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Regular Article

Longitudinal associations between justice sensitivity, nonsuicidal self-injury, substance use, and victimization by peers

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Abstract

Justice sensitivity (JS), the tendency to perceive and negatively respond to alleged injustice, has been associated with a range of internalizing and externalizing problems and peer victimization; however, it remains unclear if it has an association with self-victimization. Participants ($N = 769$) reported on their JS longitudinally at 9–19 (T1), 11–21 (T2), and 14–22 years of age (T3). They further reported on nonsuicidal self-injury (NSSI) and illegal substance use as indicators of self-victimization as well as victimization by peers at T2 and T3. A cross-lagged latent model revealed that victim JS at T1 was positively associated with NSSI, substance use, and peer victimization at T2, and victim JS at T2 was positively associated with substance use at T3. Higher observer JS at T2 predicted higher illegal substance use at T3 and higher illegal substance use at T2 predicted higher observer JS at T3. Finally, higher peer victimization at T2 predicted less perpetrator JS at T3 in the total group. Multigroup models further revealed sex-specific effects. Our findings highlight that being sensitive to injustice, particularly the tendency to feel unfairly treated or being taken advantage of, contributes to individuals' vulnerability to both engaging in behaviors reflecting self-victimization and being a target of peer victimization, which in turn have influences on JS.

Keywords: justice sensitivity, longitudinal, nonsuicidal self-injury, peer victimization, substance use

(Received 20 July 2020; revised 10 March 2021; accepted 10 March 2021)

Behavior reflecting self-victimization is increasingly widespread in adolescent community samples (Gallimberti et al., 2015; Lim et al., 2019), which includes nonsuicidal self-injury (NSSI), that is, the deliberate injury to one's own body tissue without conscious suicidal intent (Nock, 2010), and substance use, that is, the harmful use of psychoactive substances, such as cannabis and others (Gallimberti et al., 2015; Ramo, Liu, & Prochaska, 2012). In addition, victimization by peers such as physical aggression (e.g., being hit or kicked), verbal aggression (e.g., being insulted or called names), and relational aggression (e.g., being excluded from the peer group) is common among adolescents (Bowes, Joinson, Wolke, & Lewis, 2015; Jenkins, Fredrick, & Wenger, 2018). NSSI, substance use, and peer victimization have been linked to severe psychological problems, including suicide (Bilen et al., 2011; Cipriano, Cella, & Cotrufo, 2017; Jacobson & Gould, 2007; Moore et al., 2017; Nitkowski & Petermann, 2011). It is, therefore, pivotal to identify factors that may promote or maintain self- and peer victimization in order to develop effective prevention or intervention measures.

Increasing evidence showed that NSSI, substance use, and peer victimization are all associated with broad personality dimensions, particularly high neuroticism (Hansen, Steenberg, Palic, & Elklit, 2012; Jacobson & Gould, 2007; Kotov, Gamez, Schmidt, & Watson, 2010; Lloyd-Richardson, Perrine, Dierker, & Kelley, 2007). These findings suggest that self- and peer victimization may also be associated with other personality traits, particularly the ones which have relations with neuroticism, internalizing problem behavior, and/or peer victimization. Justice sensitivity (JS), that is, the tendency to perceive injustice and adversely respond to it (Schmitt, Gollwitzer, Maes, & Arbach, 2005), is such a personality trait (Bondü & Inerle, 2020; Bondü, Rothmund, & Gollwitzer, 2016; Schmitt et al., 2005). However, it is unknown if there is a link between JS and self-victimization (i.e., NSSI and substance use). In addition, only one study to date examined the association between JS and victimization by peers (Bondü et al., 2016).

Nonsuicidal Self-Injury, Substance Use, and Victimization by Peers

NSSI comprises a broad range of deliberate behavior that causes injury and often pain to oneself, such as cutting oneself with various objects, preventing wounds from healing, or swallowing improper subjects (Zetterqvist, 2015). Individuals engaging in NSSI often perceive an irresistible, repeated impulse to self-harm, increasing tension before acting on this impulse, and feelings of relief thereafter (Hawton, Saunders, & O'Connor, 2012; Zetterqvist, 2015). The lifetime prevalence rate of NSSI is high, that is, 18% in community samples and over 40% in clinical

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samples (Gillies et al., 2018; Laye-Gindhu & Schonert-Reichl, 2005; Muehlenkamp, Claes, Havertape, & Plener, 2012; Swannell, Martin, Page, Hasking, & St John, 2014). This is alarming because NSSI shows high comorbidity with other personality and affective disorders, and particularly with borderline personality disorder (Gillies et al., 2018). Furthermore, individuals engaging in NSSI are more likely to commit suicide than those who do not engage in NSSI (Hawton, Zahl, & Weatherall, 2003).

In addition to NSSI, the use of substances (i.e., cannabis, stimulants, hallucinogens, or opioids) is also increasingly common among young individuals (Compton, Thomas, Stinson, & Grant, 2007; UNODC, 2015) with prevalence rates ranging from 12% to 18% in adolescence (Compton et al., 2007; Hasin et al., 2016). The repeated persistent use of the substances may result in adverse consequences, such as loss of control over the and hazardous use, substance tolerance, and impairments in physical health, social relationships, or performance (APA, 2013). In addition, substance use shows high comorbidity rates with other mental disorders, such as affective, personality, or psychotic disorders (Compton et al., 2007). Hence, NSSI and substance use are similar in providing short-term stress release, but potentially causing adverse consequences to the individuals in the long run.

Finally, victimization is often inflicted not by the individuals themselves but by others, such as peers. The estimated prevalence of victimization by peers is high with a range from 10% up to 35% among children and adolescents (Due, Holstein, & Soc, 2008; Jansen et al., 2012). Particularly, repeated victimization by peers has critical long-term consequences, such as anxiety and depressive symptoms and impairments in other areas of life (Moore et al., 2017; Ttofi, Farrington, Lösel, & Loeber, 2011, for a meta analysis; Wolke, Copeland, Angold, & Costello, 2013).

Adolescence is a critical phase for the development and maintenance of both self- and peer victimization. NSSI and substance use are likely to emerge during adolescence (Cipriano et al., 2017; Grant et al., 2016; Taylor et al., 2017), and peer victimization is common in adolescence (Arseneault, 2018). During adolescence, increasing educational and social demands as well as increasing importance of peers may promote more social anxiety and fear of rejection (Waylen & Wolke, 2004). Girls are more likely to engage in NSSI than boys (Bresin & Schoenleber, 2015; Gillies et al., 2018; Nock, 2010), whereas boys are more likely to use substances (Grant et al., 2016; Hasin et al., 2016) and to experience peer victimization than girls (Smith, López-Castro, Robinson, & Görzig, 2019).

Apart from the importance of age and sex, NSSI, substance use, and peer victimization share further risk factors. One common underlying problem is the habitual tendency to experience negative emotions as captured by the trait neuroticism. In addition, impaired emotion regulation skills, that is, difficulties in adequately modulating and coping with these negative emotions were suggested to create a vulnerability for NSSI, substance use, and peer victimization (Bierman, Kalvin, & Heinrichs, 2015; Jacobson & Gould, 2007; Junker, Nordahl, Bjorngaard, & Bjerkeset, 2019; Lloyd-Richardson et al., 2007). NSSI and substance use may be dysfunctional coping mechanisms in the face of such negative events (Gratz & Chapman, 2007; Kober, 2014), whereas negative behavior associated with emotion dysregulation may predispose to rejection and victimization by peers. Taken together, these findings suggest that personality traits which also predispose individuals to experience negative emotions and strain, such as JS, may also promote NSSI, substance use, and or victimization by peers.

Given the similarities between NSSI, substance use, and peer victimization, it is not surprising that they have associations with each other as well. There is extensive evidence that NSSI and substance use either co-exist or that NSSI predicts later substance use (Haug, Núñez, Becker, Gmel, & Schaub, 2014; Kaminer & Bukstein, 2008; Tharp-Taylor, Haviland, & D'Amico, 2009), and that peer victimization is associated with an elevated risk of both NSSI and substance use (Lereya et al., 2013; Moore et al., 2017; Zapolski, Rowe, Fisher, Hensel, & Barnes-Najor, 2018). Thus, it seems reasonable to simultaneously investigate potential risk factors for all of these problems.

Justice Sensitivity (JS)

JS is a personality trait that captures individual differences in the disposition to frequently perceive and negatively react to injustice (Schmitt et al., 2005). Individuals high in JS are hypervigilant towards, interpret even ambiguous situations as, and tend to ruminate about injustice (Schmitt, Neumann, & Montada, 1995, 2010). Individuals' affective responses to injustice depend on the perspective from which it is perceived: Victim JS indicates the tendency to feel unfairly treated or being taken advantage of and is primarily associated with anger; observer JS indicates the tendency to perceiving others being unfairly treated and is primarily associated with indignation; perpetrator JS indicates the tendency to feeling unfairly treating others and is primarily associated with guilt (Schmitt, Baumert, Gollwitzer, & Maes, 2010).

The individual differences in JS can be validly and reliably measured from middle childhood onwards and from adolescence onwards and the stability rates of the different JS perspectives are similar to those of adults (Bondü et al., 2016; Schmitt et al., 2005). Girls tended to report higher mean levels of JS, particularly observer and perpetrator JS, but the factor structure was shown to be equal for boys and girls (Bondü & Elsner, 2015).

All JS perspectives are positively correlated, but only victim JS reflects self-oriented concerns for justice (Schmitt et al., 2010). High victim JS was positively associated with other rather negatively evaluated traits, such as Machiavellism, paranoia, vengeance, jealousy, and suspiciousness (Schmitt et al., 2010). In contrast, observer and perpetrator JS reflect altruistic concerns for injustice and are positively associated with good social skills, such as empathy, role taking, and social responsibility (Schmitt et al., 2005). The differences between the JS perspectives are reflected in differential associations with prosocial and antisocial behaviors as well as internalizing problems. Previous findings suggest that JS may also show relations with measures of victimization by self and others (Bondü et al., 2016).

Potential Links between Justice Sensitivity, Nonsuicidal Self-Injury, Substance Use, and Victimization by Peers

There are several reasons to expect associations between JS, NSSI, substance use, and peer victimization. First, all JS perspectives were positively related to neuroticism (Schmitt et al., 2005) and a broad range of adverse emotions, including sadness, disappointment, guilt, anger, or helplessness (Bondü & Inerle, 2020), which are also common among individuals who engage in NSSI, use substances, and are victimized by peers. Thus, high JS might be an indicator of the inability to regulate one's emotions which might make justice-sensitive individuals more vulnerable to engage in NSSI, substance use, and peer victimization (Schwartz, Proctor, & Chien, 2001).

Second, in addition to the similarities in affective aspects, JS captures the cognitive tendency to experience strain in the face of and to ruminate about alleged injustice (Schmitt et al., 2005). Thus, high JS, particularly high victim JS, may promote the generation of stress and a negatively biased interpretation of the situation (Liu, Kraines, Massing-Schaffer, & Alloy, 2014; Normansell & Wisco, 2017), which may be associated with using avoidant problem solving strategies to deal with them (Kraines & Wells, 2017). NSSI and substance use may be two of these avoidant strategies individuals use to cope with perceptions of injustice and the strain associated with these perceptions, which is potentially associated with further problems in social interactions, and subsequent adverse mental states (Downey, Mougios, Ayduk, London, & Shoda, 2004; Gao, Assink, Cipriani, & Lin, 2017). Victimization by peers may be considered as unjust and, therefore, may add to the perceptions of strain. It has also been shown to be related to rumination (Barchia & Bussey, 2010). Finally, NSSI and substance use are characterized by perseverating thoughts of the act or the substance before acting on the urge of engaging in these behaviors (Grant et al., 2016; Nock, 2010). Hence, victim JS comprises both affective and cognitive aspects and processes that are similar to or may predispose to (self-)victimization.

Third, increasing evidence indicates that smaller personality traits, which capture vulnerabilities towards specific negative social cues, such as injustice, may contribute to the development and maintenance of mental health problems (Bondü & Elsner, 2015; Bondü, Sahyazici-Knaak, & Esser, 2017; Fontana et al., 2018; Gardner & Zimmer-Gembeck, 2018), suggesting that JS could contribute to the development of NSSI, substance use, and victimization by peers as well. Particularly, victim JS has been positively associated with externalizing problems, such as aggression, conduct problems, bullying, and attention-deficit/ hyperactivity disorder (ADHD) symptoms (Bondü & Elsner, 2015; Bondü & Esser, 2015; Bondü & Krahe, 2015; Bondü et al., 2016), as well as with internalizing problems, including emotional problems, depressive symptoms, and anxiety symptoms (Bondü & Elsner, 2015; Bondü & Inerle, 2020; Bondü et al., 2017). Observer JS showed mostly negative associations with externalizing problems, but positive associations with internalizing problems, such as depressive symptoms and eating behavior pathology (Bondü, Bilgin, & Warschburger, 2020). Perpetrator JS showed negative associations with externalizing (Bondü & Krahe, 2015; Bondü et al., 2016; Bondü et al., 2017) and positive or nonsignificant associations with internalizing problems. These associations suggest that JS might also predict other adverse behaviors related to internalizing and externalizing problems, such as NSSI, substance use, and problems with peers.

Fourth, specifically peer relationships play an important role in engaging in NSSI and using substances during adolescence (Adler & Adler, 2011). Hence, theories building on the link between social relationships and deviance, such as General Strain Theory (GST) (Agnew, 1992; 2006), provide further background for the explanation of the association between JS and NSSI, substance use, and peer victimization in young individuals. GST emphasizes that stressful social interactions, such as rejection and victimization by peers and negative experiences at school pressure individuals to engage in deviant acts (i.e., criminal behavior, use of illegal drugs, and self/other directed aggressive behavior) due to the violation of the basic norms of justice (Agnew, 1992). Strain perceived as unjust rather than merely unfortunate was assumed to have the strongest associations with deviant behaviors due to

resulting in the most negative emotional states (Agnew, 2001). Particularly anger was emphasized as the most critical emotional reaction for producing deviance (Agnew, 1992). Given that anger is considered as a particularly strong emotion both in victim JS and in NSSI, substance use, and peer victimization (Bondü & Richter, 2016b; Bradley et al., 2011; Kochenderfer-Ladd, 2004; Laye-Gindhu & Schonert-Reichl, 2005; Schmitt et al., 1995), associations between these maladaptive behaviors and victim JS should be particularly pronounced.

Fifth, JS may be particularly influential during adolescence not only due to the increasing importance of peer relationships (Waylen & Wolke, 2004), but also because justice norms are especially important and inflexible during this developmental period (Birkeland, Melkevik, Holsen, & Wold, 2012), which may include several unjust experiences, such as in peer interactions, school performance, or emerging partner relationships (Bondü & Elsner, 2015). Hence, individuals high in JS may be particularly vulnerable towards unjust experiences, and, consequently maladaptive behavior during this period.

Finally, accumulating evidence shows that JS also is an outcome of mental health problems. For example, depressive symptoms predicted higher subsequent victim JS (Bondü et al., 2017), eating disorder pathology predicted higher subsequent victim and observer JS (Bondü et al., 2020) in adolescents. One previous study showed no bidirectional links between victimization by peers and JS in the total group, but victimization predicted an increase in victim JS in girls, but a decrease in victim JS in boys over a one-year period (Bondü et al., 2016), suggesting a sensitization towards unfair treatment in girls, but a desensitization in boys. Taken together, these findings suggest that NSSI, substance use, and peer victimization may also influence JS, but the previous finding concerning peer victimization requires replication in other samples and with longer durations.

The Current Study

To the best of our knowledge this is the first study to investigate the prospective links between JS and measures of self-victimization, such as NSSI and substance use. Only one previous study examined the links between JS and peer victimization. The current study undertakes a cross-lagged approach with three points of measurement to examine potential bidirectional associations. That way, the present study adds to the existing research by relating JS to further mental health problems, by examining potential risk factors for (self-) victimization with longitudinal data, and by considering potential moderating effects of sex which is important due to pertinent sex differences in both JS and the outcome measures. To illustrate, girls are more likely to engage in NSSI and report higher victim, observer, and perpetrator JS; whereas boys are more likely to use substances, be victimized by peers, and have lower JS scores in all perspectives (Bondü & Inerle, 2020; Gillies et al., 2018; Grant et al., 2016; Smith et al., 2019). These findings may suggest differential relations between the study variables in boys and girls. In line with the theoretical assumptions and previous research outlined above, we expected that (a) individuals who engaged in NSSI, used substances, and were victimized by peers will report higher levels of victim and observer JS and lower levels of perpetrator JS than individuals who did not at each assessment points, (b) bidirectional association between JS and NSSI, substance use, and peer victimization with victim JS and observer JS showing positive and perpetrator JS showing negative longitudinal links, and (c) sex to moderate

the longitudinal associations between the study variables: associations regarding NSSI will be more pronounced for girls and associations for substance use and peer victimization will be more pronounced for boys.

Method

Participants

Participants were recruited from a previous study on developmental risk factors. For the present study, participants were assessed between 2011 and 2012 at ages 9–19 (T1), between 2013 and 2014 at ages 11–21 (T2), and between 2015 and 2016 at ages 14–22 years (T3). Of the initial sample, 1,665 children participated in T1 and/or T2. In the present study, we included all 769 participants who took part in the study from T1 to T3 (46.2% retention rate). In the final sample, the mean age of the participants was 16.77 years ($SD = 2.01$) at T3; 55.7% were females, and 45.9% had parents with university entrance qualification. Concerning study attrition, more males ($N = 498$) than females ($N = 398$) dropped out of the study ($\chi^2 = 20.9$, $p < .001$). Participants who dropped out ($M = 13.73$, $SD = 1.97$) were significantly older at T1 than participants who remained in the study ($M = 13.04$, $SD = 1.99$), $t(1,502) = 6.72$, $p < .001$. Furthermore, participants who dropped out had lower observer and perpetrator JS at T1 ($M = 2.78$, $SD = 1.20$ and $M = 3.16$, $SD = 1.32$) than participants who remained in the study ($M = 3.04$, $SD = 1.11$ and $M = 3.56$, $SD = 1.18$), $t(1,484) = -4.25$, $p < .001$ and $t(1,484) = -6.256$, $p < .001$.

Measures

Justice Sensitivity (JS). We measured JS using the five-item short version of the Justice Sensitivity Inventory for Children and Adolescents (Bondü & Elsner, 2015; Schmitt et al., 2010) at all three measurement points. The scale captures emotional and cognitive reactions to the perception of injustice from three perspectives: Victim ("It makes me angry when I am treated worse than others"), observer ("I am upset when someone is…"), and perpetrator ("I feel guilty when I treat someone…"). Response options range from 0 (*totally disagree*) to 5 (*totally agree*). The scale was shown to be valid and reliable (Bondü & Elsner, 2015; Schmitt et al., 2010). We computed mean scores separately for the three subscales.

Nonsuicidal Self-Injury (NSSI). Participants who indicated to engage in NSSI in a filter item were asked to report on six common methods of self-harm using the following *yes/no* items translated and adapted from Klonsky and Glenn (2009) and Gratz (2001) at T2 and T3: (a) burning and/or cutting, (b) stabbing the skin using needles and/or staples, (c) preventing wounds from healing, (d) beating themselves or hitting their head against objects, (e) swallowing dangerous substances and/or objects, and (f) hurting themselves in a different way. We calculated two test halves scores from these six items, which were used to create latent variables at T2 and T3, which were set to zero for participants who did not report any self-injuring behavior. In order to investigate group comparisons, we created a dichotomous variable at both T2 and T3 with 0 = *participants who never engaged in NSSI*; 1 = *participants who engaged in NSSI*.

Substance Use. Participants reported on their use of illegal substances during the last 6 months at T2 and T3 using two questions: (a) How many times have you consumed cannabis

(e.g., smoked, in cookies)?; (b) How many times have you consumed other illegal drugs (e.g., ecstasy, speed, cocaine, crystal meth). Response options were 0 = *never*, 1 = *less than once a month*, 2 = *once a month*, 3 = *once a week*, 4 = *every day*. We used these continuous scores in the latent analyses. We created a dichotomous score for group comparisons (0 = *nonuser*; 1 = *substance use*).

Peer Victimization. Participants reported on peer victimization at T2 and T3 using a five-item questionnaire covering physical, verbal, and relational forms of aggression (e.g., "Other students have insulted me") (Espelage, Bosworth, & Simon, 2000). Response options ranged from 1 = *never* to 6 = *very often*. We computed T2 and T3 peer victimization mean scores and used them in the latent analyses. For the T2 and T3 group comparisons, we used a dichotomous variable (0 = *no or low peer victimization*; 1 = *high peer victimization*), where high peer victimization was defined based on a score +1.5 SD higher from the mean score of the total sample at the respective measurement point.

Analysis

We firstly examined (a) sex differences in the justice-sensitivity subscales, NSSI, substance use, and peer victimization controlling for participant age at T1 and (b) differences in the JS subscales between participants who did and did not engage in NSSI, use substances, and experienced victimization by peers at each assessment point via separate multivariate analyses of covariance (MANCOVAs) controlling for sex and age, respectively.

We secondly conducted a longitudinal latent cross-lagged path analysis using Mplus 8 (Muthén & Muthén, 1998–2015) in order to investigate the longitudinal, bidirectional associations between JS, NSSI, substance use, and peer victimization including covariance terms, stability paths, and cross-lag paths. JS subscales, peer victimization, and NSSI were indicated by test-halves, respectively, substance use was indicated by the two items. Corresponding test halves of the three JS subscales were allowed to correlate within each assessment point due to the similarities in item wordings between the subscales (i.e., the first T1 victim JS test-half score was allowed to correlate with the first T1 test-half scores of observer and perpetrator JS; and the first T1 test-halves of observer and perpetrator JS were allowed to correlate. We applied the same pattern to the second test halves and for correlations of test-halves within T2 and T3) and with the same test-halves at the other assessment points. (The first T1 test-half of victim JS were allowed to correlate with the first T2 and T3 test-halves of victim JS; and T2 and T3 test-halves of victim JS were allowed to correlate. We applied the same pattern to observer and perpetrator JS).

In order to ensure that our measures had the same meaning across points of measurement, we tested configural (parameters freely estimated), weak (factor loadings constrained equal), strong (factor loadings and intercepts constrained equal), and strict (factor loading, intercepts, and residual variances constrained equal) measurement invariance (MI) for all variables (Table 1). To assess the model fit, we inspected values of and changes in absolute fit indices. Comparative fit index (CFI)/ Tucker–Lewis index (TLI) > 0.95, root mean square error of approximation (RMSEA) < 0.05, standardized root mean square residual (SRMR) < 0.06, and/or CFI decreases < .01 indicated good or negligible decreases in model fit (Cheung & Rensvold, 2002). Strong MI showed the best fit for JS, peer victimization and NSSI. Regarding substance use, the model for configural MI showed the best fit, but yielded

Table 1. Measurement invariance for justice sensitivity, nonsuicidal self-injury, substance use, and victimization by peers

	χ^2	df	p	χ^2-difference test	RMSEA	CFI	TLI	SRMR	BIC	AIC
Justice sensitivity										
Configural	91.125	63	.012	-	.024 [.012; .034]	.997	.992	.019	33,974.562	33,389.280
Weak	98.152	69	.012	$\Delta\chi^2(6) = 7.027$, $p = .318$	.023 [.011; .033]	.997	.992	.020	33,941.718	33,384.307
Strong	197.551	75	<.001	$\Delta\chi^2(6) = 99.399$, $p < .001$	.046 [.038; .054]	.985	.970	.030	34,001.247	33,471.706
Strict	262.146	81	<.001	$\Delta\chi^2(6) = 64.595$, $p < .001$	.054 [.047; .061]	.978	.959	.043	34,025.971	33,524.301
Nonsuicidal self-injury										
Configural	19.109	1	<.001	-	.154 [.098; .217]	.978	.870	.020	489.810	429.440
Weak	19.163	2	<.001	$\Delta\chi^2(1) = .654$, $p = .418$	.106 [.066; .151]	.979	.938	.021	483.220	427.495
Strong	21.028	3	<.001	$\Delta\chi^2(1) = 1.865$, $p = .172$	.088 [.055; .126]	.978	.957	.108	478.441	443.511
Strict	31.559	4	<.001	$\Delta\chi^2(1) = 10.531$, $p < .001$	.095 [.066; .127]	.967	.950	.043	482.329	435.891
Substance use[a]										
Configural	.079	1	.779	-	.000 [.000; .063]	1.000	1.011	.002	2,449.466	2,389.097
Weak	48.178	2	<.001	$\Delta\chi^2(1) = 48.177$, $p < .001$	.173 [.133; .217]	.906	.717	.075	2,490.922	2,435.197
Strong	49.200	3	<.001	$\Delta\chi^2(1) = 1.022$, $p = .312$	.142 [.108; .178]	.906	.811	.075	2,485.300	2,434.218
Strict	85.578	4	<.001	$\Delta\chi^2(1) = 36.378$, $p < .001$	.163 [.134; .194]	.834	.750	.093	2,515.034	2,468.596
Peer victimization										
Configural	11.561	1	.001	-	.117 [.063; .182]	.994	.966	.008	1,886.305	1,825.935
Weak	11.563	2	.003	$\Delta\chi^2(1) = .002$, $p = .964$	.079 [.039; .126]	.995	.985	.008	1,879.662	1,823.937
Strong	15.844	3	.001	$\Delta\chi^2(1) = 4.281$, $p = .038$	.075 [.041; .113]	.993	.986	.012	1,877.300	1,826.218
Strict	17.373	4	.001	$\Delta\chi^2(1) = 1.529$, $p = .216$	.066 [.036; .099]	.993	.989	.022	1,872.185	1,825.747

Notes. χ^2 = chi-square; df = degrees of freedom; RMSEA = root mean square error of approximation; CFI = comparative fit index; TLI = Tucker–Lewis Index; SRMR = standardized root mean square residual; Bayesian information criteria; AIC = Akaike information criteria
[a]Please note that the configural model yielded an error message about a negative variance between substance use variables at T2 and T3, we thus assumed strong measurement invariance for substance use which shows the second-best model fit.

a warning message, whereas the second-best fitting model for strong MI converged without problems. Thus, we assumed strong MI for all variables.

Afterwards, we analyzed the longitudinal associations between JS, NSSI, substance use, and peer victimization using cross-lagged panel model. All predictors were allowed to correlate at T1 and T2. At T3, correlations of error terms between the three JS sub-scales were allowed and estimated as were the correlations of error terms between NSSI and substance use. All other T3 correlations of error terms were restricted to zero. Parents' highest educational achievement was used as a control variable. To assess the model fit, we inspected χ^2 test as well as values of and changes in absolute fit indices. Nonsignificant chi square values, CFI/TLI > 0.95, RMSEA < 0.05, SRMR < 0.06 (Browne & Cudeck, 1992; Hooper, Coughlan, & Mullen, 2008; Hu, Bentler, & Kano, 1992) indicated good model fit. We used a maximum likelihood estimator and missing data were replaced using the full information maximum likelihood procedure. p values were calculated for each path coefficient. $p < .05$ was considered to be significant. After running the model for the total group, we examined the potential moderating role of sex in two multigroup models. In the first model, path coefficients were constrained to be equal for boys and girls. In the second model, path coefficients were allowed to vary in magnitude between the two groups. We then used χ^2-differences to test whether the constrained or the unconstrained model showed a better fit with the data and interpreted the model with the better fit. We assumed strong measurement

invariance between boys and girls, but in order for the model to converge without error messages, only assumed weak measurement invariance of JS and NSSI over time in these models.

Results

Descriptives

Of the participants, $N = 35$ (4.9%) engaged in any kind of NSSI behavior at T2, whereas $N = 69$ (9.1%) engaged in NSSI at T3. Burning and/or cutting was the most common method at both assessment points, $N = 33$ (4.6%) and $N = 61$ (8.0%), respectively. At T2, $N = 74$ (10.3%) participants reported substance use: $N = 73$ (10.1%) participants reported cannabis use and $N = 7$ (1.0%) reported illegal drug use. The percentage of substance use increased at T3 ($N = 159$, 20.9%), where the percentage of cannabis use increased two-fold ($N = 157$, 20.7%) and illegal drug use increased four-fold ($N = 31$, 4.1%). Similar numbers of participants were victimized by their peers at T2 ($N = 67$, 9.3%) and at T3 ($N = 64$, 8.4%).

Regarding sex differences, girls reported higher victim JS than boys at T2 and T3, higher observer JS at all measurement points, higher perpetrator JS at T1 and T3, more NSSI at T2 and T3, less peer victimization at T2 and T3, and less substance use at T3 (Table 2).

Participants who engaged in NSSI reported significantly higher victim JS at both T2 and T3 and significantly lower levels of

Table 2. Internal consistencies, mean values, and standard deviations of all measures for the total sample and separately for boys and girls

T1	α	Total M (SD) N = 715	Boys M (SD) N = 318 (44.5%)	Girls M (SD) N = 397 (55.5%)	F	p
Victim JS	0.78	2.672 (1.121)	2.684 (1.132)	2.663 (1.113)	0.526	.468
Observer JS***	0.84	3.048 (1.114)	2.810 (1.129)	3.238 (1.066)	25.281	<.001
Perpetrator JS***	0.88	3.571 (1.189)	3.302 (1.235)	3.786 (1.107)	31.544	<.001
T2		**Total M (SD) N = 671**	**Boys M (SD) N = 309 (46.1%)**	**Girls M (SD) N = 362 (53.9%)**	**F**	**p**
Victim JS*	0.80	2.724 (1.049)	2.621 (1.049)	2.812 (1.043)	4.382	.037
Observer JS***	0.88	2.997 (1.093)	2.724 (1.063)	3.229 (1.065)	36.012	<.001
Perpetrator JS***	0.89	3.534 (1.158)	3.233 (1.210)	3.791 (1.047)	40.121	<.001
Peer victimization***	0.66	1.228 (0.337)	1.302 (0.388)	1.164 (0.272)	27.189	<.001
Substance use*	–	0.177 (0.648)	0.226 (0.793)	0.135 (0.489)	5.914	.015
NSSI***	–	0.079 (0.403)	0.016 (0.188)	0.132 (0.514)	13.054	<.001
T3		**Total M (SD) N = 691**	**Boys M (SD) N = 304 (44%)**	**Girls M (SD) N = 387 (56%)**	**F**	**p**
Victim JS***	0.77	2.987 (0.979)	2.795 (0.976)	3.137 (0.956)	20.558	<.001
Observer JS***	0.87	3.173 (1.023)	2.884 (1.021)	3.401 (0.968)	44.539	<.001
Perpetrator JS***	0.88	3.615 (1.101)	3.349 (1.132)	3.825 (1.030)	32.042	<.001
Peer victimization**	0.63	1.230 (0.321)	1.269 (0.345)	1.199 (0.297)	7.289	.007
Substance use**	–	0.399 (0.964)	0.500 (1.143)	0.320 (0.788)	8.270	.004
NSSI***	–	0.179 (0.652)	0.046 (0.311)	0.284 (0.812)	24.570	<.001

T1: Time 1; T2: Time 2; T3: Time 3; JS: justice sensitivity; NSSI: nonsuicidal self-injury
Significant sex differences: *p < .05; **p < .01; ***p < .001
Please note that the analyses were controlled for T1 age

perpetrator JS at T2 than participants who did not (Table 3). Participants who used substances reported higher victim JS at T3 and lower levels of perpetrator JS at T2 and T3 than participants who did not. Participants who were often victimized by their peers reported higher victim and observer JS than participants who were seldom victimized by their peers at T2. There were no significant differences at T3.

JS perspectives, NSSI, substance use, and peer victimization were moderately stable (Table 4). NSSI, substance use, and peer victimization were unrelated except for a correlation between T3 victimization and NSSI. Victim JS showed small positive relations with all outcome variables at least once. Perpetrator JS showed small negative relations with victimization and NSSI at least once. Only T3 observer JS showed a negative correlation with T3 victimization and a positive correlation with T2 substance use.

Cross-Lagged Associations between JS, NSSI, Substance Use, and Peer Victimization

The model fit of the overall model including the full sample was good: $\chi^2(321) = 564.301$, p < .001; CFI = .979; RMSEA = .031 [.027;.036]; SRMR = .037. Figure 1 shows statistically significant paths. For the ease of interpretation, nonsignificant path coefficients and correlations were omitted from the figure but retained in the model (all estimates for path coefficients in Supplementary Table S1). The JS latent factors showed moderate to high stabilities from T1 to T2 and from T2 to T3. There was a high stability between T2 and T3 substance use ($\beta = .519$, p < .001), and a moderate stability between T2 and T3 peer victimization ($\beta = .329$, p < .001) and NSSI ($\beta = .360$, p < .001). Higher T1 victim JS predicted more T2 NSSI ($\beta = .121$, $p = .049$), substance use

($\beta = .135$, $p = .025$), and victimization by peers ($\beta = .139$, $p = .009$). Higher T2 victim JS predicted more T3 substance use ($\beta = .108$, $p = .041$). T1 perpetrator JS predicted lower T2 substance use ($\beta = −.134$, $p = .035$). Higher T2 observer predicted lower T3 substance use ($\beta = −.147$, $p = .023$), whereas T2 substance use predicted higher T3 observer JS ($\beta = .121$, $p = .007$). Finally, T2 peer victimization predicted lower T3 perpetrator JS ($\beta = −.086$, $p = .018$).

Concerning the potential moderating role of sex, the model with path coefficients allowed to vary between groups ($\chi^2(651) = 990.783$, p < .001; CFI = .971; RMSEA = .037 [.032;.041]; SRMR = .065) fit the data better than the model with path coefficients constrained to be equal between girls and boys ($\chi^2(717) = 1,328.449$, p < .001; CFI = .948; RMSEA = .047 [.043;.051]; SRMR = .109; $\Delta\chi^2 = 337.666$, $\Delta df = 66$, Δp < .001). This finding indicates substantial differences between the longitudinal relations of the study variables between boys and girls. Hence, we interpreted the model with sex-specific findings: Partly in line with Hypothesis 3, in girls, T1 victim JS predicted higher T2 NSSI and peer victimization (Figure 2). T2 peer victimization predicted lower T3 victim JS. In boys, T2 observer JS predicted less T3 substance use. There were two marginally significant effects of T1 and T2 victim JS on higher T2 and T3 substance use, respectively. T2 NSSI predicted lower, T2 substance use predicted higher observer JS. There was an only marginally significant effect of T2 victimization on lower T3 perpetrator JS.

Discussion

Findings of the current study revealed that in line with the hypotheses, participants who engaged in NSSI, used substances,

Table 3. Mean values, and standard deviations by nonsuicidal self-injury, substance use and peer victimization

Variable	NSSI (N = 30) M (SD)	No-NSSI (N = 642) M (SD)	F	p	Substance use (N = 70) M (SD)	No-substance use (N = 603) M (SD)	F	p	Peer victimization (N = 63) M (SD)	No-peer victimization (N = 609) M (SD)	F	p
T2												
Victim JS	3.106 (.742)	2.697 (1.053)	5.619	.018	2.994 (.921)	2.689 (1.061)	0.341	0.560	3.057 (1.043)	2.686 (1.047)	12.833	<.001
Observer JS	3.253 (1.222)	2.984 (1.085)	.040	.842	3.100 (1.073)	2.980 (1.100)	0.138	0.711	3.136 (.963)	2.978 (1.110)	4.515	.034
Perpetrator JS	3.173 (1.222)	3.548 (1.154)	8.499	.004	3.234 (1.147)	3.561 (1.160)	6.475	0.011	3.273 (1.102)	3.557 (1.165)	1.064	.303

Variable	NSSI (N = 65) M (SD)	No-NSSI (N = 632) M (SD)	F	p	Substance use (N = 149) M (SD)	No-substance use (N = 547) M (SD)	F	p	Peer victimization (N = 59) M (SD)	No-peer victimization (N = 637) M (SD)	F	p
T3												
Victim JS	3.310 (0.880)	2.955 (0.984)	4.333	.038	3.179 (0.934)	2.934 (0.986)	7.067	.008	3.139 (1.014)	2.977 (.974)	3.865	.050
Observer JS	3.221 (1.094)	3.167 (1.016)	.542	.462	3.228 (1.034)	3.154 (1.022)	.203	.652	2.955 (1.098)	3.191 (1.016)	.381	.537
Perpetrator JS	3.560 (1.227)	3.622 (1.084)	2.097	.148	3.456 (1.185)	3.655 (1.072)	5.283	.022	3.264 (1.357)	3.645 (1.069)	2.902	.089

Note: T2: Time 2; T3: Time 3; JS: justice sensitivity; NSSI: nonsuicidal self-injury
Significant differences: *p < .05; **p < .01; ***p < .001
Please note that the analyses were controlled for sex and T1 age

and were victimized by their peers tended to have higher victim JS and lower perpetrator JS. Furthermore, those who were victimized by their peers tended to have higher observer JS cross-sectionally. Thus, these behaviors and experiences were associated with more negative affective and cognitive responses towards perceived unfair treatment and less expressed negative responses towards inflicting injustice onto others. Regarding longitudinal associations, victim JS at T1 was associated with higher T2 NSSI, substance use, and peer victimization when the stability of these variables was not considered. Victim JS at T2, however, was still associated with higher T3 substance use when its stability was controlled for. That is, being sensitive to one's own unjust treatment may predispose individuals to be victimized both by others and themselves. In contrast, there were negative bidirectional associations between substance use and observer and/or perpetrator JS between T2 and T3. This indicates that the tendency to care for justice for the sake of others may protect individuals from substance use and that substance use may be associated with a concern for other's just treatment. These findings were further qualified by sex differences. In girls, T1 victim JS was associated with higher T2 NSSI and peer victimization, T2 NSSI was associated with lower T3 victim JS. In boys, there was a negative bidirectional association between observer JS and substance use: T2 substance use was associated with higher T3 observer JS, observer JS at T2 was associated with lower T3 substance use. Furthermore, T2 NSSI was associated with lower T3 observer JS. Taken together, JS and (self-)victimization showed small but significant concurrent and prospective bidirectional associations.

General Findings

The prevalence rates of NSSI, substance use, and victimization were similar to those reported in previous research (Grant et al., 2016; Nock, 2010). Also in line with previous research, girls were more likely to engage in NSSI, less likely to use substances, and less likely to be exposed to peer victimization than boys (Bresin & Schoenleber, 2015; Gillies et al., 2018; Grant et al., 2016; Hasin et al., 2016; Nock, 2010; Smith et al., 2019). Finally, as in previous research, there was an increase in the rate of both engaging in NSSI and using substances (Cipriano et al., 2017; Grant et al., 2016; Taylor et al., 2017) between T2 and T3 when the majority of the participants in the present sample made the transition into late adolescence. This indicates the reliability of our findings. Note, however, that contrasting previous findings, there were hardly any associations between the three indicators of (self-)victimization in our study.
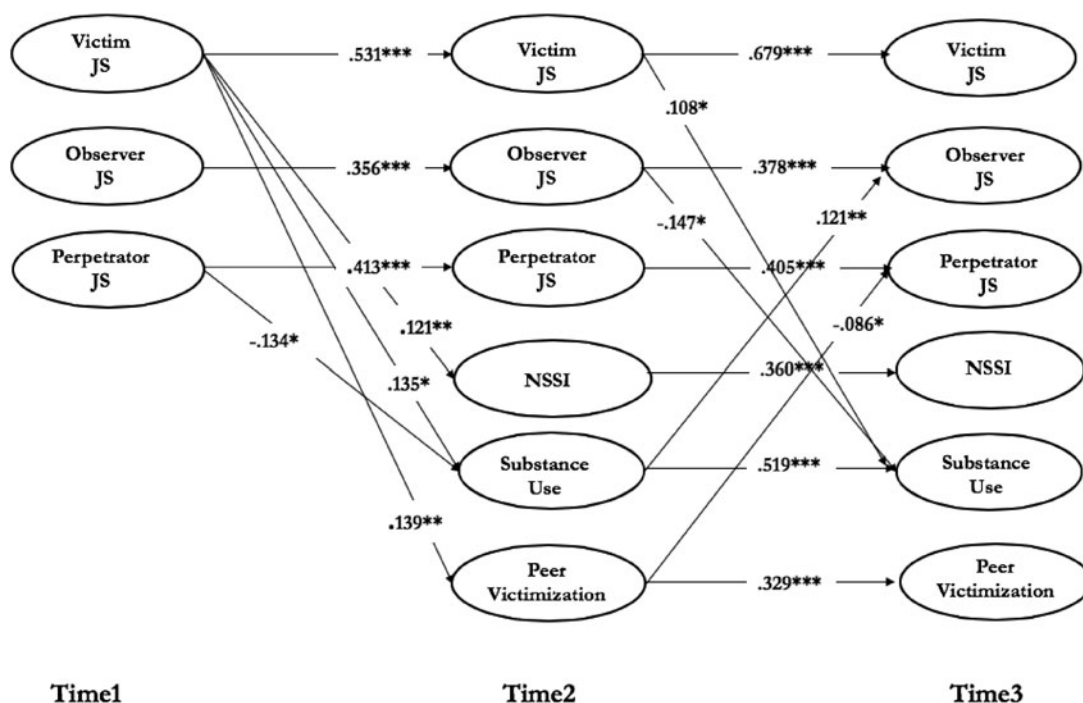
Associations between JS, NSSI, and Substance Use

Regarding associations with indicators of self-victimization, victim JS revealed the only significant association with NSSI. This finding is in line with the reasoning that the adverse emotions as well as strain and rumination associated with perceived unjust treatment may predispose to NSSI as a strategy to cope with negative emotions and to relief strain and negative thoughts, which is a maladaptive coping and emotion regulation mechanism (Klonsky, Victor, & Saffer, 2014). This reasoning may also explain the finding that the association between victim JS and NSSI was particularly evident in girls, because previous research showed that girls use rumination more often to cope with their emotions (Selby & Joiner, 2009) and are more likely to report emotional reasons (e.g., "to avoid painful memories") than boys

Table 4. Correlations between study variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Sex	1															
2. Parental education	−.093*	1														
3. Victim JS T1	−.012	.006	1													
4. Observer JS T1	.193**	−.021	.433**	1												
5. Perpetrator JS T1	.203**	−.007	.083*	.523**	1											
6. Victim JS T2	.084*	.000	.427**	.204**	.076	1										
7. Observer JS T2	.227**	−.030	.203**	.435**	.352**	.405**	1									
8. Perpetrator JS T2	.227**	.012	.049	.349**	.477**	.143**	.605**	1								
9. Victim JS T3	.133**	.049	.345**	.208**	.060	.446**	.182**	.030	1							
10. Observer JS T3	.212**	.037	.176**	.367**	.248**	.230**	.439**	.310**	.423**	1						
11. Perpetrator JS T3	.202**	.027	.095*	.298**	.334**	.122**	.371**	.473**	.176**	.554**	1					
12. Peer Victimization T2	−.204**	−.043	.069	−.041	−.094*	.113**	−.021	−.122**	.017	−.064	−.130**	1				
13. Peer Victimization T3	−.108**	−.002	.038	.014	−.037	.031	.006	−.052	.075*	−.077*	−.148**	.339**	1			
14. Substance use T2	−.071	.078	.118**	.050	−.058	.065	−.006	−.069	.036	.081*	.008	.006	−.052	1		
15. Substance use T3	−.084*	.110**	.132**	.052	−.090*	.054	−.064	−.068	.099**	.040	−.083*	.002	−.044	.432**	1	
16. NSSI T2	.154**	−.016	.069	−.008	−.009	.154**	.056	−.044	.042	.018	.002	.018	.008	−.002	−.029	1
17. NSSI T3	.180**	−.110**	.025	.057	.028	.076*	.060	−.009	.085*	.019	−.002	.038	.163**	−.041	.023	.321**

Note: T1: Time 1; T2: Time 2; T3: Time 3; JS: justice sensitivity; NSSI: nonsuicidal self-injury; *p < .05; **p < .01

Figure 1. Cross-lagged model of associations between justice sensitivity (JS), nonsuicidal self-injury (NSSI), substance use, and victimization by peers, including the variances and covariances, stability, and cross-lags in the total sample. Model fit: $\chi^2(321) = 564.301$, $p < .001$; comparative fit index (CFI) = .979; root mean square error of approximation (RMSEA) = .031 [.027; .036]; standardized root mean square residual (SRMR) = .037; $N = 769$. Please note that covariance coefficients are not shown in the figure to allow ease of interpretation, but retained in the model.
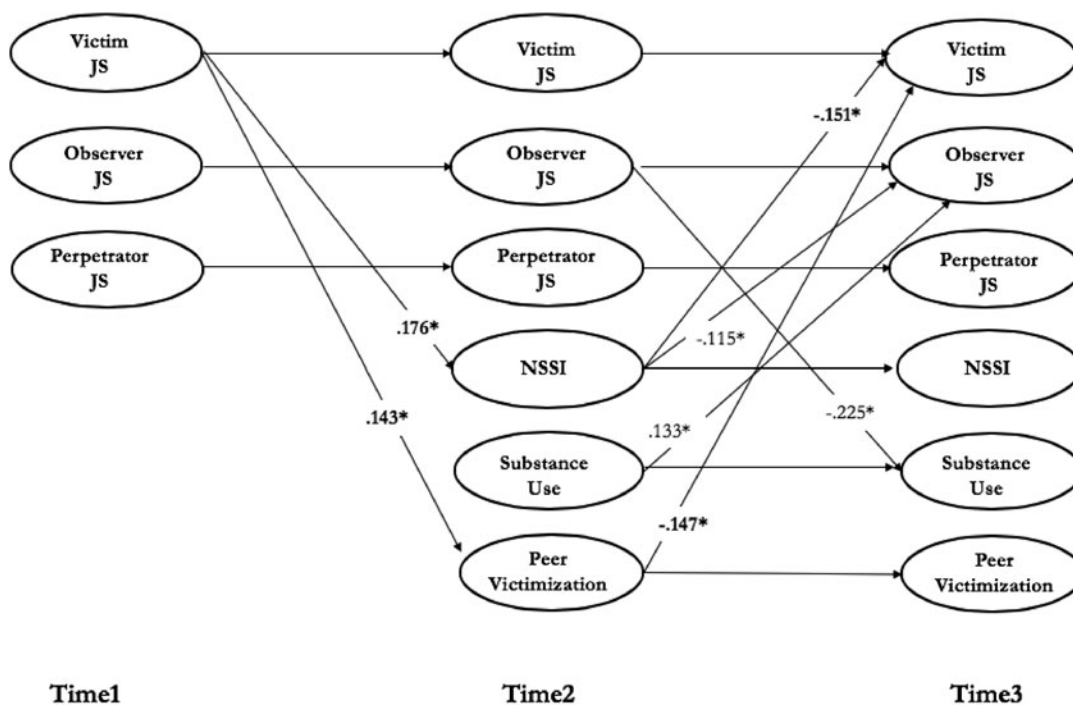
Figure 2. Cross-lagged model of associations between justice sensitivity (JS), nonsuicidal self-injury (NSSI), substance use, and victimization by peers, including the variances and covariances, stability, and cross-lags by sex (male/female). Scores for the female group are indicated by bold type. Model fit: $\chi^2(651) = 990.783$, $p < .001$; comparative fit index (CFI) = .971; root mean square error of approximation (RMSEA) = .037 [.032;.041]; standardized root mean square residual (SRMR) = .065. Please note that covariance and stability coefficients are not shown in the figure to allow ease of interpretation, but retained in the model.

who are more likely to report social reasons to engage in NSSI (e.g., "to show others how tough I am") (Laye-Gindhu & Schonert-Reichl, 2005). Thus, girls may be more likely to use

NSSI as a coping strategy in the case of unfair treatment. Given that adolescents may lack the skills to cope with negative emotions related to injustice (Birkeland et al., 2012), specifically

high victim JS may promote these problems. In addition, it was suggested that JS, particularly high victim JS, may be related with further strain due to interpreting more social interactions as unjust, expecting more negative social interactions, or attributing adverse social situations to malevolent intent similar to dysfunctional thoughts (Bondü et al., 2017). Associations between victim JS and NSSI, however, did not hold stable when the stability of NSSI was considered, indicating that adversely responding to unfair treatment does not further add to the behavior once it was established.

Regarding substance use, relations with JS were more complex. Victim JS predicted subsequent higher substance use consistently both when not considering (T1 to T2) and when considering (T2 to T3) the stability of substance use, indicating that victim JS may predispose to substance use for the same reasons that have been outlined with regard to NSSI. However, the altruistic facets of JS, namely perpetrator JS at T1 and observer JS at T2 predicted less subsequent substance use at T2 and T3, respectively, suggesting that caring for the just treatment of others may be negatively associated with using illegal substances and may level out the potential promoting effects of victim JS. This is interesting because previous research consistently showed positive relations between observer JS and internalizing problems as well as no or also positive relations between perpetrator JS and internalizing problems (Bondü et al., 2020; Bondü & Elsner, 2015; Bondü & Inerle, 2020; Bondü et al., 2017), whereas both were negatively related to measures of externalizing problems (Bondü & Krahe, 2015). Although substance use is often considered as an example of internalizing problem behavior in psychological contexts, its relationship with JS resembles that of externalizing problem behavior. This may indicate that the characteristics of illegal substance use that bring it close to externalizing behavior, such as showing harmful/aggressive behavior towards oneself, surpassing social norms, showing illegal behavior by buying drugs, or low impulse control, are more relevant for understanding its relations with observer JS than its internalizing aspects (Martel et al., 2009). In line with this reasoning, strong relations between antisocial behavior and substance use were documented (Obando, Trujillo, & Trujillo, 2014).

Further findings of the current study suggested bidirectional associations between being highly sensitive to the unfair treatment of others (observer JS) and substance use, particularly in boys. Whereas T2 observer JS that was associated with empathy and prosocial behavior in previous research (Fetchenhauer & Huang, 2004; Schmitt et al., 2005) predicted lower T3 substance use, T2 substance use predicted higher T3 observer JS in the total sample and in boys. This finding is similar to the positive prospective association between eating disorder pathology and subsequent high observer JS (Bondü et al., 2020), indicating that mental health problems may not only increase the vulnerability towards own unfair treatment, but also to the unfair treatment of others. More research, however, is needed to fully understand this association, that in boys seemed to be levelled out by negative associations between T2 self-harm and T3 observer JS.

Associations between JS and Peer Victimization

It was repeatedly suggested that negative emotions, cognitions, and interactions associated with (victim) JS, may predispose individuals to problems with peers (Bondü & Elsner, 2015). Nevertheless, the concurrent and prospective associations between JS and victimization in the present study were small. Particularly at the third assessment point, participants who

experienced victimization by peers did not differ from those without similar experiences regarding victim JS. This is in line with previous research showing no cross-sectional associations between problems with peers and victim JS (Bondü & Elsner, 2015) and no longitudinally associations between victim JS and victimization by peers (Bondü et al., 2016). Regarding the longitudinal associations in the present sample, victim JS predicted more victimization by peers in the total sample and in girls, but only when the stability of victimization was not controlled for. This gives support to the idea that having high victim JS traits could signal an inability to manage one's emotions, frequent outbursts of anger, and detrimental behavior, such as revenge, which may predispose those individuals to victimization by peers. Those children may be the ones who easily over-react to injustice and are unable to respond to peer provocation strategically (Bondü et al., 2017; D'Esposito, Blake, & Riccio, 2011). That is, victim JS might impair peer relationships, but the effects could be small.

Concerning the longitudinal effects of victimization by peers on the perspectives of JS, previous research showed that it predicted higher victim JS in girls and lower victim JS in boys. It was assumed that these differences emerge, because social relationships tend to be more important for girls, making adverse social situations more discomforting and threatening, whereas boys may try to hide negative emotions after maltreatment by others (Bondü et al., 2016). In the present sample, however, victimization by peers predicted lower subsequent perpetrator JS in the total sample and in boys, suggesting that being victimized might be negatively associated with the concern for justice for others. It is reasonable that being exposed to peer victimization might impair an individual's ability to have concerns for treating others unfairly because being exposed to peer victimization is associated with a decrease in empathy (Malti, Perren, & Buchmann, 2010). In girls, initially high victim JS was associated with higher subsequent peer victimization, which in turn was associated with lower levels of subsequent victim JS. This finding is in contrast with the finding of the previous study showing a unidirectional association, where peer victimization was associated with an increase in victim JS in girls (Bondü et al., 2016). More research is needed to explain this finding and the differences in findings between samples. One explanation emerging from the present study could be that girls experienced less peer victimization than boys and, therefore, may have less adverse experiences to cope with which may make the desensitization easier. Alternatively, girls may also not want to admit that they were hurt by victimization by peers.

In summary, only some of the hypothesized associations between JS, NSSI, substance use, and peer victimization were significant, particularly with regard to observer and perpetrator JS and when the stability of the outcome measures was considered. This could mean that the continuity of NSSI and peer victimization mainly depend on the previous instances of these variables rather than on JS. Victim JS showed the most consistent links with the outcome measures, suggesting the closest links with indicators of developmental psychopathology in line with previous research (Bondü & Elsner, 2015). Furthermore, some of the significant associations depended on the sex of the participants. This may highlight the importance of sex while investigating the links between trait variables and NSSI, substance use, and peer victimization. Finally, there were fewer significant associations in the single-sex groups than the total sample. However, this finding should be interpreted with caution because sample sizes are smaller and, therefore, significant effects are harder to find in a multigroup analysis.

Limitations and Outlook

The strengths of the current study include being the first study to examine the longitudinal associations between JS, NSSI, substance use, and peer victimization using a large sample. Thus, the current study contributes to the theoretical advancement of the role of personality traits in engaging in maladaptive behavior and being exposed to aggression by others. Given the complex association between NSSI, substance use, and peer victimization, including all three of them in the same model allowed us to consider the effects of these variables on each other. Limitations included using self-report data only and not including other personality traits such as neuroticism which may have an influence on the association between JS, NSSI, substance use, and peer victimization. Substance use was measured with two items only and those items only covered illegal substances, which may have limited the reliability of our findings. Furthermore, we assumed strong MI for substance use even though the configural model showed the best model fit, but produced an error message. In addition, it is important to note that we were only able to assume weak measurement invariance over time for JS and NSSI in the multigroup model that examined the moderator role of sex. Moreover, participants who dropped out from the study reported lower observer and perpetrator JS at T1 than the ones who remained in the study. Although it is a common finding that participants with higher scores on positively evaluated variables remain in longitudinal studies (Gustavson, von Soest, Karevold, & Røysamb, 2012), this might limit the generalizability of our findings. Finally, NSSI, substance use, and victimization by peers were only measured at two occasions, preventing to compute a full cross-lagged model between T1 and T2. This, however, also allowed us to examine the sole effects of JS and its effects beyond the stability of problem behavior at the same time. Future research should replicate the present findings, while taking into account further potential relevant variables, such as neuroticism or emotion dysregulation and using a more comprehensive measure of substance use. Most importantly, the moderating role of sex should be re-investigated in larger samples that allow for considering measurement invariance across time and sex for all variables.

The current study is the first to investigate the prospective links between JS, NSSI, substance use, and peer victimization. Findings suggest that being sensitive to injustice-related cues, particularly the tendency to feel unfairly treated or being taken advantage of, could contribute to increasing vulnerability towards self-harming behavior, such as NSSI and substance use, as well as experiencing harming behavior by others, such as peer victimization. It is also important to note that JS can be influenced by these problems in terms of a symptom or a maintaining factor. Clinicians should be aware of the role of victim JS in treatment of these problems and more research is needed in order to examine and understand the effects of and influences on JS in more detail.

References

Adler, P. A., & Adler, P. (2011). *The tender Cut: Inside the hidden world of self-injury*. New York; London: NYU Press.

Agnew, R. (1992). Foundation for a general strain theory of crime and delinquency. *Criminology*, 30, 47–88. doi:10.1111/j.1745-9125.1992.tb01093.x

Agnew, R. (2001). Building on the foundation of general strain theory: Specifying the types of strain most likely to lead to crime and delinquency. *Journal of Research in Crime and Delinquency*, 38, 319–361. doi:10.1177/0022427801038004001

Agnew, R. (2006). *General strain theory: Current status and directions for further research taking stock: The Status of criminological theory* (pp. 101–123). Piscataway, NJ, US: Transaction Publishers.

American Psychiatric Association (APA) (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). VA: Arlington.

Arseneault, L. (2018). Annual research review: The persistent and pervasive impact of being bullied in childhood and adolescence: Implications for policy and practice. *Journal of Child Psychology and Psychiatry*, 59, 405–421. doi:10.1111/jcpp.12841

Barchia, K., & Bussey, K. (2010). The psychological impact of peer victimization: Exploring social-cognitive mediators of depression. *Journal of Adolescence*, 33, 615–623. doi:10.1016/j.adolescence.2009.12.002

Bierman, K. L., Kalvin, C. B., & Heinrichs, B. S. (2015). Early childhood precursors and adolescent sequelae of grade school peer rejection and victimization. *Journal of Clinical Child & Adolescent Psychology*, 44, 367–379. doi:10.1080/15374416.2013.873983

Bilen, K., Ottosson, C., Castren, M., Ponzer, S., Ursing, C., Ranta, P., … Pettersson, H. (2011). Deliberate self-harm patients in the emergency department: Factors associated with repeated self-harm among 1524 patients. *Emergency Medicine Journal*, 28, 1019–1025. doi:10.1136/emj.2010.102616

Birkeland, M. S., Melkevik, O., Holsen, I., & Wold, B. (2012). Trajectories of global self-esteem development during adolescence. *Journal of Adolescence*, 35, 43–54. doi:10.1016/j.adolescence.2011.06.006

Bondü, R., Bilgin, A., & Warschburger, P. (2020). Justice sensitivity and rejection sensitivity as predictors and outcomes of eating disorder pathology: A 5-year longitudinal study. *International Journal of Eating Disorders*, 53, 926–936. doi:10.1002/eat.23273

Bondü, R., & Elsner, B. (2015). Justice sensitivity in childhood and adolescence. *Social Development*, 24, 420–441. doi:10.1111/sode.12098

Bondü, R., & Esser, G. (2015). Justice and rejection sensitivity in children and adolescents with ADHD symptoms. *European Child & Adolescent Psychiatry*, 24, 185–198. doi:10.1007/s00787-014-0560-9

Bondü, R., & Inerle, S. (2020). Afraid of injustice? Justice sensitivity is linked to general anxiety and social phobia symptoms. *Journal of Affective Disorders*, 272, 198–206. doi:10.1016/j.jad.2020.03.167

Bondü, R., & Krahé, B. (2015). Links of justice and rejection sensitivity with aggression in childhood and adolescence. *Aggressive Behavior*, 41, 353–368. doi:10.1002/ab.21556

Bondü, R., & Richter, P. (2016b). Interrelations of justice, rejection, provocation, and moral disgust sensitivity and their links with the hostile attribution bias, trait anger, and aggression. *Frontiers in Psychology*, 7, 795. doi:10.3389/fpsyg.2016.00795

Bondü, R., Rothmund, T., & Gollwitzer, M. (2016). Mutual long-term effects of school bullying, victimization, and justice sensitivity in adolescents. *Journal of Adolescence*, 48, 62–72. doi:10.1016/j.adolescence.2016.01.007

Bondü, R., Sahyazici-Knaak, F., & Esser, G. (2017). Long-term associations of justice sensitivity, rejection sensitivity, and depressive symptoms in children and adolescents. *Frontiers in Psychology*, 8, 1446–1446. doi:10.3389/fpsyg.2017.01446

Bowes, L., Joinson, C., Wolke, D., & Lewis, G. (2015). Peer victimisation during adolescence and its impact on depression in early adulthood: Prospective cohort study in the United Kingdom. *British Medical Journal*, 350, h2469. doi:10.1136/bmj.h2469

Bradley, B., DeFife, J. A., Guarnaccia, C., Phifer, J., Fani, N., Ressler, K. J., & Westen, D. (2011). Emotion dysregulation and negative affect: Association with psychiatric symptoms. *The Journal of Clinical Psychiatry*, 72, 685–691. doi:10.4088/JCP.10m06409blu

Bresin, K., & Schoenleber, M. (2015). Gender differences in the prevalence of nonsuicidal self-injury: A meta-analysis. *Clinical Psychology Review*, 38, 55–64. doi:10.1016/j.cpr.2015.02.009

Browne, M. W., & Cudeck, R. (1992). Alternative ways of assessing model fit. *Sociological Methods & Research*, 21, 230–258.

Cheung, G. W., & Rensvold, R. (2002). Evaluating goodness-of-Fit indexes for testing measurement invariance. *Structural Equation Modeling: A Multidisciplinary Journal*, 9, 233–255. doi:10.1207/S15328007SEM0902_5

Cipriano, A., Cella, S., & Cotrufo, P. (2017). Nonsuicidal self-injury: A systematic review. *Frontiers in Psychology*, 8, 1946. doi:10.3389/fpsyg.2017.01946

Compton, W. M., Thomas, Y. F., Stinson, F. S., & Grant, B. F. (2007). Prevalence, correlates, disability, and comorbidity of DSM-IV drug abuse and dependence in the United States: Results from the national epidemiologic survey on alcohol and related conditions. *Archives of General Psychiatry*, 64, 566–576. doi:10.1001/archpsyc.64.5.566

D'Esposito, S. E., Blake, J., & Riccio, C. A. (2011). Adolescents' vulnerability to peer victimization: Interpersonal and intrapersonal predictors. *Professional School Counseling*, 14, 299–309. www.jstor.org/stable/23801080

Downey, G., Mougios, V., Ayduk, O., London, B. E., & Shoda, Y. (2004). Rejection sensitivity and the defensive motivational system: Insights from the startle response to rejection cues. *Psychological Science*, 15, 668–673. doi:10.1111/j.0956-7976.2004.00738.x

Due, P., Holstein, B. E., & Soc, M. S. (2008). Bullying victimization among 13 to 15-year-old school children: Results from two comparative studies in 66 countries and regions. *International Journal of Adolescent Medicine & Health*, 20, 209–221. doi:10.1515/ijamh.2008.20.2.209

Espelage, D. L., Bosworth, K., & Simon, T. R. (2000). Examining the social context of bullying behaviors in early adolescence. *Journal of Counseling & Development*, 78, 326–333. doi:10.1002/j.1556-6676.2000.tb01914.x

Fetchenhauer, D., & Huang, X. (2004). Justice sensitivity and distributive decisions in experimental games. *Personality and Individual Differences*, 36, 1015–1029.

Fontana, A., De Panfilis, C., Casini, E., Preti, E., Richetin, J., & Ammaniti, M. (2018). Rejection sensitivity and psychopathology symptoms in early adolescence: The moderating role of personality organization. *Journal of Adolescence*, 67, 45–54. doi:10.1016/j.adolescence.2018.05.012

Gallimberti, L., Buja, A., Chindamo, S., Lion, C., Terraneo, A., Marini, E., … Baldo, V. (2015). Prevalence of substance use and abuse in late childhood and early adolescence: What are the implications? *Preventive Medicine Reports*, 2, 862–867. doi:10.1016/j.pmedr.2015.09.018

Gao, S., Assink, M., Cipriani, A., & Lin, K. (2017). Associations between rejection sensitivity and mental health outcomes: A meta-analytic review. *Clinical Psychology Review*, 57, 59–74. doi:10.1016/j.cpr.2017.08.007

Gardner, A. A., & Zimmer-Gembeck, M. J. (2018). Rejection sensitivity and responses to rejection: Serial mediators linking parenting to adolescents and young adults' depression and trait-anxiety. *Journal of Relationships Research*, 9, 1–14. doi:10.1017/jrr.2018.8

Gillies, D., Christou, M. A., Dixon, A. C., Featherston, O. J., Rapti, I., Garcia-Anguita, A., … Christou, P. A. (2018). Prevalence and characteristics of self-harm in adolescents: Meta-analyses of community-based studies. *Journal of the American Academy of Child & Adolescent Psychiatry*, 57, 733–741. doi:10.1016/j.jaac.2018.06.018

Grant, B. F., Saha, T. D., Ruan, W. J., Goldstein, R. B., Chou, S. P., Jung, J., … Hasin, D. S. (2016). Epidemiology of DSM-5 drug use disorder: Results from the national epidemiologic survey on alcohol and related conditions-III. *JAMA Psychiatry*, 73, 39–47. doi:10.1001/jamapsychiatry.2015.2132

Gratz, K. L. (2001). Measurement of deliberate self-harm: Preliminary data on the deliberate self-harm inventory. *Journal of Psychopathology and Behavioral Assessment*, 23, 253–263. doi:10.1023/A:1012779403943

Gratz, K. L., & Chapman, A. L. (2007). The role of emotional responding and childhood maltreatment in the development and maintenance of deliberate self-harm among male undergraduates. *Psychology of Men & Masculinity*, 8, 1–14. doi:10.1037/1524-9220.8.1.1

Gustavson, K., von Soest, T., Karevold, E., & Røysamb, E. (2012). Attrition and generalizability in longitudinal studies: Findings from a 15-year population-based study and a Monte Carlo simulation study. *BMC Public Health*, 12, 918. doi:10.1186/1471- 2458-12-918

Hansen, T. B., Steenberg, L. M., Palic, S., & Elklit, A. (2012). A review of psychological factors related to bullying victimization in schools. *Aggression and Violent Behavior*, 17, 383–387. doi:10.1016/j.avb.2012.03.008

Hasin, D. S., Kerridge, B. T., Saha, T. D., Huang, B., Pickering, R., Smith, S. M., … Grant, B. F. (2016). Prevalence and correlates of DSM-5 cannabis use disorder, 2012-2013: Findings from the national epidemiologic survey on alcohol and related conditions-III. *American Journal of Psychiatry*, 173, 588–599. doi:10.1176/appi.ajp.2015.15070907

Haug, S., Núñez, C. L., Becker, J., Gmel, G., & Schaub, M. P. (2014). Predictors of onset of cannabis and other drug use in male young adults: Results from a longitudinal study. *BMC Public Health*, 14, 1202–1202. doi:10.1186/1471-2458-14-1202

Hawton, K., Saunders, K. E., & O'Connor, R. C. (2012). Self-harm and suicide in adolescents. *Lancet*, 379, 2373–2382. doi:10.1016/s0140-6736(12)60322-5

Hawton, K., Zahl, D., & Weatherall, R. (2003). Suicide following deliberate self-harm: Long-term follow-up of patients who presented to a general hospital. *British Journal of Psychiatry*, 182, 537–542. doi:10.1192/bjp.182.6.537

Hooper, D., Coughlan, J., & Mullen, M. (2008). Structural equation modelling: Guidelines for determining model fit. *Electronic Journal of Business Research Methods*, 6, 53–60.

Hu, L. T., Bentler, P. M., & Kano, Y. (1992). Can test statistics in covariance structure analysis be trusted? *Psychological Bulletin*, 112, 351–362.

Jacobson, C. M., & Gould, M. (2007). The epidemiology and phenomenology of non-suicidal self-injurious behavior among adolescents: A critical review of the literature. *Archives of Suicide Research*, 11, 129–147. doi:10.1080/13811110701247602

Jansen, P. W., Verlinden, M., Berkel, A. D.-v., Mieloo, C., van der Ende, J., Veenstra, R., … Tiemeier, H. (2012). Prevalence of bullying and victimization among children in early elementary school: Do family and school neighbourhood socioeconomic status matter? *BMC Public Health*, 12, 494. doi:10.1186/1471-2458-12-494

Jenkins, L. N., Fredrick, S. S., & Wenger, J. (2018). Peer victimization and social-emotional outcomes: The role of teacher and peer support. *Aggressive Behavior*, 44, 176–184. doi:10.1002/ab.21741

Junker, A., Nordahl, H. M., Bjorngaard, J. H., & Bjerkeset, O. (2019). Adolescent personality traits, low self-esteem and self-harm hospitalisation: A 15-year follow-up of the Norwegian young-HUNT1 cohort. *European Child & Adolescent Psychiatry*, 28, 329–339. doi:10.1007/s00787-018-1197-x

Kaminer, Y., & Bukstein, O. G. (2008). *Adolescent substance abuse: Psychiatric comorbidity and high-risk behaviors*. New York, NY, US: Routledge/Taylor & Francis Group.

Klonsky, E. D., & Glenn, C. R. (2009). Assessing the functions of non-suicidal self-injury: Psychometric properties of the inventory of statements about self-injury (ISAS). *Journal of Psychopathology and Behavioral Assessment*, 31, 215–219. doi:10.1007/s10862-008-9107-z

Klonsky, E. D., Victor, S. E., & Saffer, B. Y. (2014). Nonsuicidal self-injury: What we know, and what we need to know. *The Canadian Journal of Psychiatry*, 59, 565–568.

Kober, H. (2014). Emotion regulation in substance use disorders. In J. J. Gross (Ed.), *Handbook of emotion regulation* (2nd ed.) (pp. 428–446). New York, NY: Guilford Press.

Kochenderfer-Ladd, B. (2004). Peer victimization: The role of emotions in adaptive and maladaptive coping. *Social Development*, 13, 329–349. doi:10.1111/j.1467-9507.2004.00271.x

Kotov, R., Gamez, W., Schmidt, F., & Watson, D. (2010). Linking "big" personality traits to anxiety, depressive, and substance use disorders: A meta-analysis. *Psychological Bulletin*, 136, 768–821. doi:10.1037/a0020327

Kraines, M. A., & Wells, T. T. (2017). Rejection sensitivity and depression: Indirect effects through problem solving. *Psychiatry*, 80, 55–63. doi:10.1080/00332747.2016.1185891

Laye-Gindhu, A., & Schonert-Reichl, K. A. (2005). Nonsuicidal self-harm among community adolescents: Understanding the "whats" and "whys" of self-harm. *Journal of Youth and Adolescence*, 34, 447–457. doi:10.1007/s10964-005-7262-z

Lereya, S. T., Winsper, C., Heron, J., Lewis, G., Gunnell, D., Fisher, H. L., & Wolke, D. (2013). Being bullied during childhood and the prospective pathways to self-harm in late adolescence. *Journal of the American Academy of Child & Adolescent Psychiatry*, 52, 608–618.e602. doi:10.1016/j.jaac.2013.03.012

Lim, K. S., Wong, C. H., McIntyre, R. S., Wang, J., Zhang, Z., Tran, B. X., … Ho, R. C. (2019). Global lifetime and 12-month prevalence of suicidal behavior, deliberate self-harm and non-suicidal self-injury in children and

adolescents between 1989 and 2018: A meta-analysis. *International Journal of Environmental Research and Public Health, 16*, 4581. doi:10.3390/ijerph16224581

Liu, R. T., Kraines, M. A., Massing-Schaffer, M., & Alloy, L. B. (2014). Rejection sensitivity and depression: Mediation by stress generation. *Psychiatry, 77*, 86–97. doi:10.1521/psyc.2014.77.1.86

Lloyd-Richardson, E. E., Perrine, N., Dierker, L., & Kelley, M. L. (2007). Characteristics and functions of non-suicidal self-injury in a community sample of adolescents. *Psychological Medicine, 37*, 1183–1192. doi:10.1017/s003329170700027x

Malti, T., Perren, S., & Buchmann, M. (2010). Children's peer victimization, empathy, and emotional symptoms. *Child Psychiatry & Human Development, 41*, 98–113. doi:10.1007/s10578-009-0155-8

Martel, M. M., Pierce, L., Nigg, J. T., Jester, J. M., Adams, K., Puttler, L. I., … Zucker, R. A. (2009). Temperament pathways to childhood disruptive behavior and adolescent substance abuse: Testing a cascade model. *Journal of Abnormal Child Psychology, 37*, 363–373. doi:10.1007/s10802-008-9269-x

Moore, S. E., Norman, R. E., Suetani, S., Thomas, H. J., Sly, P. D., & Scott, J. G. (2017). Consequences of bullying victimization in childhood and adolescence: A systematic review and meta-analysis. *World Journal of Psychiatry, 7*, 60–76. doi:10.5498/wjp.v7.i1.60

Muehlenkamp, J. J., Claes, L., Havertape, L., & Plener, P. L. (2012). International prevalence of adolescent non-suicidal self-injury and deliberate self-harm. *Child & Adolescent Psychiatry and Mental Health, 6*, 10. doi:10.1186/1753-2000-6-10

Muthén, L. K., & Muthén, B. O. (1998–2015). *Mplus User's Guide*. Los Angeles, CA.

Nitkowski, D., & Petermann, F. (2011). [Non-suicidal self-injury and comorbid mental disorders: A review]. *Fortschritte Neurologie Psychiatrie, 79*, 9–20. doi:10.1055/s-0029-1245772

Nock, M. K. (2010). Self-injury. *Annual Review of Clinical Psychology, 6*, 339–363. doi:10.1146/annurev.clinpsy.121208.131258

Normansell, K. M., & Wisco, B. E. (2017). Negative interpretation bias as a mechanism of the relationship between rejection sensitivity and depressive symptoms. *Cognition and Emotion, 31*, 950–962. doi:10.1080/02699931.2016.1185395

Obando, D., Trujillo, A., & Trujillo, C. A. (2014). Substance use and antisocial behavior in adolescents: The role of family and peer-individual risk and protective factors. *Substance Use & Misuse, 49*, 1934–1944. doi:10.3109/10826084.2014.956365

Ramo, D. E., Liu, H., & Prochaska, J. J. (2012). Tobacco and marijuana use among adolescents and young adults: A systematic review of their co-use. *Clinical Psychology Review, 32*, 105–121. doi:10.1016/j.cpr.2011.12.002

Schmitt, M., Baumert, A., Gollwitzer, M., & Maes, J. (2010). The justice sensitivity inventory: Factorial validity, location in the personality facet space, demographic pattern, and normative data. *Social Justice Research, 23*, 211–238. doi:10.1007/s11211-010-0115-2

Schmitt, M., Gollwitzer, M., Maes, J., & Arbach, D. (2005). Justice sensitivity: Assessment and location in the personality space. *European Journal of Psychological Assessment, 21*, 202–211. doi:10.1027/1015-5759.21.3.202

Schmitt, M. J., Neumann, R., & Montada, L. (1995). Dispositional sensitivity to befallen injustice. *Social Justice Research, 8*, 385–407. doi:10.1007/bf02334713

Schwartz, D., Proctor, L. J., & Chien, D. H. (2001). The aggressive victim of bullying: Emotional and behavioral dysregulation as a pathway to victimization by peers. In J. Juvonen & S. Graham (Eds.), *Peer harassment in school: The plight of the vulnerable and victimized* (pp. 147–174). New York, NY, US: The Guilford Press.

Selby, E. A., & Joiner, T. E., Jr. (2009). Cascades of emotion: The emergence of borderline personality disorder from emotional and behavioral dysregulation. *Review of General Psychology, 13*, 219.doi:10.1037/a0015687

Smith, P. K., López-Castro, L., Robinson, S., & Görzig, A. (2019). Consistency of gender differences in bullying in cross-cultural surveys. *Aggression and Violent Behavior, 45*, 33–40. doi:10.1016/j.avb.2018.04.006

Swannell, S. V., Martin, G. E., Page, A., Hasking, P., & St John, N. J. (2014). Prevalence of nonsuicidal self-injury in nonclinical samples: Systematic review, meta-analysis and meta-regression. *Suicide and Life-Threatening Behavior, 44*, 273–303. doi:10.1111/sltb.12070

Taylor, M., Collin, S. M., Munafò, M. R., MacLeod, J., Hickman, M., & Heron, J. (2017). Patterns of cannabis use during adolescence and their association with harmful substance use behaviour: Findings from a UK birth cohort. *Journal of Epidemiology and Community Health, 71*, 764–770. doi:10.1136/jech-2016-208503

Tharp-Taylor, S., Haviland, A., & D'Amico, E. J. (2009). Victimization from mental and physical bullying and substance use in early adolescence. *Addictive Behaviors, 34*, 561–567. doi:10.1016/j.addbeh.2009.03.012

Ttofi, M. M., Farrington, D. P., Lösel, F., & Loeber, R. (2011). Do the victims of school bullies tend to become depressed later in life? A systematic review and meta-analysis of longitudinal studies. *Journal of Aggression, 3*, 63–73. doi:10.1108/17596591111132873

UNODC. (2015). *World Drug Report*. United Nations Office on Drugs and Crime: United Nations Publication.

Waylen, A., & Wolke, D. (2004). Sex "n" drugs "n" rock "n" roll: The meaning and social consequences of pubertal timing. *European Journal of Endocrinology, 151*, U151–U159. doi:10.1530/eje.0.151u151

Wolke, D., Copeland, W. E., Angold, A., & Costello, E. J. (2013). Impact of bullying in childhood on adult health, wealth, crime, and social outcomes. *Psychological Science, 24*, 1958–1970. doi:10.1177/0956797613481608

Zapolski, T. C. B., Rowe, A. T., Fisher, S., Hensel, D. J., & Barnes-Najor, J. (2018). Peer victimization and substance use: Understanding the indirect effect of depressive symptomatology across gender. *Addictive Behaviors, 84*, 160–166. doi:10.1016/j.addbeh.2018.04.010

Zetterqvist, M. (2015). The DSM-5 diagnosis of nonsuicidal self-injury disorder: A review of the empirical literature. *Child and Adolescent Psychiatry and Mental Health, 9*, 31. doi:10.1186/s13034-015-0062-7