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A Dynamic Examination of the Associations between Shyness, Psychological Difficulties, and Stressful Life Events during Early Adolescence

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Abstract

Although numerous studies have established linkages between shyness and later psychological difficulties, most extant research did not examine variation in shyness over time in relation to variation in psychological difficulties over time or possible environmental factors of influence outside of the school context. The current study used multi-level modelling to simultaneously examine time-invariant and time-variant associations between shyness, the psychological difficulties of depressive symptoms and loneliness, and stressful life events at four waves across one year in a community sample of 271 young adolescents (51% boys; $M_{\text{age}} = 11.83$ years at W1). Results revealed significant time-variant and time-invariant effects when loneliness was examined as a predictor of shyness. In addition, a significant interaction effect indicated that shyness decreased over time for those young adolescents who experienced few stressful life events, highlighting an understudied moderator of risk. Overall, findings have important implications for understanding the psychological concomitants of shyness as well as etiological models of shyness.

Keywords

Shyness; Depressive Symptoms; Loneliness; Multi-level Modelling

It is widely recognized that *shyness*, the tendency to experience fear and wariness in social situations and/or situations involving perceived evaluation, is a strong individual risk factor for child and adolescent adjustment difficulties, including anxiety, depressive symptoms, and interpersonal problems (Rubin, Coplan, & Bowker, 2009). In most research, shyness (related constructs include *anxious-solitude* and *anxious-withdrawal*) is conceptualized, explicitly or not, as a relatively stable trait. In other words, the effects of shyness on outcomes are

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examined and interpreted as being *time-invariant* or the result of a relatively stable characteristic across time (e.g., Boivin, Hymel, & Bukowski, 1995).

Although longitudinal studies have long indicated that there is consistency in shyness in individuals over time, recent research shows that there is also significant variability or change within individuals over time in this and related constructs (Booth-LaForce et al., 2012; Gazelle & Ladd, 2003; Gazelle & Rudolph, 2004). This suggests that investigators should also be testing the associations between fluctuations in shyness from time point to time point and fluctuations in outcomes across the same time points, or *time-variant* effects, to fully understand the role of this tendency in development. Findings from other areas of study indicate that modeling both time-invariant and time-variant components of predictors of psychopathology provides unique information for understanding whether, for whom, and when problematic adjustment outcomes may occur (i.e., depressive symptoms; Hussong et al., 2008; King, Molina, & Chassin, 2008; Schacter & Juvonen, 2018). Yet, research examining time-variant effects in shyness continues to be rare. Even rarer are studies in which both types of effects are simultaneously considered. Nevertheless, evaluating both types of effects of shyness on psychological outcomes is important as it provides information about two different developmental issues with clinical significance: (1) individual differences in shyness and the outcomes (time-invariant effects; TI); and (2) within-person changes in shyness and the outcomes (time-variant effects; TV, see Schacter & Juvonen, 2018). Accordingly, to gain insights into these separate effects of shyness, the current study will test both TV and TI effects (the former being evaluated across four 3-month intervals, the latter operationalized as the average across four time points) of shyness on depressive symptoms and loneliness, two common psychological outcomes in this area of study (Rubin et al., 2009). Also of interest is the potential influence of a theoretically indicated but understudied environmental factor, stressful life events (Rubin, LeMare, & Lollis, 1990).

Shyness and Psychological Adjustment

When the *time-invariant* or average effects of youth shyness are considered, the negative psychosocial concomitants of shyness are clear (i.e., depressive symptoms, loneliness, peer adversity; e.g., Boivin et al., 1995; Rubin, Hymel, & Mills, 1989). Child-by-environment models of risk and adaptation and supporting research suggest that shy youths' anxious tendencies and interpersonal difficulties (i.e., with peers) both contribute to their psychological problems (Rubin et al., 2009).

When shyness is studied over time and across settings, moderate stability has been found (e.g., Rubin et al., 1989). Thus, shyness is oftentimes described and studied as a relatively stable construct over time. However, recent work shows evidence of fluctuations across individuals over time. For example, findings from multi-wave studies show that average levels of shyness typically decline for boys and girls across the elementary and early middle school years (e.g., Shell, Gazelle, & Faldowski, 2014). Such studies also show significant individual differences in changes in shyness over time (Booth-LaForce et al., 2012; Gazelle & Ladd, 2003; Gazelle & Rudolph, 2004). What factors explain this variability? Available evidence suggests that peer (e.g., friendlessness, peer exclusion) and parenting factors (e.g.,

lower levels of parental autonomy-granting) both predict high-stable and increasing shy and anxious-withdrawn trajectories over time (Booth-LaForce & Oxford, 2008; Booth-LaForce et al., 2012; Oh et al., 2008). Additionally, youth who are high and stable or increasing in their shyness show higher initial and increasing levels of social difficulties (i.e., peer exclusion) and depressive symptoms over time relative to other youth (Gazelle & Ladd, 2003; Gazelle & Rudolph, 2004).

What is missing in this recent work is attention to whether individual differences in the stability of shyness might also explain variability in other indices of psychological maladjustment aside from depressive symptoms. During early adolescence (10–14 years), depressive symptoms and loneliness often first emerge, and become increasingly elevated and uniquely predictive of major clinical disorders in adulthood (Cacioppo, Grippo, London, Goossens, & Cacioppo, 2015; Pine, Cohen, Cohen, & Brook, 1999). Due to peer problems, shy youth report high levels of loneliness, and shyness is associated with increases in loneliness over time (Markovic & Bowker, 2017). Yet, patterns of change in shyness in relation to patterns of change in loneliness have not been previously explored. Thus, the first study goal is to examine the TV and TI effects of shyness on depressive symptoms and loneliness during early adolescence. Our short-term (assessments every 3 months) longitudinal design allows us to evaluate shorter-term fluctuations in shyness, loneliness, and depressive symptoms than considered in past research (i.e., assessments every 6 months: Gazelle & Rudolph, 2004; assessments every year; Yang, Chen, & Wang, 2015).

Also of interest is whether depressive symptoms and loneliness help to explain variability in shyness over time. Psychological difficulties and shyness have been theorized to influence one another (Rubin et al., 2009), but mixed findings have emerged in the few studies that considered whether psychological difficulties predict shyness. One study of young adolescents found evidence that a psychological difficulty predicted shyness (Dill, Vernberg, Fonagy, Twemlow, & Gamm, 2004), but another study failed to do so (Yang et al., 2015). The Dill et al. study, however, only tested the *TI* effects of a construct not under examination in the current study, negative affect (which included sad, mad, and frightened emotions). The Yang et al. study did consider both depressive symptoms and loneliness, as well as *TI* and *TV* effects across 1-year intervals, but their sample resided in urban China. Due to documented variations in the concomitants of shyness across cultures (Chen & French, 2008), it is unclear whether the results would be the same in samples outside of China. It is also possible that their annual assessments failed to capture short-term fluctuations that lead to change.

Although the evidence is mixed in studies focused specifically on shyness, it is well established that depressive symptoms and loneliness can undermine aspects of interpersonal functioning (Rudolph, Flynn, & Abaied, 2008; Grant et al., 2013). For example, despite longing for social connection, lonely youth may become hypersensitive to social threat and avoid peers out of fears of rejection (Cacioppo, Chen, & Cacioppo, 2017). Many youth also cope with depressive and anxious symptoms with avoidant coping strategies (Grant et al., 2013). Presumably, depressive symptoms and loneliness may lead many young adolescents to increase in their anxious avoidance of and social anxieties at a given time point and over

time. Our study is one of the first to evaluate both TI and TV effects of psychological adjustment on fluctuations in shyness over time.

Shyness and Stressful Life Events

Guided by bio-ecological models of development that acknowledge reciprocal influences between the child and his or her various environmental contexts (Bronfenbrenner & Morris, 2006), we also evaluate the TI and TV associations between shyness and the occurrence of stressful life events. *Stressful life events*, defined as “environmental circumstances or conditions that threaten, challenge, exceed or harm the psychological or biological capacities of the individual” (Grant et al., 2013, p. 448; i.e., parental death, divorce, moving homes), are a major focus of inquiry in developmental psychopathology and clinical research as they can have significant and negative influences on youth psychosocial adjustment (i.e., depression, anxiety, substance use; e.g., Compas, Howell, Phares, Williams, & Giunta, 1989; Tolan, 1988). According to theory on stress and coping (Rutter, 1981), such stressful events can overwhelm individuals’ coping, processing, and regulatory abilities and resources, thereby leaving youth vulnerable to a range of internalizing and externalizing problems. Individuals may vary in their average exposure to life events over time (e.g., perhaps due to individual stress generation or persistent difficulties in the family; Rudolph et al., 2000) and in their exposure to life events at any given time point (e.g., due to transient environmental conditions). Thus, recent research considers the TV and TI effects of stressful life events on outcomes (e.g., King et al., 2008).

Although theories around and research on the impact of life events are not new, little empirical research has considered whether stressful life events are associated with shyness. Several lines of related scholarship, however, suggest that such relations might exist. For example, early etiological models of shyness identified negative environmental circumstances or “setting conditions,” including stressful life events, as early and critical determinants of negative relationships (with parents and peers) and the development of shy behavioral tendencies (e.g., Rubin, LeMare, & Lollis, 1990, p. 219). Findings from studies that utilized general measures of setting conditions (e.g., stressful life events + parenting hassles + maternal depression) supported this contention by showing significant linkages between such conditions and negative parenting and child outcomes (e.g., Booth-LaForce, Rose-Krasnor, McKinnon, & Rubin, 1994). There is also some evidence that internalizing-related behaviors (i.e., anxious and depressed behaviors; which are conceptually similar to shy behaviors) and stressful life events are related (e.g., Sanchez, Lambert, & Cooley-Strickland, 2013).

The most direct evidence that shyness and stressful life events might be related comes from a longitudinal study in which adolescents who had greater exposure to stressful life events (i.e., moving, parental divorce, death of a family member, illness of a family member) experienced smaller decreases in shyness over time relative to adolescents with less exposure (Laceulle, Nederhof, Karreman, Ormel, & van Aken, 2012). Laceulle and colleagues argued that the stressors and challenges associated with stressful life events may interfere with typical decreases in shyness (and associated fears and anxieties) over time or with “adolescents’ development toward a mature “temperament” (p. 281). This idea is

consistent with developmental cascade and spillover effects models in which negative functioning and events in one domain (in this case, stressful life events) may spillover and interfere with, and otherwise impact, healthy functioning in another domain (shy behavioral tendencies). Although time-varying (TV) effects were not evaluated in the Laceulle et al. (2012) study, numerous studies show that many adolescents respond to stressful life events with avoidance (Seiffge-Krenke, 2000), raising the possibility that TV effects between stressful life events and shyness might also exist (i.e., increases in stressful life events might be related to increases in shyness).

Of particular interest in our study is whether stressful life events might impact the stability of shyness. In this respect, we tested the idea that stressful life events (both TV and TI) might increase vulnerability for increasing shyness over time. As noted previously, theory (e.g., Rutter, 1981) suggests that the effects of stressful life events are detrimental to development because such events can be overwhelming to individuals and thereby interfere with normative developmental change. Given some evidence that shy youth react more strongly to social stressors such as peer rejection, and that such reactions can impede their recovery (Gazelle & Druhen, 2009), we evaluate the novel hypothesis that high and increasing levels of stressful life events might similarly overwhelm shy young adolescents, thereby leading to increasing shyness over time. Although our study is the first to evaluate this specific hypothesis, it dovetails well not only with developmental cascade and spillover models but also diathesis-stress theories and research emphasizing the interaction of individual vulnerabilities (diatheses) and environmental adversities (stress) in the prediction of psychopathology outcomes (Monroe & Simons, 1991).

The Present Study

The current study uses peer- and self-report data collected at four waves over the course of approximately one year to test the general hypotheses that shyness and the psychological difficulties of loneliness and depressive symptoms exert influence on one another via both time-invariant (TI; average) and time-variant (TV) effects. We also evaluate the hypothesis that both TV and TI associations exist between shyness and the stressful life events, and that stressful life events may lead to increasing shyness over time.

Because previous research suggests that associations between shyness and psychological adjustment differ for boys and girls (for review, see Doey, Coplan, & Kingsbury, 2014), we explore for potential sex differences in all analyses. We make no specific a priori sex differences predictions, however, due to the novelty of the specific research questions addressed herein and inconsistencies in previous research. All effects in the models are examined while controlling for peer rejection, a known concomitant of shyness and psychological difficulties, and ethnicity, which is oftentimes associated with stressful life events. Finally, it should be emphasized that our study design includes a shorter assessment interval than has been used in prior longitudinal studies. Available evidence, however, suggests that there is short-term (across 3–6 months or less) change in shyness (and related constructs) as well as the predictors of change examined in this study (e.g., Stretch, MacCarthy, & Wykes, 1997; Gazelle & Ladd, 2003).

Method

Participants

Participants were 271 young adolescents (51% boys; $M_{\text{age}} = 11.83$ years, $SD = 0.49$, at the start of the study, Wave 1), from two suburban public middle schools in Buffalo, New York. Participants were part of a longitudinal study on short-term changes in peer relationships. All Grade 6 students at the two schools were recruited for participation; informed written parental permission and adolescent assent were obtained for all participants, with a consent rate of 70%. Fifty-eight percent of participants self-identified as Caucasian, 21% as African-American, 12% as Biracial, 4% as Hispanic, 3% as Arabic, 1% as Native American, and 1% as Asian, similar to the ethnic composition of the participating schools. Publically available information indicates that the median income for the families in the participating school districts ranged between \$44,969 and \$54,098.

Procedure

Participants completed measures on four occasions (approximately 3 to 3.5 months apart): Wave 1 (W1: Grade 6, Fall, November), Wave 2 (W2: Grade 6, Winter, early February), Wave 3 (W3: Grade 6, Spring, end of May/ early June), and Wave 4 (W4: Grade 7, Fall, late September). At each wave, participants completed measures in group-format settings (e.g., cafeteria). Each session lasted 30 to 45 minutes. Students were told that their answers were confidential and that they could stop completing the questionnaires at any time. Various incentives were used to ensure the return of forms, including a pizza party for the three homerooms that returned their consent forms first. Retention rates in this study were high; only 10 students dropped out of the study (due to leaving the school) between W1 and W4. Analyses indicated no differences in the study variables for participants who completed measures at all waves relative to participants with incomplete data ($ps > .05$). All procedures were approved by the Institutional Review Board at the University at Buffalo.

Peer Report Measures (W1-W4)

Shyness.—Four peer nominations items assessed shyness (“very shy”; “doesn’t talk much or talks quietly”; “gets nervous about group discussion”; “hardly ever starts up a conversation”; Oh et al., 2008); in previous research, the mean shyness scores were found to be internally consistent ($\alpha s = .83-.91$) and correlated significantly with teacher-reports of shy and anxious behaviors. Nominations were unlimited, with same- and other-sex nominations permitted (for any grade-mates). For the shyness items and also the peer rejection item described below, no class lists were provided; instead, participants wrote the names of peers for each item, and only nominations for participating peers were utilized (for an identical procedure, see Bowker & Raja, 2011; Oh et al., 2008). For each item, the number of nominations received were summed, proportionalized, and then standardized (within school; Cillessen, 2009). Mean scores were calculated at each wave ($\alpha s = .82-.89$).

Peer rejection.—To assess peer rejection, participants wrote the names of an unlimited number of same-sex and other-sex grademates that best fit with the peer nomination item, “Someone you like to be with the least.” Nominations received were first summed, proportionalized, and then standardized within school.

Self-Report Measures (W1-W4)

Loneliness and depressive symptoms.—Loneliness was assessed with the 16-item *Loneliness and Social Dissatisfaction Questionnaire* (LSDQ; Asher, Hymel & Renshaw, 1984; “It’s hard for me to make friends”). At each wave, participants rated each item on a 5-point Likert scale (1 = *not at all true*; 5 = *really true*). Depressive symptoms were assessed with the 10-item *Children’s Depressive Inventory: Short Version* (CDI:S; Kovacs, 1992; e.g., “I am sad all of the time”). For each item, participants were presented with three statements and asked to pick one statement that best describes their feelings in the past two weeks (e.g., “I do not feel alone”, “I feel alone many times”, or “I feel alone all the time”; coded as 0, 1, or 2). Mean scores were calculated with higher scores reflecting greater levels of loneliness and depressive symptoms. Consistent with other studies that utilized the 10-item scale (e.g., Priess, Lindberg, & Hyde, 2009), mean scores were computed for the CDI in this study. Both scales have been found to be internally consistent in previous studies of young adolescents (α s = .71–.91; e.g., Craighead, Smucker, Craighead, & Ilardi, 1998), and the internal consistencies for these scales in this study were acceptable (loneliness, W1-W4: α = .91–.93; depressive symptoms, W1-W4: α = .73–.76). The construct and convergent validity of these scales were previously established (i.e., associations between scores on the CDI and diagnoses of major depression; Craighead, Curry, & Illardi, 1995).

Stressful life events.—Participants completed the 16-item Stress Index (Attar, Guerra, & Tolar, 1994) that assesses exposure to violence (e.g., family violence, crime in neighborhood), circumscribed events (e.g., family death), and negative life transitions (e.g., relocation) during childhood and adolescence. The measure has been previously associated with youth aggression and internalizing problems, evidence of convergent validity (Attar et al., 1994). For each item, participants reported whether they had experienced the event in the past year (with “yes” = 1, “no” = 0), and mean total scores were calculated with higher scores indicating greater experience of stressful events (α s = .71–.79).

Most participants reported having experienced 3 or more stressful life events in the past year (M s = 4.79, 3.42, 3.64, 3.14, SD s = 3.02, 2.63, 2.89, 2.86, for W1-W4, respectively), similar to the number of life events reported in studies of high-risk youth (i.e., studies of inner-city youth living in poverty; Kiser, Medoff, & Black, 2010). Youth most commonly reported serious illness, injury, or hospitalization of a family member (48%–54%), and experiencing a death in the family (40%–63%). Many also reported a new baby entering into their families (e.g., 45% at W1), and a new marriage (e.g., 49% at W3). Reports of violence were less common than those reported in high-risk samples, but were reported by a sizable minority of participants (e.g., at W1, 25% reported that they knew someone outside their family who had been beaten, attacked, or hurt by others). Preliminary analyses revealed few differences in the pattern of associations between the three subscales and the study variables (output available from the first author). Thus, total scores were examined herein.

Results

Zero-Order Associations

Zero-order correlations are presented in Table 1. Of note are the correlations that show significant stabilities, and at the same time, variability, for each of the measures across time, including in the reporting of stressful life events. Shyness was associated positively with depressive symptoms and loneliness at each wave, and not related to stressful life events.

Analytic Plan

Shyness predicts psychological difficulties.—To account for the non-independence of the longitudinal measures and to model time-variant (TV) and time-invariant (TI; average) effects, we employed multilevel modeling (MLM) to evaluate the study hypotheses. Each participant's scores over time were nested within the individual in a two-level MLM approach (Raudenbush & Bryk, 2002) where we used measures of constructs at each wave to create TV effects and the average over the four waves of the construct to create the TI effects (TI *M*s (*SD*)s = 0.00 (0.70), 0.32 (0.30), 1.67 (0.60), 0.26 (0.20), for shyness, depressive symptoms, loneliness, and stressful life events, respectively). The first series of models tested the main effects of TV shyness and TI shyness on the outcomes of depressive symptoms, loneliness, and stressful life events. For each of the three models, linear change over time (i.e., waves), rejection, and TV shyness were entered at Level 1 with both linear change over time and shyness entered as random effects. At Level 2, sex, ethnicity, and TI shyness were entered as predictors. Results are presented in Table 2; no random effects were significant and thus only fixed effects are reported.

Psychological difficulties predict shyness.—Next, a series of models tested TV and TI main effects of depressive symptoms, loneliness, and stressful life events with shyness as the outcome. For each of these three models, linear change over time (i.e., time points), rejection, and the TV effect of one of the predictors were entered at Level 1 with both linear change over time and the TV predictor entered as random effects. At Level 2, sex, ethnicity, and the TI of the predictor were entered. In each model, the intercept was set such that the Level 2 effects were predicting individual starting scores. This allowed us to interpret significant Level 2 effects as predicting linear change over time in the outcome while controlling for participants' W1 outcome scores.

Finally, we tested various interactions to evaluate effects of time, sex as a moderator of main effects, and TV and TI interactions between the main predictors. For time, we tested the linear change over time $\times$ Level 1 TV predictor interaction and the linear change over time $\times$ Level 2 TI predictor in each model. For sex, we tested the cross-level interactions of sex $\times$ Level 1 TV predictor and sex $\times$ Level 1 linear change over time interaction and the Level 2 interaction sex $\times$ TI predictor in each of the models. Finally, the cross level interaction of the TV predictor $\times$ TI predictor was evaluated in each model. There was no missing data on shyness or rejection, but missing data on the psychological variables and the stressful life events (which was mostly due to limited time allowed by the schools for participants to complete measures) was handled using full information maximum likelihood (FIML) estimation. Results are presented below as well as in Tables 2 and 3.

Depression Models Outcome Models

Intra-class correlation: The unconditional model revealed that 28.78% of the variability in depressive symptoms was at the between-subject level. There was a significant proportion of variability, justifying the use of multilevel modeling ($\chi^2_{(220)} = 1715.52, p < .05$). This left 71.22% of the variability to be explained by the time-variant predictors. In sum, this intra-class correlation reflects that it is important to examine both TV and TI effects.

Main effects: There were no significant effects at Level 1 for linear change over time, rejection, or TV shyness. At the between-individual level, no main effects for ethnicity, sex, or TI shyness emerged.

Linear change over time interactions: TV and TI shyness did not moderate change in depressive symptoms over the four waves (all $ps > .31$).

TV shyness $\times$ TI shyness interaction: TI shyness did not moderate the effects of TV shyness on depressive symptoms (all $ps > .39$). Of note, none of these non-significant effects were consistent with hypotheses.

Sex interactions: Sex did not moderate any of the effects of time, TV shyness, and TI shyness on depressive symptoms (all $ps > .28$).

Loneliness Outcome Models

Intra-class correlation: The unconditional model revealed that 30.93% of the variability was at the between-subject level. There was a significant proportion of variability (69.07%; $\chi^2_{(213)} = 1705.41, p < .05$), that could be explained by TV predictors, supporting the exploration of both TV and TI effects.

Main effects: As seen in Table 2, there was a significant decrease in loneliness over time but no significant effects for rejection or TV shyness. However, as expected, TI (or average) shyness was associated positively with loneliness. Additionally, there was a significant Level 2 effect for sex with girls reporting lower levels of loneliness than boys. There were no significant effects for ethnicity.

Linear change over time interactions: TV and TI shyness did not moderate change in loneliness over the waves (all $ps > .18$).

TV shyness $\times$ TI shyness interaction: TI shyness did not moderate the effects of TV shyness on loneliness (all $ps > .37$), which was not consistent with a priori expectations.

Sex interactions: Sex did not moderate any of the effects of time, TV shyness, and TI shyness on loneliness (all $ps > .64$).

Stressful Life Events Models

Intra-class correlation: The unconditional model revealed that 59.41% of the variability in stressful life events was at the between-subject level; this was a significant proportion of

variability ($\chi^2_{(222)} = 1080.10, p < .05$). The remaining 40.59% of the variability was at the within-subject level, illustrating the importance of testing TV and TI effects.

Main effects: There was a significant decrease in stressful life events across the waves. However, there was no significant association between rejection or TV shyness and stressful life events. At the between-individual level, there were no effects for sex or TI shyness but there was a significant effect for ethnicity. Caucasian participants reported fewer stressful life events relative to all other participants.

Linear change over time interactions: TV and TI shyness did not moderate change in stressful life events across the four waves (all $ps > .22$).

TV shyness $\times$ TI shyness interaction: TI shyness did not moderate the effects of TV shyness on stressful life events (all $ps > .45$).

Sex interactions: Sex did not moderate any of the effects of time, TV shyness, and TI shyness on stressful life events (all $ps > .17$). No a priori expectations were developed regarding sex but the other non-significant effects in this model were not consistent with our general hypotheses.

Shyness Outcome Models

Intra-class correlation: The unconditional model revealed that 25.25% of the variability in shyness was at the between-subject level, again with a significant proportion of unexplained variability ($\chi^2_{(271)} = 3437.96, p < .05$). The remaining 74.75% of the variability at the within-subject level reinforces the need to examine both TV and TI effects.

Main effects: There was no effect of linear change over time but there was for rejection with increases in rejection associated with increases in shyness at the same time point ($b = 0.05$, S.E. = .02, $t(543) = 1.94, p < .05$). Depressive symptoms, loneliness, and stressful life events were not associated with shyness in these individual models (as shown in Table 3) but follow-up exploratory analyses did reveal TV and TI effects for loneliness on shyness when TV and TI depressive symptoms were controlled (see Table 3). Specifically, and consistent with expectation, as both TV loneliness and TI loneliness increased, shyness increased. There were no TV or TI effects for depressive symptoms in this model, and the significant TV and TI effects for loneliness were only found when the other type of effect for loneliness was not included in the model (which was necessary due to issues of multicollinearity).

Linear change over time interactions: Also in-line with hypotheses, there was a significant linear change over time $\times$ TI stressful life events interaction (Table 3). As shown in Figure 1, those low in average SLE over the four time points showed decreases in shyness over the four waves ($b = -0.17$, S.E. = .08, $t(222) = 2.20, p < .05$). For those high in average SLE over the four time points, there was little change in shyness ($b = 0.04$, S.E. = .05, $t(222) = .69, p > .05$). There was no significant main effect of stressful life events on the intercept in this model, but as shown in Figure 1, there was a general tendency for youth with lower stress to start out with somewhat higher shyness but then to converge with those with more stress over time.

TV predictor × TI predictor interaction: None of the three TI predictors moderated effects of the same TV predictor variable in any of the models for shyness (all $ps > .36$).

Sex interactions: Sex did not moderate any of the effects of time, any of the three TV predictors, and any of the three TI predictors of shyness (all $ps > .34$).

Discussion

The overarching goal of this investigation was to extend past research by examining the time-variant and time-invariant associations between shyness, two types of psychological difficulties (loneliness, depressive symptoms), and the occurrence of stressful life events during early adolescence. The results revealed that increases in loneliness as well as changes in loneliness appear to have implications for shyness. We also found that shyness was related to loneliness. A significant interaction between shyness and stressful life events was also revealed, suggesting that stressful life events may be a previously unknown environmental factor of influence in many shy young adolescents' lives. Taken together, our findings illustrate that the consideration of both time-variant and time-invariant effects as well as a broader view of environmental factors of influence are necessary to advance understanding of the nature and psychological concomitants of shyness.

Shyness and Psychological Difficulties

Shyness was concurrently correlated with loneliness *and* depressive symptoms at each wave. These findings converge with previous research linking shyness (and related constructs) to high levels of loneliness and depressive symptoms (e.g., Gazelle & Ladd, 2003; Gazelle & Rudolph, 2004). Also consistent with prior work (Booth-LaForce et al., 2012; Gazelle & Ladd, 2003; Shell et al., 2014), we found substantial stability and variability in shyness, depressive symptoms, and loneliness over the course of our tri-monthly assessments, which allowed for the examination of both TV and TI predictors of change in our models.

One notable difference from past research is that our longitudinal models did not reveal significant associations between shyness and depressive symptoms. These non-significant longitudinal associations between shyness and depressive symptoms were not expected, and might be explained by a difference in conceptual models (i.e., diathesis-stress models) and how they translated into analyses (i.e., interaction terms between shyness and environmental risk factors are typically included when diathesis-stress models are evaluated) as well as differences between shyness and the other related constructs (anxious-solitude) studied in past research. It may also be that our shorter interval assessments failed to capture the changes in depressive symptoms associated with shyness/related constructs in previous studies with longer assessment intervals (e.g., Gazelle & Ladd, 2003; Gazelle & Rudolph, 2004). Of course, the lack of significant associations in the model with shyness as the outcome and depressive symptoms as the predictor could be interpreted as consistent with the non-significant findings reported by Yang et al. (2015). Replication is clearly needed with longitudinal studies that consider changes across different interval periods. Nevertheless, the findings may suggest that the length of assessment periods in studies of shyness matters and highlight the importance of including more than one psychological outcome.

The most noteworthy findings in this investigation pertain to loneliness. When loneliness was modelled as the outcome, significant time-*invariant* or average effects of shyness were found. In the models that treated shyness as the outcome, similar time-*invariant* effects for loneliness were evinced, but we also found evidence of a significant time-*variant* effect. These findings are novel and suggest that prior research that focused exclusively on *TI* associations between shyness and loneliness did not capture the complexity of the relations between these constructs over time. Indeed, our findings show for the first time that changes in loneliness lead to changes in shyness, illustrating that for many young adolescents, their experiences with shyness and loneliness are not “static” over time. Also newsworthy was the result that higher levels of loneliness are predictive of higher levels in shyness, and vice versa. These findings are consistent with our hypotheses and dovetail with past theory on shyness in which reciprocal associations between shyness and psychological outcomes are hypothesized (Rubin et al., 2009). They are also consistent with developmental psychopathology models that emphasize reciprocal and co-occurring changes across developmental domains (Masten & Cicchetti, 2010).

It is interesting that our findings cannot be explained by the peer difficulty of rejection as it was controlled in all analyses. Peer difficulties are the single most often cited cause of shy youths’ behavioral and psychological problems. Instead, our results point to a negative and in some cases, *dynamic*, self-perpetuating cycle between shyness and loneliness that is not dependent on peer rejection *or* shared overlap with depressive symptoms (given that some of the effects only emerged when controlling for depressive symptoms in an exploratory manner; see Table 3) and is in need of further study. Higher levels of shyness were associated with high levels of loneliness over time, likely because as the anxious avoidance of and worries about peers increases, young adolescents become less likely to fulfill strong social needs and desires for peer interaction, which even shy youth possess. In turn, increases in loneliness may lead to increases in shyness because chronic loneliness can lead to hypervigilance in social situations and enhanced tendencies towards self-preservation, which in turn, likely fosters increasing anxious avoidance of and concerns regarding peers (Cacioppo et al., 2017). In this regard, one can imagine the highly lonely young adolescent who desires to be with peers and is well aware of her or his social deficiencies but becomes increasingly withdrawn and anxious due to fears of rejection. The short intervals between our assessments suggest that this cycle may develop rather quickly for many young adolescents.

The time-variant effect of loneliness on shyness suggests that shyness is not always “trait-like,” but instead, that experiences with loneliness may increase shy and anxious fears and cognitions in some young adolescents. However, the time-*invariant* effect of loneliness on shyness is consistent with the time-variant result and together provides strong support that many young adolescents may become shy across a school year and a grade tradition because they experience loneliness over time. This direction of effects has not been previously reported. We did not find any sex differences in these patterns of effects, suggesting that shy young adolescent boys and girls may be equally vulnerable to the dynamic cycle and the effects of increasing loneliness on shyness.

Although speculative, these interpretations are consistent with approach and avoidance models of social withdrawal (Coplan & Armer, 2007) and the evolutionary theory of loneliness (Cacioppo et al., 2017). Such effects may be especially likely to occur during early adolescence when peer relationships take on special importance; it might also be especially relevant in Western societies, such as the United States, where the negative costs associated with shyness and peer-based loneliness appear to be the greatest (Chen & French, 2008). Further work involving youth of all ages, from both Western and non-Western societies, will be needed to test these hypotheses as well as the generalizability of the current results. But, if the findings are replicated, they may suggest that clinicians would do well to target this cycle with interventions that include behavioral activation therapy, which focuses on overcoming individuals' avoidance of activities that could bring pleasure (e.g., Martell, Dimidjian, & Herman-Dunn, 2013). Small changes in shyness could disrupt the cycle.

Shyness and Stressful Life Events

In our study, there were no time-variant or time-invariant main effects of stressful life events on shyness. Instead, our findings support bio-ecological model in which shyness decreased only when the occurrence of stressful life events was consistently low (a time-*invariant* effect of stressful life events on change in shyness). Thus, the evidence from this study suggests that decreases in shyness may be possible in larger environmental contexts relatively free of stress and major life changes, but not in environments in which such circumstances are relatively average or high. When the occurrence of stressful life events is consistently low, shy young adolescents may have the emotional abilities and resources to more confidently approach peers and social situations over time (Compas et al., 1998; Rutter, 1981). However, such resources may not be available when stressful life events are consistently occurring, thereby leading to less change in shyness over time. Of note, in our study, peers reported on shyness as observed in the school setting, while young adolescents reported on stressful life events occurring (directly or indirectly) in the home environment. Thus, our findings uncover a previously unknown way in which the spillover or transfer of stress and difficulties from one relational context (in this case, at home, in terms of stressful life events) to the next (in this case, at school, in terms of their anxieties, fears, and behaviors) occurs for shy youth (Masten & Cicchetti, 2010).

Study Limitations and Future Directions

Strengths of this study include its multi-method, longitudinal design and its simultaneous examination of time-variant and time-invariant associations between shyness and depressive symptoms, and the less commonly studied outcome of loneliness. The inclusion of an assessment of stressful life events at each wave also enabled us to uncover a novel environmental factor relevant for the development of shyness.

The current findings, however, should be interpreted with caution due to several study limitations. First, we only controlled for rejection in our study. Recent work, however, suggests that peer exclusion (i.e., being left out of group activities and play) may have a greater impact on shy youth (e.g., Bukowski et al., 2010, Shell et al., 2014). Thus, it will be important for future work to include assessments of peer exclusion to best determine the

extent to which the effects between shyness, psychological difficulties, and stressful life events are unique and not explained by school-based peer difficulties.

Second, a key variable in our investigation, stressful life events, reflected the occurrence of such events, and not how such events were appraised or how the young adolescents coped with such events. The risks associated with the occurrence of stressful life events do depend, to some extent, on how events are interpreted and coping strategies (e.g., Mezulis, Hyde, & Abramson, 2006), suggesting that future research would benefit from considering appraisal and coping processes to fully understand the shyness risks associated with stressful life events. Another limitation of our stressful life events measure is that it was retrospective and thus may have been subject to recall biases. In addition, at each wave, participants reported on the occurrence of stressful life events in the past year. Correlations and results from unconditional models suggested significant inter- and intra-individual variability over time in stressful life events. An inspection of the item-level data revealed evidence consistent with these analyses; for example, only two events were endorsed by more than 5% of participants at each wave (Marriage in family; 6.2%; Death in family; 5.1%). Nevertheless, future studies should prompt participants to report on more recent and new stressful events at each wave (i.e., as the same event could have been reported more than once in our study and participants may not have been reporting on the most recent events). Researchers should perhaps also use even shorter assessment intervals than were used in our study (which may help to eliminate any recall biases). Moreover, the use of a different measure, which includes additional life events away from school but outside of the home environment, would be useful to better evaluate different types of non-school stressors and their relative degree of influence in the lives of highly shy youth.

Another study limitation pertains to our sample, which was a relatively-low risk community sample outside of one large Northeastern city in the United States. Thus, it is heretofore not clear whether and to what degree our findings can be generalized to adolescents who reside in other parts of the United States, or other parts of the world, especially those who live in locales that might be higher risk (i.e., due to poverty, violence). Our participants did report similar numbers of stressful life events to that found in high-risk samples elsewhere in the United States, although the proportion of violent (and presumably severe) events was lower, thus generating additional concern for the generalizability of findings. All findings should be replicated, but perhaps especially results pertaining to stressful life events as it is plausible that they may not generalize to, or be more pronounced in high-risk groups.

An additional limitation is that the present study does not offer further insights into the causal nature of associations between shyness, psychological difficulty, and stressful life events given that the changes examined in the study are concurrent between the predictor and the outcome in each model. Finally, it is important to emphasize that the effects found were small in magnitude, especially those involving stressful life events. Moreover, the TV and TI effects for loneliness as a predictor of shyness were only significant when the other type of effects for loneliness (i.e., TV when TI effects for loneliness were examined) were deleted from the model. Thus, while the results may have important implications for theory and future research, it is not yet clear whether there are also applied implications. As noted previously, our results may highlight the importance of attending more carefully to the

impact of shy youths' loneliness on their behavior in future prevention and intervention efforts. We also think that our findings may point to the importance of attending more fully to different contexts of influence in the lives of shy young adolescents in intervention efforts.

Addressing the limitations of our research will be important in future research. In such future studies, it would also be interesting to determine whether there are indirect effects of stressful life events on shyness vis-à-vis parenting, as previously hypothesized by Rubin and colleagues. Additionally, future work should consider why stressful life events impacted the stability of shy behavior but did not impact the psychological difficulties associated with shyness (associations that we explored in preliminary analyses; output available from the first-author by request).

Conclusion

Our longitudinal design and multi-level modelling that incorporated changes in the predictor *and* outcome variables allowed us to reveal new information about the dynamic ways in which shyness and loneliness influence each other over time. Our results also show that stressful life events moderate the stability of shyness, findings that highlight the importance of considering shy youths' home environments. The overall implications of the present research are that in order to garner a more complete understanding of the etiology of child and adolescent shyness, future research needs to consider both time-variant and invariant effects as well as a wider range of environmental factors that confer risk and protection. The present study constitutes an important step in this direction.

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Figure 1.
Moderation of stressful life events (SLE) linear change over time in shyness ($n = 136$).

Table 1.

Correlations between Main Study Variables across All Four Waves

	Shyness				Depressive Symptoms				Loneliness				Stressful Life Events			
	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4
Shyness																
W1 Fall Gr. 6	--															
W2 Winter Gr. 6	.72***	--														
W3 Spring Gr. 6	.76***	.79***	--													
W4 Fall Gr. 7	.66***	.71***	.77***	--												
Depressive Symptoms																
W1 Fall Gr. 6	.22**	.25**	.25**	.29***	--											
W2 Winter Gr. 6	.21**	.22**	.28***	.24**	.65***	--										
W3 Spring Gr. 6	.15*	.15*	.18*	.21**	.73***	.64***	--									
W4 Fall Gr. 7	.24**	.29**	.33***	.25**	.69***	.71***	.79***	--								
Loneliness																
W1 Fall Gr. 6	.36***	.40***	.44***	.38***	.73***	.55***	.55***	.52***	--							
W2 Winter Gr. 6	.29***	.24**	.39***	.24**	.43***	.55***	.35***	.52***	.69***	--						
W3 Spring Gr. 6	.33***	.34***	.40***	.30***	.51***	.45***	.58***	.60***	.68***	.76***	--					
W4 Fall Gr. 7	.26**	.35***	.38***	.31***	.46***	.50***	.45***	.65***	.62***	.68***	.73***	--				
Stressful Life Events																
W1 Fall Gr. 6	-.10	-.02	-.01	.02	.15	.09	.16	.23*	.11	-.03	.07	.17	--			
W2 Winter Gr. 6	-.04	-.03	-.01	.07	.09	.13	.08	.19*	.03	.05	-.02	.19*	.62***	--		
W3 Spring Gr. 6	-.07	.00	-.03	-.09	.10	.13	.25**	.25**	.14	.02	.12	.18*	.60***	.58***	--	
W4 Fall Gr. 7	-.06	-.01	.02	.04	.26**	.16	.36***	.34***	.16	.04	.19*	.32***	.54***	.53***	.62***	--

Note.

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

.100 > *d*

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Table 2

Final Model Estimates for Depressive Symptoms, Loneliness, and Stressful Life Events

Predictors	Outcomes		
	Depressive Symptoms (<i>n</i> = 179)	Loneliness (<i>n</i> = 193)	Stressful Life Events (<i>n</i> = 180)
	<i>b</i> (<i>SE</i>)	<i>b</i> (<i>SE</i>)	<i>b</i> (<i>SE</i>)
Intercept	.34 (.03)	1.73 (.06)	.35 (.02)
Linear change over time	−.01 (.01)	−.04 (.02) *	−.03 (.01) *
Rejection	.01 (.01)	.05 (.03)	.01 (.01)
TV Shyness	−.01 (.02)	.00 (.03)	−.01 (.01)
Sex	−.03 (.02)	−.09 (.04) *	.00 (.01)
Ethnicity	−.02 (.04)	−.01 (.07)	−.08 (.02) *
TIShyness	.06 (.04)	.20 (.06) *	.01 (.01)

Note. Level 1 predictors are left aligned and Level 2 predictors are right aligned; TV = timevarying, TI = time-invariant, *b* = coefficient, *SE* = standard error; the Ethnicity variable evaluated Caucasian participants in relation to all other participants; Intercept and TV shyness are set as random; sex was coded as 0 = boys, 1 = girls

* $p < .05$.

Table 3.
Final Model Estimates for Shyness with Depressive Symptoms, Loneliness, and Stressful Life Events as Predictors

Predictors	Outcome: Shyness			
	TI and TV Predictors			
	Depressive Symptoms (<i>n</i> = 127)	Stressful Life Events (<i>n</i> = 136)	Loneliness Events (<i>n</i> = 152) Original Model	Loneliness (<i>n</i> = 127) Exploratory Model
	<i>b</i> (<i>SE</i>)	<i>b</i> (<i>SE</i>)	<i>b</i> (<i>SE</i>)	<i>b</i> (<i>SE</i>)
Intercept	-.06 (.06)	.06 (.11)	-.03 (.09)	-.10 (.05)
Sex	.16 (.05)*	.17 (.06)*	.15 (.05)*	.13 (.04)*
Ethnicity	.04 (.09)	-.02 (.11)	.05 (.10)	.13 (.07)
TI Predictor	.10 (.10)	-.06 (.06)	.13 (.08)	-.08 (.09)
Linear change over time	.02 (.02)	.01 (.02)	.01 (.03)	.03 (.02)
Sex	.00 (.02)	.00 (.02)	.00 (.02)	<.01 (.02)
Ethnicity	-.04 (.03)	-.04 (.03)	-.02 (.04)	-.05 (.04)
TI Predictor	.01 (.01)	.03 (.02)*	.02 (.02)	-
TV Predictor	-.05 (.05)	-.02 (.03)	.03 (.05)	.10 (.04)*
Sex	.02 (.04)	-.03 (.02)	.03 (.04)	-
Ethnicity	-.05 (.07)	-.03 (.04)	-.04 (.07)	-
TI Predictor	.07 (.04)	-.01 (.02)	.04 (.04)	-
TV Rejection	.04 (.03)	.04 (.02)	.04 (.03)	.04 (.03)
TV Depression	-	-	-	-.05 (.03)
TI Depression	-	-	-	-.01 (.08)

Note. Level 1 predictors are left aligned and Level 2 predictors are right aligned; TV = time-varying, TI = time-invariant, *b* = coefficient, *SE* = standard error; Intercept and change over time and the TV were set as random; sex was coded as 0 = boys, 1 = girls

* $p < .05$.