greater perceived social support can also buffer the impact of stress on adjustment by providing individuals with

means of coping with the experience (the stress-buffering hypothesis) (Cohen, 2004; Cohen & Wills, 1985). Perceived social support is argued to be a protective factor in the relationship between peer-victimization and depression, providing those being victimized with the perception of having support available to manage the situation (Davidson & Demaray, 2007).

Domain-specific perceived social support reflects the evaluation of support available from specific individuals within the social network (Pierce et al., 1991). From a social-ecological perspective, development is viewed as an interaction between the individual and their environment, where the environment is defined as a series of interconnected systems: the micro-, meso-, exo-, macro-, and chrono-systems (Bronfenbrenner, 1979). Employing a social-ecological approach can be helpful to identify sources of perceived social support available to the individual (Bokhorst et al., 2009). In adolescence domain-specific perceived social support can be drawn from several sources within the micro-system (adolescents' immediate environment), for example from parents/ guardians, teachers, and peers/friends (Bokhorst et al., 2009; Pössel et al., 2018). As adolescents develop social relationships beyond the family, the perception of available support from other sources, such as teachers and friends may also be protective, particularly when faced with school-related stressors, such as peer-victimization (Yeung & Leadbeater, 2010).

To date, research has reported inconsistent findings as to the role of these different domains of perceived social support in the relationship between peer-victimization and negative outcomes (Noret et al., 2018). Perceived social support from teachers and parents/ guardians has generally been found to be protective in the relationship between peer-victimization and poor-mental health (e.g. Davidson & Demaray, 2007). Where a moderating role for teachers and parents/ guardians is reported, the relationship between peer-victimization and adjustment was weaker for those with higher levels of perceived social support, highlighting a protective role of such evaluations. However, some studies have

reported no moderating role (Cheng et al., 2008; Lim et al., 2011) and gender differences in this relationship have been reported. For example, perceived social support from teachers has been found to moderate the relationship between peer-victimisation and internalizing symptoms in boys but not girls (Davidson & Demaray, 2007).

Studies examining the role of perceived social support from peers/ friends are inconsistent in their results (Noret et al., 2018). Some report no buffering role (e.g. Davidson & Demaray, 2007; Noret et al., 2020) while others support such an effect (Cheng et al., 2008; Tanigawa et al., 2011). Contradicting the stress-buffering hypothesis, Holt and Espelage (2007) reported that peer-victimization is more strongly associated with maladjustment among young people with more support. These inconsistencies may reflect differences in the measurement of perceived social support in a peer-victimisation context (Rueger et al., 2010). Alternatively, these inconsistent findings may reflect the unstable and changeable nature of adolescent friendships (Gariépy et al., 2016).

The current study

Underpinned by the TMS (Lazarus & Folkman, 1984), we examine the role of cognitive appraisals in the longitudinal relationship between peer-victimization and depressive symptomatology. Cognitive appraisals play a role in the way in which adolescents interpret and assign meaning to their experiences of peer-victimization (Hunter & Boyle 2002; Terranova et al., 2011), and can be directly related to both emotional outcomes (Smith et al., 1993) and poor mental health (e.g. Fearnow-Kenney & Klierwer, 2000; Fosco & Feinberg, 2015). Longitudinal data are needed to test the hypothesized mediating role of cognitive appraisals in the relationship between peer-victimization and depressive symptomatology. While some longitudinal evidence exists (e.g. Taylor et al., 2013) much of the research to date has tended to employ cross-sectional designs which compromises the statistical evaluation of mediation (Maxwell & Cole, 2007).

Therefore, the aim of this study is to examine the longitudinal relationship between peer-victimization and depressive symptomatology while assessing the potential moderating and mediating role of cognitive appraisals in this effect. Specifically, we will test the following hypotheses:

1. Peer-victimization will significantly predict symptoms of depression over time.
2. Primary appraisals of threat, blame, challenge and control, will mediate the relationship between peer-victimization and subsequent symptoms of depression.
3. Perceived social support from parents or teachers or close friends will moderate the relationship between peer-victimization and subsequent symptoms of depression. The relationship between peer-victimization and symptoms of depression will be stronger for those with lower levels of perceived social support.
4. Perceived social support from parents or teachers or close friends will moderate the mediating role of primary appraisals on the relationship between peer-victimization and subsequent symptoms of depression. Specifically, perceived social support from parents, or teachers, or friends will moderate the relationships between peer-victimization and each of the four types of primary appraisal.

Method

Design and Participants

Data were collected as part of a three-wave longitudinal study between April 2018 and December 2019 and 1,058 pupils from four secondary schools (high schools) in Scotland and England took part. Participants were in the first three years of secondary school (years 7 to 9 in England, S1-S3 in Scotland; equivalent to grades 6 to 8 in the US school system). As the aim of the study was to analyse adolescents' cognitive appraisals of their experiences of peer-victimization, only participants who reported experiencing peer-victimization at time 1 (T1) were included in the analyses reported here (N=533, 50.4%). Participant demographics at each wave of data collection are shown in Table 1.

TABLE 1 HERE

Measures

Peer-victimization. A short version of the personal experiences checklist (PECK: Hunt et al., 2012) was included in the T1 and T3 surveys to measure experiences of peer-victimization. The questionnaire includes 14 items related to relational-verbal, physical, cyber, and culture-based victimization. Participants were instructed "*Thinking about the last month or so at school, how often do the following things happen to you?*" and were then asked to rate each of the 14 items (e.g. *other kids hit me*) on a five-point frequency likert scale ranging from 0 = "never" to 4 = "everyday". The scale was tested for invariance across both time points, to ensure the psychometric properties of the scale were equivalent over these two conditions (Putnick & Bornstein, 2016). This initial test found the scale was not invariant due to problematic thresholds at the extreme end of the likert scale for three items on the measure. Therefore, and consistent with the approach taken by Prinz et al. (2019), the five-point scale was reduced to four points by recoding those who reported experiencing these behaviors most days (=4) and everyday (=5) into the same category (=4). The recoded

version met the criteria for strong invariance over time (Bowen & Masa, 2015). Therefore, a total peer-victimization score was calculated by summing all 14 items on the scale, with a higher score indicating more frequent experiences of peer-victimization. Regarding the internal reliability of the scale, McDonald's $\omega = .97$ at both time 1 and at time 3.

Cognitive Appraisals. Threat, challenge, control, and blame appraisals were measured at all three time points. To measure threat appraisal, the four-item scale developed by Hunter et al. (2004) was used. Items include statements such as “*You will feel bad about yourself*” and are rated on a four-point likert scale ranging from “not likely” (=1) to “very likely” (4). The four items are summed to create a score of threat appraisal, with a higher score indicating a greater evaluation of threat which represents a more maladaptive response. In the current study, the internal reliability of the scale was acceptable at all three time points (McDonald's ω at T1 = .80, T2 = .75, and T3 = .77). Challenge appraisal was measured using a five-item scale. The original four items developed by Hunter et al. (2004) were included in the scale (e.g. “*You will learn to be nice to others*”) alongside an additional item based on the scale developed by Hood et al. (2009) “*Something good would end up happening*” to capture a more general positive outcome from the experience. The five items were rated on a four-point likert scale ranging from “not likely” (=1) “very likely” (=4) and were summed so that a higher score represents a greater appraisal of challenge and therefore a more adaptive appraisal. In the current study, the internal reliability of the scale was acceptable at all three time points (McDonald's ω at T1 = .76, T2 = .77, and T3 = .81).

Control and blame appraisals were measured using the two scales developed by Catterson and Hunter (2010). The internal reliability of both scales was poor across all three time points. For control, McDonald's ω at T1 = .30, T2 = .32, and T3 = .35, and for blame, McDonald's ω at T1 = .45, T2 = .35, and T3 = .44. When mediators are not measured reliably

it can lead to biased estimates (Kenny, 2018), and therefore blame and control were not included in the analyses.

Perceived social support was measured at T1 using the child and adolescent social support scale (CASSS: Malecki & Demaray, 2002). The CASSS is a 60-item measure assessing five subscales of perceived social support (parent, teacher, classmate, close friend, and school). Only the 36 items measuring the perceived frequency of available social support from parent, teacher, and close friend subscales were included here. Participants were asked to read each statement (e.g. “*My parents/ guardians listen to me when I need to talk*”) and assess the frequency of available support on six-point likert scale (1 = “Never” to 6 = “Always”). Responses were summed to provide a score of perceived social support in each domain. A higher score represents a greater perception of available social support in each domain. The CASSS has excellent psychometric properties (Rueger et al., 2010). In the current study the internal reliability of the subscales were: McDonald's $\omega = .95$ for perceived social support from parents, McDonald's $\omega = .93$ for perceived social support from teachers, and McDonald's $\omega = .96$ for perceived social support from close friends.

Depressive Symptomatology. Depressive symptomatology was measured at time points one and three using the Center for Epidemiologic Studies Depression Scale-revised 10-item version for adolescents (CESDR-10: Haroz et al., 2014). The CESDR-10 begins with the instruction “Below is a list of the ways you might have felt or acted. Please check how much you have recently felt this way”, and asks them to rate each of the 10 items (e.g. *I felt sad*) on a five-point likert scale from “not at all or less than 1 day in the last week” (0) to “nearly every day for 2 weeks” (4). Responses to the items are then summed, and a higher score reflects a greater experience of depressive symptomatology. The scale is appropriate for use with adolescents (e.g. Ybarra & Mitchell, 2014) and displayed excellent internal reliability (T1 McDonald's $\omega = .97$; T3 McDonald's $\omega = .96$).

Procedure

Ethical approval was granted by the School ethics committee at the University of Strathclyde. Hypotheses and the data analysis plan were pre-registered on the Open Science Framework on the 13th February 2018 (Noret et al., 2018b). Thoughts and feelings about bullying. Retrieved from osf.io/cx9fe). Schools were contacted with an invitation to participate in the study. Once a school had agreed to participate in the study, informed consent was obtained from parents. Pupils were also provided with the opportunity to provide consent to participate and could opt out of the study at any point. Data were collected from pupils at three time points approximately one month apart. Pupils completed the questionnaire in class time, in the presence of a researcher who could answer any questions. Pupils at two schools completed the questionnaire online via Qualtrics.com and, in the remaining two schools, pupils completed a paper questionnaire. At each time point, pupils were provided with a debrief sheet which provided information on support available in school and from national charities.

Data analysis

To assess the longitudinal relationships between peer-victimization, cognitive appraisals, and depressive symptomatology, cross-lagged panel analyses were conducted. As per the pre-registered analytical plan, the models were built in phases. An initial cross-lagged model was conducted to calculate the auto-regressive effects of depressive symptomatology at T1 on the depressive symptomatology at T3, and the auto-regressive effects of peer-victimization at T1 on peer-victimization at T3. All autoregressive paths for each type of primary appraisal were estimated. The error terms associated with each type of primary appraisal at T2 were correlated with the equivalent error term at T3.

For the third phase of the data analysis, the mediators were removed from the analysis and three separate models were calculated to test for the moderating effect of perceived social

support on the relationship between peer-victimization at T1 and depressive symptomatology at T3. Each of the three models tested the moderating effect of a different form of perceived social support (teacher, parent/guardian, close friend). Where any source of perceived social support was a significant moderator, it was included in the final model. The final model assessed whether perceived social support moderated the relationship between peer-victimization at T1 and any form of cognitive appraisal identified as significant in the second model. Where significant moderating effects were identified for the perceived social support variables, simple slopes analyses were conducted in Mplus Version 8.1 to identify the relationships between the relevant variables at three levels of the social support variable (the moderator). These relationships were calculated for the mean score of perceived social support, +1SD above the mean and -1SD below the mean.

Little's MCAR test was calculated using SPSS (V24) and indicated that data for all variables of interest were missing completely at random; $\chi^2 (2051) = 2,041.80, p=.55$. Therefore, to manage missing data, all models were estimated using full information maximum likelihood estimation (FIML) (Little, 2013), using Mplus Version 8.1. In model 1 (the simple cross-lagged model) and model 3 (the perceived social support models), paths were estimated using the maximum likelihood with robust standard errors estimator (MLR) to address deviations from normality in the data (Muthén et al., 2017). In model 2 (the mediation model), paths were estimated with the Maximum Likelihood (ML) estimator and the indirect effects were tested with bootstrapped confidence intervals, an approach seen as the most appropriate for testing indirect effects, and one which is also appropriate for data which deviate from normality (Hayes, 2013). Model fit was established using the RMSEA and CFI fit indices. Acceptable fit was defined as an RMSEA below .08 and a CFI value above .90 (Little, 2013).

Results

Descriptive statistics

As shown in Table 2, T2 challenge appraisals were not significantly correlated to T1 peer-victimization, T1 depressive symptomatology, or T2 threat appraisals. T2 and T3 threat appraisals were not significantly correlated to perceived social support from parents or teachers. T3 threat appraisals were also not significantly correlated to T3 challenge. All other correlations across variables were significant.

TABLE 2 HERE.

Hypothesis 1: Peer-Victimization will significantly predict symptoms of depression over time.

A cross-lagged panel model was estimated to examine the relationships between Peer-Victimization and Depressive Symptomatology. This model accounted for 13.1% in the variance in T3 Peer-Victimization ($R^2 = .13$), and 18.8% of the variance in T3 Depressive Symptomatology ($R^2 = .19$). Due to the saturated nature of the model the fit indices reflect a perfect fit to the data and are not reported (Kelloway, 2015). T1 Peer-Victimization predicted T3 Depressive Symptomatology, $b = 0.59$, $SEb = 0.11$, $\beta = 0.43$, $p < .001$, 95% CI [.28, .58]. In addition, T1 Depressive Symptomatology significant predicted T3 Peer-Victimization $b = 0.32$, $SEb = 0.06$, $\beta = 0.36$, $p < .001$, 95% CI [.21, .51].

Hypothesis 2: Primary appraisals of threat, blame, challenge and control, will mediate the relationship between peer-victimization and symptoms of depression over time.

In the second model, cognitive appraisals of Threat and Challenge were entered as mediators of the T1 Peer-Victimization to T3 Depressive Symptomatology relationship. This model was an acceptable fit to the data, $RMSEA = .06$, 90% CI [.04, .08], $CFI = .95$. The model accounted for 16.2% of the variance in Peer-Victimization at time 3 ($R^2 = .16$), and

31.1% of the variance in Depressive Symptomatology at time 3 ($R^2 = .31$). As shown in Table 3, T1 Peer-Victimization was significantly and positively associated with T3 Depressive Symptomatology and T1 Depressive Symptomatology significantly and positively associated with T3 Peer-Victimization. Regarding the mediating effects of Challenge and Threat Appraisal, a significant total indirect effect was present. However, neither Threat nor Challenge appraisals accounted for a significant portion of the mediated effect on their own. T1 Peer-Victimization was significantly and negatively associated with T2 Challenge Appraisal, but no significant relationship was found between T1 Peer-Victimization and T2 Threat Appraisal. T2 Challenge Appraisal was significantly and negatively associated with T3 Depressive Symptomatology, whereas T2 Threat Appraisal was significantly and positively associated with T3 Depressive Symptomatology.

TABLE 3 HERE

Hypothesis 3. Perceived social support from parents or teachers or close friends will moderate the relationship between peer-victimization and symptoms of depression. The relationship between peer-victimization and symptoms of depression will be stronger for those with lower levels of perceived social support.

Three cross-lagged models were estimated, omitting cognitive appraisals as mediators and including sources of Perceived Social Support separately as possible moderators of the association between T1 Peer-Victimization and T3 Depressive Symptomatology. For Perceived Social Support from Close Friends, the model was a good fit to the data, $RMSEA=0.06$, 90% CI [.01, .12], $CFI=0.97$. The model accounted for 12.5% of the variance in T3 Peer-Victimization ($R^2=.13$), and 20.1% of the variance in T3 Depressive Symptomatology ($R^2=.20$). As shown in Table 4, consistent with models 1 and 2, T1 Peer-Victimization was associated with T3 Depressive Symptomatology, and T1 Depressive Symptomatology was associated with T3 Peer-Victimization. As shown in Table 4, T1

Perceived Social Support from Close Friends was not significantly associated with T3 Depressive Symptomatology and did not moderate the relationship between T1 Peer-Victimization and T3 Depressive Symptomatology.

Regarding Perceived Social Support from Parents/ Guardians, and Perceived Social Support from Teachers, neither model was a good fit to the data; for the parents/ guardian model, RMSEA=0.20, 90% CI [.15, .25], CFI=0.79, and for the teacher model, RMSEA=0.22, 90% CI [.17, .27], CFI=0.66. Therefore, the models are not reported for perceived social support from parents/ guardians, or for perceived social support from teachers.

Hypothesis 4: Perceived social support from parents or teachers or close friends will moderate the mediating role of primary appraisals on the relationship between peer-victimization and symptoms of depression.

Since no source of perceived social support moderated the relationship between T1 peer-victimization and T3 depressive symptomatology, no model was estimated to further assess this hypothesis (as per our pre-registered data analysis plan).

Discussion

This study applied the Transactional Model of Stress (Lazarus & Folkman, 1984) to examine the role of cognitive appraisals of threat, challenge, control, blame and perceived social support in the longitudinal relationship between peer-victimization and depressive symptomatology. Across a three-month period, among adolescents who reported experiencing peer-victimisation, the frequency of peer-victimization was associated with increases in depressive symptomatology and depressive symptomatology was associated with increases in peer-victimization. No form of perceived social support moderated this relationship. A small significant total indirect effect for threat and challenge appraisal was found; however, independently neither threat nor challenge mediated the relationship between peer-victimization and depressive symptomatology. Despite this, peer-victimization at the start of the study was significantly associated with challenge appraisals, but not threat appraisals, one month later. Both threat and challenge appraisals were associated with depressive symptomatology one month later.

The longitudinal relationship between peer-victimization and depressive symptomatology

Supporting our first hypothesis, peer-victimization was significantly, positively associated with depressive symptomatology after three months, even after controlling for earlier levels of depressive symptomatology. In addition, depressive symptomatology at the start of the study was significantly and positively associated with later peer-victimization. These findings lend further support to the notion of a reciprocal relationship between peer-victimization and depressive symptomatology reported in previous research (e.g. Rejntes et al., 2010). The aim of those perpetrating victimization is to demean and humiliate the target, damaging their social reputation and status (Juvonen & Graham, 2014). Peer-relationships are of increased importance during adolescence, and such damage can relate to feelings of

rejection which in turn relates to negative outcomes such as symptoms of depression (LaFontana & Cillessen, 2010; Storch & Ledley, 2005). Higher levels of depressive symptomatology were also associated with later peer-victimization. Adolescents with higher levels of depressive symptomatology may find peer-relationships particularly challenging which may leave them vulnerable to victimization (Kaltiala-Heino et al., 2010; Rejntes et al., 2010). The findings of the current study support previous research, which suggests that depressive symptomatology can be both an antecedent and outcome to peer-victimization (Rejntes et al., 2010).

The role of threat, challenge, control, and blame appraisals in the relationship between peer-victimization and depressive symptomatology

There was partial support for the hypothesis that primary appraisals of threat, blame, challenge, and control would mediate the relationship between peer-victimization and subsequent symptoms of depression. The mediating role of control and blame appraisals could not be tested due to the poor reliability of the scales. However, threat and challenge appraisals accounted for a significant total indirect effect in the relationship between peer-victimization and depressive symptomatology; yet neither was, on its own, a significant mediator. This total indirect effect reflects the sum of the specific indirect effects (Hayes, 2013) and was evidenced in the significant associations between peer-victimization, both threat and challenge, and subsequent symptoms of depression. This significant total indirect effect suggests that collectively threat and challenge appraisals play a role in explaining the association between peer-victimization and depressive symptomatology.

The inclusion of threat and challenge appraisals in the model accounted for an additional 13% of the variance in depressive symptomatology at the end of the study. This demonstrates that these appraisals have an important direct effect upon depressive symptomatology in the context of peer-victimization. Both threat and challenge appraisals

capture evaluations of the possible future implications of an event, but where threat appraisals reflect an evaluation of the risk of future personal harm, and challenge appraisals reflect a more positive eagerness to address the event (Palmwood & McBride, 2017). Although limited, research on children and adolescents' challenge appraisals of peer-victimization suggests such appraisals can capture an evaluation of positive outcomes following the experience, for example learning how to deal with bullying and how not to bully others, feeling there is an opportunity to make new friends, and thinking the bullying will stop (Hunter & Boyle 2004). The more positive nature of challenge appraisals is highlighted in the association between challenge appraisals and a reduction in depressive symptomatology reported in this study. The findings of the current study are the first to highlight this pattern of outcomes in a peer-victimization context. From a social-ecological perspective (Bronfenbrenner, 1979; Espelage & Swearer, 2003), such findings emphasize that individual-level appraisals play an important role in adolescents' adaptation to experiences of peer-victimization.

After controlling for both threat and challenge appraisals at the start of the study, peer-victimization was negatively associated with challenge appraisal one month later. In cross-sectional work, Hunter and Boyle (2002) report that appraisals of control are lower among young people experiencing persistent peer-victimisation (lasting over 4 weeks). Our results suggest that this may also be true of challenge appraisals and extend the finding to longitudinal data. This adds weight to the notion that early intervention is important and supports a definition of 'early' as 'within one month'.

In contrast to challenge appraisals, threat appraisals can reflect an anticipation of possible harm or loss, or fear that the event may occur again in the future (Lazarus & Folkman, 1984). Peer-victimization at the start of this study was not associated with threat appraisals one month later. Taken alongside the previously discussed effect present for

challenge appraisals, and reports pertaining to control appraisals (Hunter & Boyle, 2002), it seems that some forms of appraisal may be less affected by peer-victimisation than others. However, threat appraisals in the second month of the study were significantly associated with depressive symptomatology one month later, highlighting their negative impact on adjustment. Taken together, these findings highlight the direct relationship in a peer-victimisation between threat and challenge appraisals and depressive symptomatology context and offer a possible avenue for early intervention.

The role of perceived social support in the relationship between peer-victimization and depressive symptomatology

Disconfirming the stress-buffering hypothesis (Cohen & Wills, 1985), perceived social support from *close friends* did not moderate the longitudinal relationship between peer-victimization and depressive symptomatology. However, the lack of a moderating role of perceived social support from friends is consistent with previous research (e.g. Noret et al., 2020). This may relate to the unique nature of peer-victimization as a stressor, in that the goal of this behavior is to damage social status and social networks (Juvonen & Graham, 2014). As peer-victimization continues this may result in damage to friendships, resulting in support erosion (Slavin & Rainer, 1990) or further peer-rejection (Rueger et al., 2016). Thus, over time peer-victimization may be associated with a reduction in such support from friends, which in turn leads to depressive symptomatology. Therefore, perceived social support may function as a mediator not a moderator in the longitudinal relationship between peer-victimization and depressive symptomatology.

It was not possible to assess the moderating role of perceived social support from *teachers* and *parents/ guardians* as the pre-registered models were a poor fit to the data. This could reflect misspecification in the model, for example, the operationalisation of perceived support as moderating variables. The evaluation of support from *teachers* and *parents/*

guardians may reflect previous experiences of reporting peer-victimisation. If such support has not been helpful or has resulted in young people not feeling as if they are believed, or fearing repercussions this will affect the evaluation of this support. As a result, over time, such support may not be evaluated as helpful (Fekkes, Pijpers, & Verloove-Vanhorick, 2005; Oliver & Candappa, 2007). Therefore, and consistent with the discussion on perceived support from *close friends*, it may be that these variables are a better fit to the data if they are operationalized as mediators. Such mediating relationships should ideally be tested with longitudinal data (Maxwell & Cole, 2007). In the current study, it was not possible to test this alternative model as perceived social support was measured only once at the start of the study. Testing this relationship would be an important avenue of future research.

Limitations and future directions

This study highlights the applicability of the TMS (Lazarus & Folkman, 1984) and the Social-ecological model (Bronfenbrenner, 1979) for understanding the process and social context underpinning the relationship between peer-victimization and adjustment. A strength of our study is that it aimed to examine multiple cognitive appraisals from both an individual (threat, challenge, control, and blame appraisals) and micro-system level (perceived social support). The findings of the current study are the first to highlight the role of challenge appraisals in the relationship between peer-victimization and depressive symptomatology.

However, these findings should be considered in the context of some limitations. While well-validated measures were utilized in the study, all measures were self-report and as such social desirability may affect responses (Solberg & Olweus, 2003). Future research could consider the use of other methods, such as peer-nomination, to supplement the self-report measure of peer-victimization. In the current study, measures of threat, challenge, control, and blame appraisals that had previously been documented as reliable (Catterson & Hunter, 2010) were used. However, the blame and control measures performed poorly in this

study and for this reason were excluded from the analyses. Further work is required to develop well-validated measures of cognitive appraisals specific to peer-victimization to enable the examination of their role in the relationship between peer-victimization and negative outcomes.

The current study measured young people's experiences of peer-victimization alongside their cognitive appraisals and symptoms of depression once a month, over a three-month period. However, adolescents' recall of their appraisals following experiences of peer-victimization may be affected by time and be reframed or altered in some way (Didymus & Fletcher, 2012). Furthermore, adolescents' appraisals may be affected by changes in their experiences of peer victimization, or by any damage to social networks and available support available from friends and peers (Juvonen & Graham, 2014). Diary methods offer the potential to provide more detail on adolescents' experiences of peer-victimization and the role of others, such as close friends, in the behavior (Seiffge-Krenke, 1995). Analysing diary entries would enable a more in-depth investigation of in-the-moment appraisals of peer-victimization, alongside the analysis of how appraisals change in response to continued peer-victimization.

Implications for Practice

Many anti-bullying initiatives highlight the importance of social support and talking to others about peer-victimization experiences (e.g. Demaray & Malecki, 2006). The findings of the current study support previous research (e.g. Noret et al., 2020), which found no moderating role for perceived social support in the relationship between peer-victimization and adjustment. Further work is required to identify sources of support that may be helpful in tackling experiences of peer-victimization. Alternatively, future research could focus on developing alternative interventions to buffer the impact of peer-victimization on depressive symptomatology.

Our results also speak to the relevance and importance of a focus on threat and challenge appraisals. Both these forms of appraisal were associated with subsequent reports of depressive symptomatology and therefore offer avenues for intervention. Previous studies have demonstrated the effectiveness of interventions focusing on altering individual's appraisals of situations (e.g. Alter et al., 2010), or suggest cognitive behavioral therapy (CBT) as a means of altering cognitive appraisals (Jamieson, 2017). Gee et al.'s (2020) recent meta-analysis suggests that school-based interventions, including school-based CBT, are effective in reducing adolescents' symptoms of depression and anxiety. Such interventions could be integrated into existing anti-bullying programmes, as a means of reframing adolescents' appraisals of their experiences and equipping them with the resources required to manage their experiences. Given the likelihood that peer-victimization will never be completely eradicated, such an approach may offer hope for young people experiencing ongoing aggression from their peers.

Conclusion

Peer-victimization continues to be frequently experienced by youth and has serious consequences for the development of symptoms of depression. The results of this study are the first to highlight a role for challenge appraisals in this relationship. Such findings highlight the applicability of the transactional model of stress and social-ecological model to the study of the relationship between peer-victimization and mental health. While the current study found no moderating role for perceived social support from friends, the role of threat and challenge appraisals in the development of depressive symptomatology is highlighted. Such findings offer alternative avenues for intervention to support adolescents experiencing peer-victimization.

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Table 1 Participant demographics across the three time points

	Time 1 (T1) (N=533)	Time 2 (T2) (N=348)	Time 3 (T3) (N=238)
Gender			
Male	214 (40.2%)	143 (41.1%)	103 (43.3%)
Female	294 (55.2%)	197 (56.6%)	127 (53.4%)
Prefer not to say	20 (3.8%)	8 (2.3%)	8 (3.4%)
School Year			
Year 7/ S1	197 (37.0%)	156 (44.8%)	90 (37.8%)
Year 8/ S2	196 (36.8%)	119 (34.2%)	91 (38.2%)
Year 9/ S3	139 (26.1%)	68 (19.5%)	54 (22.7%)
Age (11 to 14 years)	\bar{x} =12.56, sd=0.92	\bar{x} =12.48, sd=0.90	\bar{x} =12.71, sd=0.85

Table 2 Descriptive statistics and correlations between all variables across the three time points.

	M(SD)	2	3	4	5	6	7	8	9	10	11	12	13
1. T1 PV	20.75 (6.31)	.69***	.41***	.46***	.46***	.35***	.39***	-.04	-.14**	-.23**	-.25***	-.22***	-.21***
2. T3 PV	20.26 (6.99)	-	.38***	.53***	.41***	.47***	.44***	-.19**	-.19*	-.23**	-.37***	-.30***	-.26***
3. T1 Depression	18.30 (8.25)		-	.46***	.46***	.35***	.39***	-.04	-.14**	-.23***	-.25***	-.22***	-.21***
4. T3 Depression	16.42 (8.41)			-	.41***	.47***	.44***	-.19**	-.19*	-.23**	-.37***	-.30***	-.26***
5. T1 Threat	1.87 (0.70)				-	.64***	.57***	-.09*	-.13*	-.25***	-.17***	-.12*	-.11*
6. T2 Threat	1.87 (0.70)					-	.61***	-.11	-.12*	-.22*	-.19**	-.11	-.08
7. T3 Threat	1.77 (0.71)						-	-.16*	-.18*	-.11	-.14*	-.13	-.06
8. T1 Challenge	2.64 (0.74)							-	.56***	.46***	.22***	.27***	.20***
9. T2 Challenge	2.72 (0.69)								-	.58***	.17**	.20**	.12*
10. T3 Challenge	2.54 (0.83)									-	.17*	.32***	.17*
11. T1 PSS Parents	60.01 (12.38)										-	.38***	.43***
12. T1 PSS Teacher	54.93 (13.10)											-	.41***
13. T1 PSS Close Friend	59.64 (13.43)												-

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

Table 3 Unstandardized and standardized paths for mediation model

	<i>b</i>	SE <i>b</i>	β	95% Bias-Corrected Bootstrapped CI
Cross-lagged paths				
T1 victimization → T3 depression	0.40**	0.13	0.30	0.12, 0.47
T1depression → T3 victimization	0.36***	0.06	0.40	0.25, 0.54
Stability paths				
T1 Threat → T2 threat	0.62***	0.06	0.61	0.51, 0.69
T2 Threat → T3 threat	0.84***	0.09	0.87	0.71, 1.01
T1 Challenge → T2 Challenge	0.50***	0.05	0.53	0.43, 0.62
T2 Challenge → T3 Challenge	1.01***	0.14	0.85	0.63, 1.09
Path As (Peer-Victimization → Appraisal)				
T1 victimization → T2 Threat	0.01	0.06	0.11	-0.01, 0.22
T1 victimization → T2 Challenge	-0.02**	0.01	-0.14	-0.27, -0.04
Path Bs (Appraisals → depression)				
T2 Threat → T3 depression	3.90**	0.84	0.34	0.20, 0.47
T2 Challenge → T3 depression	-1.64*	0.70	-0.14	-0.25, -0.02
Mediation				
Total Indirect Effect	0.07*	0.04	0.06	0.01, 0.11
Indirect Effect of Threat Appraisals	0.05	0.03	0.04	0.00, 0.09
Indirect Effect of Challenge Appraisals	0.03	0.02	0.02	0.00, 0.05

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

Table 4 Unstandardized and standardized paths for moderation model

	b	SEb	β	95% CI
Model 1: PSS Close Friend				
T1 Peer-Victimization → T3 Depression	0.59***	0.11	0.41	.28, .59
T1 Depression → T3 Peer-Victimization	0.31***	0.06	0.30	.20, .50
PSS Close Friend → T3 Depression	-0.07	0.05	-0.11	-.25, .03
T1 Peer-Victimization X PSS Close Friend → T3 Depression	0.01	0.01	0.12	-.08, .33

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