

# A Longitudinal Person-Centered Examination of Nonsuicidal Self-injury Among University Students

Chloe A. Hamza · Teena Willoughby

Received: 21 May 2013 / Accepted: 30 July 2013 / Published online: 10 August 2013  
© Springer Science+Business Media New York 2013

**Abstract** Little is known about the development and maintenance of nonsuicidal self-injury (NSSI) over time; however, identifying individuals at risk for NSSI onset or its recurrent engagement is of critical importance for developing effective prevention and intervention strategies. To address this important gap in the literature, we used a person-centered approach to study patterns of change among self-injurers (i.e., new beginners, recovered injurers, relapsers, desisters, and persistent injurers). Undergraduate students ( $N = 666$ , 71.1 % female,  $M_{age} = 19.15$ ) from a mid-sized Canadian university participated in the two-wave study (assessments were 1 year apart). Participants completed the Inventory of Statements about Self-Injury (ISAS, Klonsky and Glenn in J Psychopathol Behav Assess 31:215–219, 2009) at Time 1, and a measure of past year NSSI frequency 1 year later. Participants also completed several measures of psychosocial risk (e.g., problem behaviors, problems with parents) at both time points. Consistent with Nock's (Ann Rev Clin Psychol 6:339–363, 2010) model on the development of NSSI over time, individuals who continued to engage in NSSI across the university years (i.e., persistent injurers) reported greater levels of psychosocial risk as compared to those in the other groups. Moreover, a discriminant function analysis revealed that new beginners, relapsed injurers, and persistent injurers were differentiated from recovered injurers and desisters by increases over time in problem behaviors, problems with parents, internalizing behaviors,

and suicidal ideation. Our findings provide new insight into the course of NSSI engagement across the university years, and offer clinicians ways to discriminate among individuals with varying longitudinal patterns of NSSI (i.e., on measures of psychosocial risk, and motivations to stop self-injuring).

**Keywords** Self-injury · Young adults · Longitudinal · Risk factors · Person-centered

## Introduction

Nonsuicidal self-injury (NSSI), which is defined as self-directed deliberate destruction or alteration of bodily tissue in the absence of suicidal intent (Nock and Favazza 2009), includes behaviors such as self-cutting, carving, burning and hitting (Heath et al. 2008; Klonsky and Glenn 2009). NSSI is a widely occurring health concern, and recent estimates indicate that as many as 13–38 % of young adults report a lifetime history of NSSI (Cawood and Huprich 2011; Gratz et al. 2002; Klonsky and Glenn 2009; Klonsky and Olino 2008; Whitlock et al. 2006). Although NSSI tends to have its onset in adolescence, close to 40 % of community samples report engaging in NSSI for the first time between the ages of 17 and 24 (Heath et al. 2008; Whitlock et al. 2006), which has led researchers to conclude that a significant portion of young adults who engage in NSSI will begin to do so during the university years (Heath et al. 2008). Moreover, researchers have found that as many as 35–72 % of university students with an existing history of NSSI report current (i.e., within the past year) engagement in NSSI (Glenn and Klonsky 2011; Heath et al. 2009; Klonsky and Olino 2008; Wilcox et al. 2011). Despite the widespread prevalence of NSSI among young

C. A. Hamza (✉) · T. Willoughby  
Department of Psychology, Brock University, 500 Glenridge Avenue, Saint Catharines, ON L2S 3A1, Canada  
e-mail: ch08za@brocku.ca

T. Willoughby  
e-mail: teena.willoughby@brocku.ca; twilloug@brocku.ca

adults, little is known about the development and maintenance of NSSI during the university years (Glenn and Klonsky 2011). Moreover, researchers have yet to examine whether individuals with varying patterns of NSSI engagement can be differentiated on the basis of psychosocial risk. Importantly, an examination of the risk factors associated with NSSI onset and recurrent engagement can inform theory about the development and maintenance of NSSI over time (e.g., Nock's model 2010). A better understanding of the risk factors associated with NSSI cessation, in particular, may provide new insight into the ways prevention and intervention programs can target and deter NSSI engagement (e.g., by promoting effective emotion regulation strategies). To address these significant gaps in the literature, therefore, we conducted a person-centered longitudinal examination of individuals with different patterns of NSSI engagement over time (new beginners, recovered injurers, relapsers, desisters and persistent injurers) among a large sample of young adults. Moreover, we examined whether individuals with varying levels of engagement in NSSI from first- to second-year university could be differentiated by changes on several markers of psychosocial risk over time.

### The Development and Maintenance of NSSI

According to Nock's (2010) theoretical model of the development and maintenance of NSSI over time, increases in intrapersonal risk factors (i.e., difficulty regulating emotions, depressive symptoms) and interpersonal risk factors (i.e., parent-child conflict) may undermine an individual's ability to cope with distress, and thus lead to NSSI (i.e., which acts as an effective social or affective regulation strategy). Consistent with Nock's model, concurrent studies indicate that young adults who engage in NSSI report significantly greater intrapersonal risk, including higher levels of depression, anxiety, suicidality (Glenn et al. 2009; Hamza et al. 2012; Kerr and Muehlenkamp 2010; Whitlock and Knox 2007; Whitlock et al. 2008), problem behavior engagement (Gollust et al. 2008; Serras et al. 2010), lower self-esteem (Cawood and Huprich 2011), and greater difficulty regulating their emotions (Heath et al. 2008; Muehlenkamp et al. 2010a), than non-injuring young adults. Moreover, self-injurers report lower levels of peer social support (i.e., emotional support, informal support) (Heath et al. 2009) and lower levels of perceived maternal and parental care, as well as greater alienation from parents, than young adults without a history of NSSI (Gratz et al. 2002; Martin et al. 2011). These concurrent findings highlight that high levels of psychosocial risk are associated with NSSI engagement, as predicted by Nock (2010).

Although longitudinal research on NSSI is limited, recently researchers also have started to examine whether

psychosocial risk factors are associated with NSSI engagement over time. Findings from longitudinal studies, however, offer conflicting results about which risk factors are associated with changes in NSSI engagement. For example, Jutengren et al. (2011) found that peer victimization predicted increases in NSSI frequency among Swedish adolescents over a 1 year period, although Heilbron and Prinstein (2010) found no longitudinal effects of peer status, peer victimization or depressive symptoms on adolescent NSSI engagement over time. Negative coping style, depressive symptoms, and less positive interactions with peers also have been associated with increased NSSI engagement over time among adolescents (Hakin and Abela 2011; Prinstein et al. 2010), but only among female 6th graders in Prinstein and colleagues' study. Although findings on peer associations are mixed, both Yu et al. (2012) and Yates et al. (2008) found that perceived problems with parents were associated with greater NSSI frequency over time among adolescents. To our knowledge, there have been only two longitudinal studies of NSSI among young adults. In one study, Glenn and Klonsky (2011) examined several measures of psychosocial risk among university students [e.g., alcohol use, bulimia, anxiety, depression, Borderline Personality Disorder (BPD), impulsivity] and found that although several of these variables were associated with NSSI concurrently, only BPD characteristics and frequency of NSSI at baseline were associated with increases in NSSI frequency over time. In another study of predictors of NSSI engagement (e.g., sexual orientation, affect dysregulation, suicidal behavior, social support, and family factors), Wilcox et al. (2011) identified several longitudinal risk factors of NSSI frequency, including non-heterosexual orientation, affective dysregulation, suicidal ideation, suicidal attempts and parental depression. Interestingly, unlike research involving adolescents (e.g., Heath et al. 2009), Wilcox et al. did not find that social support was associated with lower levels of engagement in NSSI over time. Longitudinal findings on risk factors for NSSI, therefore, offer conflicting results about which risk factors are most strongly associated with changes in NSSI engagement over time, and indicate that risk factors vary among self-injurers (e.g., Prinstein et al. 2010).

### Variable- Versus Person-Centered Approaches

Typically, researchers studying NSSI have relied on the use of variable-centered approaches to examine change in NSSI over time (e.g., on average does NSSI engagement change over time?). Variable-centered approaches focus on mean change within a group of individuals, but do not take into account individual heterogeneity in change (i.e., is there variability in change over time among individuals engaging

in NSSI?). Previous longitudinal findings on risk factors associated with changes in NSSI engagement over time (i.e., studies that group all self-injurers together) may be mixed, therefore, because psychosocial risk may vary among individuals with varying patterns of engagement in NSSI over time. For example, individuals who stop self-injuring may differ from individuals who continue self-injuring over time on measures of psychosocial risk. While some researchers have compared individuals who engage in NSSI over time to a comparison group of non-injurers (Hakin and Abela 2011; Heilbron and Prinstein 2010; Yates et al. 2008), there has been little attention to differences among self-injurers (e.g., individuals who stop engaging in NSSI over time, individuals who start engaging in NSSI for the first time, individuals who relapse). In fact, there has been only one two-wave exploratory study in which individuals with varying patterns of NSSI engagement over time were compared across measures of psychosocial risk. Using a small sample of young adults with a history of NSSI, Glenn and Klonsky (2011) compared individuals who reported NSSI both at baseline and 1 year later (i.e., persistent injurers) to a group of individuals who reported NSSI at baseline but not 1 year later (i.e., desisters). The researchers found that persistent self-injurers reported greater lifetime frequency of NSSI and more methods of NSSI than desisters, although the two groups did not differ across measures of psychosocial risk at baseline. Next, Glenn and Klonsky compared self-injurers with no current engagement in NSSI at Time 1 or Time 2 (i.e., recovered injurers) to a group of self-injurers with no current NSSI at Time 1, but relapsed NSSI at T2 (i.e., relapsers). Relapsers reported more recent NSSI engagement prior to baseline than did the recovered injurers, but the two groups did not differ on measures of psychosocial risk.

Although Glenn and Klonsky's (2011) work provides a preliminary examination of the differences among individuals engaging in different NSSI patterns over time, the study was limited by the use of small sample sizes (e.g., desisters  $N = 5$ ; relapsers  $N = 9$ ). Contrary to expectations, groups did not differ on measures of psychosocial risk (i.e., young adults who currently engage in NSSI would be expected to report greater psychosocial risk relative to young adults who no longer engage in NSSI); however, the lack of significant differences among groups may have been a result of low power given the small group sizes. In addition, given the small sample sizes, Glenn and Klonsky could not make all possible comparisons among groups (i.e., how might relapsers differ from desisters?), although such comparisons may provide important information about factors that lead to relapsed NSSI engagement over time (as well as identity factors that differentiate individuals who resume self-injury from individuals who stop self-injury). Importantly, there also was no specific

examination of individuals who started self-injuring for the first time between Time 1 and Time 2 (i.e., new beginners). Given that first year university represents a significant transition, and that research has shown that young adulthood may represent a period of increased risk for NSSI onset (Whitlock et al. 2006), identifying individuals at risk for NSSI onset could provide new insight into the factors that lead to first time engagement in NSSI, and could serve to inform prevention efforts aimed specifically at young adults.

Finally, clinical research has shown that an individual's own willingness to change a behavior is an important predictor of whether or not an individual will continue to engage in that behavior over time (Norcross et al. 2011; Prochaska and DiClemente 1983). More specifically, according to theory on the stages of change model, individuals who are committed to stopping a behavior are more likely to actively change behavior patterns as compared to individuals with little or no intent to change (Norcross et al. 2011). No research, however, has explored whether individuals with varying levels of motivation to stop self-injuring show different patterns of NSSI engagement over time. Importantly, an individual's willingness to change his/her NSSI engagement could be an important target of clinical intervention.

## The Present Study

The purpose of the present study was to extend previous research in three important ways. First, despite the widespread prevalence of NSSI among young adults (Cawood and Huprich 2011; Gratz et al. 2002; Klonsky and Glenn 2009; Klonsky and Olino 2008; Whitlock et al. 2006), little is known about the development and maintenance of NSSI during the university years. Although recent concurrent research suggests that early adulthood, in particular, may be a period of increased risk for NSSI onset (Heath et al. 2008; Whitlock et al. 2006), no research has specifically examined this hypothesis longitudinally. Critically, determining whether early adulthood represents a period of increased risk for NSSI engagement will have important implications for clinicians and providers of student services. To address this gap in the literature, we specifically examined engagement in NSSI over time among a young adult sample. Second, previous longitudinal research on change over time in NSSI engagement has relied primarily on variable-centered approaches. In the present study, rather than examine mean levels of change in a sample of self-injuring young adults (i.e., variable-centered approach), we examined whether individuals with different patterns of NSSI engagement over time (i.e., person-centered approach) could be differentiated on measures of psychosocial risk.

Importantly, we examined all possible patterns of change in NSSI engagement over time (i.e., new onset, continued recovery, relapse, cessation, and continued engagement). On the basis of Nock's model, we expected that persistent injurers (i.e., individuals who engaged in NSSI at both T1 and T2) would report the highest levels of psychosocial risk as compared to the other groups at both time points (i.e., individuals with high levels of social risk, have greater need for NSSI as a form of coping behavior). We also expected that increased psychosocial risk over time would differentiate new beginners, relapsers, and persistent injurers from recovered injurers and desisters (i.e., that changes in risk would be associated with change in NSSI engagement, as predicted by Nock's model). Third, no research has explored whether individuals with varying levels of motivation to stop engaging in NSSI show different patterns of NSSI engagement over time. We specifically addressed this gap in the literature, and predicted that greater motivation to stop self-injury would be associated with the cessation of NSSI behaviors over time.

## Methods

### Participants

The present sample was drawn from a larger sample of 1153 undergraduate students (70.3 % female,  $M_{age} = 19.11$ ,  $SD = 1.05$ ) from a mid-sized Canadian university who took part in a two-wave study (assessments were 1 year apart). The overall retention rate of these students at Time 2 was 72 % (if including only students who were still registered at the university at Time 2, the retention rate was 80 %). From this larger sample, 439 participants (38 %) who reported a history of lifetime NSSI at Time 1, and an additional 27 participants (i.e., an additional 2 %) who reported NSSI only at Time 2, were included in the present analysis. We also randomly selected 200 non-injuring participants from the larger sample, who did not differ from NSSI participants on age, sex and parental education, to act as a comparison group. The final sample for the present study, therefore, consisted of 666 participants (71 % female,  $M_{age} = 19.15$ ).

Consistent with the broader demographics for the region (Statistics Canada 2006), 88 % of the participants were born in Canada, and the most common ethnic backgrounds reported other than Canadian were British (19 %), Italian (17), French (10 %) and German (9 %). Data on socioeconomic status indicated mean levels of education for mothers and fathers falling between “some college, university or apprenticeship program” and “completed a college/apprenticeship/technical diploma.” Furthermore, 15 % of respondents lived at home with one or both parents, 9 % lived off-campus with roommates, and 76 % lived in

campus residences. Compared to participants who completed the survey at both Time 1 and Time 2, participants who did not complete the survey at Time 2 were more likely to be male and older in age,  $ps < 0.01$ . There were no significant differences between participants who completed the survey at Time 1 only and participants who completed the survey at Time 1 and Time 2 on any of the study measures, including the NSSI variables (and self-injurers were as likely as non-injurers to participate in the survey at Time 2).

### Procedure

At Time 1, students in first-year university were invited to complete a survey examining adjustment to university, by way of posters, classroom announcements, website posting, and residence visits. Students could participate regardless of academic major, and were given monetary compensation (\$10) or course credit for their participation at Time 1 and monetary compensation (\$20) for their participation at Time 2. At Time 2, the students who participated in the first wave of the project were invited to participate again, by way of emails, posters, and classroom announcements. Only students who previously completed the study at Time 1 were eligible to participate at Time 2. Despite widespread evidence that asking adolescents and young adults about self-injury engagement does not have any iatrogenic effects (Bjarehed et al. 2012; Gould et al. 2005; Lewis et al. 2011; Lewis and Santor 2010; Mathias et al. 2012; Muehlenkamp et al. 2010b; Reynolds et al. 2006) or lead to increased distress (Gould et al. 2005; Whitlock et al. 2013), to ensure the safety of our participants several precautions were taken in the present study. Our study was approved by the University Research ethics board, and participants were informed prior to participating in the study that they would be asked questions related to self-injurious behaviors. The survey was administered by trained research personal, who were specifically trained in handling distressed participants (no participants became distressed during survey administration, however). Moreover, participants were given a full debrief at the end of the survey, and a list of contact information of several available local mental resources (and the contact information of the researchers). Participants also were given the opportunity during the survey to provide their contact information, so that they could be contacted by a mental health professional if they were experiencing any symptoms of distress.

### Measures

#### Demographics

For the purposes of the study, we created a basic demographic questionnaire at Time 1 to assess participant age,

gender (1 = male and 2 = female) and parental education (one item per parent, averaged for participants reporting on both parents,  $r = .40$ ) on a scale of 1 (*did not finish high school*) to 6 (*professional degree*). Means and standard deviations are presented in Table 1.

#### *Nonsuicidal Self-injury (NSSI)*

At Time 1, participants completed the Inventory of Statements about Self-Injury (ISAS, Klonsky and Glenn 2009) to specifically address whether they had engaged in *direct* forms of self-injury. A list of self-injurious behaviors was provided (e.g., cutting, burning and head banging) and participants were asked to indicate how many times in their lives they had intentionally engaged in each of the behaviors listed, without lethal intent. To create a normalized measure of NSSI frequency, participant responses regarding lifetime frequency of NSSI were collapsed into the following six categories: 1 incident, 2–4 incidents, 5–10 incidents, 11–50 incidents, 51–100 incidents, more than 100 incidents (see Heath et al. 2008 for a similar categorization). At Time 1, participants also were asked to indicate whether, on average, they experienced physical pain while self-injuring, the amount of time that elapsed between the urge to self-injuring and the act of NSSI (i.e., 1 = *less than 1 h* to 6 = *more than 1 day*), whether they self-injured alone, and whether they wanted to stop self-injuring. The ISAS has been shown to have good internal consistency and construct validity in previous research (Klonsky and Glenn 2009; Klonsky and Olino 2008). Participants who indicated that they had most recently self-injured within the past year were regarded as current self-injurers at Time 1. At Time 2, participants were asked to indicate their frequency of engagement in NSSI in the past 12 months (i.e., since Time 1) using a 4-point scale of 1 (*I have not self-injured in the past year*) to 4 (*often*). Participants who indicated that they engaged in NSSI in the past year were regarded as current self-injurers at Time 2.

#### *Problem Behaviors*

Delinquency was measured at both time points with five items assessing stealing money from parents/roommates, shoplifting, destroying other people's property, impaired driving, or being the passenger in a vehicle with a driver who was impaired. Participants were asked to indicate how often in the past year they had participated in each activity on a 4-point scale from 0 (*never*) to 4 (*more than 5 times*). In addition, participants indicated at both time points the frequency of their alcohol use on an 8-point scale from 1 (*never*) to 8 (*everyday*), as well as the average number of drinks consumed per drinking session on a 6-point scale from 1 (*less than 1 drink*) to 6 (*more than 10 drinks*).

Exploratory factor analysis (EFA) using Varimax rotation was used to create variable composites. The EFA indicated that the delinquency and alcohol measures loaded onto one factor at each time point (i.e., factor scores ranged from .84 to .87). A standardized composite measure of problem behaviors was created at Time 1 and Time 2, with higher scores indicating greater involvement in problem behaviors.<sup>1</sup> Cronbach's alpha for this scale at Time 1 was 0.76 and 0.74 at Time 2.

#### *Problems with Parents*

At both time points participants completed 17 items from the Inventory for Parent and Peer Attachment Scale (e.g., I trust my mother, Armsden and Greenberg 1987) for both parents using a 4-point scale from 1 (*almost never or never*) to 4 (*almost always or always*). A parental attachment score was calculated by averaging scores from both parents ( $r = .48$  at Time 1 and  $r = .50$  at Time 2). Participants also completed the Psychological Control Scale (Barber 1996) at both time points for both parents (i.e., "my father is a person who changes the subject whenever I have something to say") using a 4-point scale from 1 (*not at all like him*) to 4 (*a lot like him*). Scores for both parents were averaged into a parental psychological control score ( $r = .40$  at Time 1 and  $r = .34$  at Time 2). Finally, participants completed the parental criticism subscale at both time points from the Multidimensional Perfectionism Scale (Frost et al. 1990), which included items such as, "My parents never try to understand my mistakes." Participants responded using a 3-point scale from 1 (*strongly disagree*) to 4 (*strongly agree*). The three parenting measures showed acceptable reliability at both Time 1 and Time 2 (Cronbachs = .82–.91). Exploratory factors analyses indicated that the three parenting measures loaded onto one factor at each time point (i.e., factor scores ranged from .80 to .83), so parenting measures were combined into a standardized composite score at Time 1 and Time 2, with higher scores indicating greater problems with parents.

#### *Internalizing Behaviors*

Four aspects of internalizing behaviors were assessed at both time points, including depressive symptoms, self-esteem, emotional reactivity and social anxiety. Depressive symptoms were measured using the Center for Epidemiological Studies Depressive Symptoms Scale (CES-D, Radloff 1977), which required participants to indicate how often they

<sup>1</sup> Results were the same when we conducted the EFA with the larger sample. A confirmatory factor analysis using all of the study measures in AMOS 16.0 also supported grouping variables as presented in the method section [as indexed by model fit (i.e., chi-square, RMSEA, CFI) and factor loadings].

**Table 1** Means and standard deviations for study measures

Measure	No NSSI (M, SD)				Beginners (M, SD)				Recovered (M, SD)				Relapsers (M, SD)				Desisters (M, SD)				Persistent (M, SD)				
	T1		T2		T1		T2		T1		T2		T1		T2		T1		T2		T1		T2		
	Demographics																								
Age	19.18 (1.18)	—	18.91 (.55)	—	19.23 (1.09)	—	19.17 (1.01)	—	19.16 (1.04)	—	19.16 (1.04)	—	18.91 (.79)	—	18.91 (.79)	—	18.91 (.79)	—	18.91 (.79)	—	18.91 (.79)	—	18.91 (.79)	—	
Sex	1.74 (0.45)	—	1.56 (0.48)	—	1.78 (0.42)	—	1.52 (0.50)	—	1.700 (.46)	—	1.700 (.46)	—	1.63 (0.49)	—	1.63 (0.49)	—	1.63 (0.49)	—	1.63 (0.49)	—	1.63 (0.49)	—	1.63 (0.49)	—	
SES	3.66 (1.25)	—	4.08 (1.04)	—	3.70 (1.24)	—	3.46 (1.06)	—	3.61 (1.19)	—	3.61 (1.19)	—	3.36 (1.38)	—	3.36 (1.38)	—	3.36 (1.38)	—	3.36 (1.38)	—	3.36 (1.38)	—	3.36 (1.38)	—	
Problem behaviors																									
Delinquency	1.35 (0.51)	1.28 (0.41)	1.34 (0.54)	1.40 (0.63)	1.46 (0.53)	1.39 (0.45)	1.62 (0.73)	1.53 (0.52)	1.53 (0.59)	1.40 (0.43)	1.54 (0.51)	1.54 (0.51)	1.54 (0.51)	1.54 (0.51)	1.54 (0.51)	1.54 (0.51)	1.54 (0.51)	1.54 (0.51)	1.54 (0.51)	1.54 (0.51)	1.54 (0.51)	1.54 (0.51)	1.54 (0.51)	1.54 (0.51)	
Alcohol frequency	3.61 (1.48)	3.61 (1.30)	3.63 (1.79)	3.70 (1.61)	3.80 (1.67)	3.71 (1.36)	3.56 (1.40)	3.73 (1.53)	3.65 (1.59)	3.71 (1.32)	3.59 (1.74)	3.74 (1.66)	3.74 (1.66)	3.74 (1.66)	3.74 (1.66)	3.74 (1.66)	3.74 (1.66)	3.74 (1.66)	3.74 (1.66)	3.74 (1.66)	3.74 (1.66)	3.74 (1.66)	3.74 (1.66)	3.74 (1.66)	
Alcohol drinks	3.81 (1.39)	3.84 (1.19)	3.55 (1.49)	4.15 (1.23)	3.85 (1.25)	3.88 (1.14)	4.01 (1.63)	4.05 (1.46)	3.87 (1.40)	4.05 (1.18)	3.88 (1.46)	4.02 (1.36)	4.02 (1.36)	4.02 (1.36)	4.02 (1.36)	4.02 (1.36)	4.02 (1.36)	4.02 (1.36)	4.02 (1.36)	4.02 (1.36)	4.02 (1.36)	4.02 (1.36)	4.02 (1.36)	4.02 (1.36)	
Problems with parents																									
Parental relationship	2.95 (0.43)	2.97 (0.38)	2.68 (0.45)	2.70 (0.49)	2.84 (0.44)	2.84 (0.42)	2.94 (0.42)	2.80 (0.45)	2.72 (0.48)	2.80 (0.40)	2.72 (0.48)	2.84 (0.40)	2.67 (0.39)	2.67 (0.39)	2.67 (0.39)	2.67 (0.39)	2.67 (0.39)	2.67 (0.39)	2.67 (0.39)	2.67 (0.39)	2.67 (0.39)	2.67 (0.39)	2.67 (0.39)	2.67 (0.39)	
Psychological control	1.42 (0.34)	1.39 (0.31)	1.55 (0.38)	1.56 (0.40)	1.51 (0.36)	1.47 (0.31)	1.50 (0.42)	1.53 (0.34)	1.55 (0.40)	1.51 (0.33)	1.55 (0.40)	1.51 (0.33)	1.61 (0.42)	1.61 (0.42)	1.61 (0.42)	1.61 (0.42)	1.61 (0.42)	1.61 (0.42)	1.61 (0.42)	1.61 (0.42)	1.61 (0.42)	1.61 (0.42)	1.61 (0.42)	1.61 (0.42)	
Parental criticism	1.98 (0.73)	2.05 (0.61)	2.26 (0.79)	2.25 (0.73)	2.11 (0.73)	2.10 (0.61)	2.13 (0.67)	2.28 (0.68)	2.19 (0.74)	2.16 (0.62)	2.19 (0.74)	2.16 (0.62)	2.47 (0.70)	2.44 (0.78)	2.44 (0.78)	2.44 (0.78)	2.44 (0.78)	2.44 (0.78)	2.44 (0.78)	2.44 (0.78)	2.44 (0.78)	2.44 (0.78)	2.44 (0.78)	2.44 (0.78)	
Internalizing behaviors																									
Depression	2.00 (0.60)	1.93 (0.56)	2.26 (0.61)	2.27 (0.78)	2.22 (0.66)	2.15 (0.61)	2.04 (0.51)	2.14 (0.61)	2.32 (0.69)	2.19 (0.61)	2.32 (0.69)	2.19 (0.61)	2.50 (0.73)	2.50 (0.73)	2.50 (0.73)	2.50 (0.73)	2.50 (0.73)	2.50 (0.73)	2.50 (0.73)	2.50 (0.73)	2.50 (0.73)	2.50 (0.73)	2.50 (0.73)	2.50 (0.73)	
Emotional reactivity	2.07 (0.77)	2.06 (0.68)	2.32 (0.74)	2.52 (0.79)	2.28 (0.79)	2.25 (0.68)	1.97 (0.63)	2.21 (0.58)	2.48 (0.92)	2.42 (0.82)	2.48 (0.92)	2.42 (0.82)	2.71 (0.93)	2.71 (0.93)	2.71 (0.93)	2.71 (0.93)	2.71 (0.93)	2.71 (0.93)	2.71 (0.93)	2.71 (0.93)	2.71 (0.93)	2.71 (0.93)	2.71 (0.93)	2.71 (0.93)	
Self-esteem	3.93 (0.68)	3.90 (0.64)	3.68 (0.60)	3.74 (0.68)	3.77 (0.68)	3.78 (0.64)	3.84 (0.61)	3.70 (0.73)	3.58 (0.77)	3.67 (0.73)	3.58 (0.77)	3.67 (0.73)	3.34 (0.66)	3.34 (0.66)	3.34 (0.66)	3.34 (0.66)	3.34 (0.66)	3.34 (0.66)	3.34 (0.66)	3.34 (0.66)	3.34 (0.66)	3.34 (0.66)	3.34 (0.66)	3.34 (0.66)	
Social anxiety	1.65 (0.51)	1.62 (0.43)	1.87 (0.39)	1.85 (0.31)	1.76 (0.57)	1.77 (0.47)	1.67 (0.45)	1.78 (0.45)	1.86 (0.54)	1.86 (0.54)	1.86 (0.54)	1.86 (0.54)	2.01 (0.55)	2.01 (0.55)	2.01 (0.55)	2.01 (0.55)	2.01 (0.55)	2.01 (0.55)	2.01 (0.55)	2.01 (0.55)	2.01 (0.55)	2.01 (0.55)	2.01 (0.55)	2.01 (0.55)	
Suicidal ideation																									
Past year ideation	1.12 (0.38)	1.15 (0.41)	1.58 (0.76)	1.85 (1.29)	1.38 (0.86)	1.40 (0.73)	1.36 (0.73)	1.89 (1.11)	1.69 (1.05)	1.57 (0.76)	1.69 (1.05)	1.57 (0.76)	2.18 (1.33)	2.18 (1.33)	2.18 (1.33)	2.18 (1.33)	2.18 (1.33)	2.18 (1.33)	2.18 (1.33)	2.18 (1.33)	2.18 (1.33)	2.18 (1.33)	2.18 (1.33)	2.18 (1.33)	
Future attempt	1.19 (0.57)	1.19 (0.45)	1.52 (0.86)	1.74 (1.09)	1.59 (1.00)	1.36 (0.67)	1.43 (0.80)	1.52 (0.87)	1.62 (1.11)	1.59 (0.83)	1.62 (1.11)	1.59 (0.83)	2.00 (1.20)	2.00 (1.20)	2.00 (1.20)	2.00 (1.20)	2.00 (1.20)	2.00 (1.20)	2.00 (1.20)	2.00 (1.20)	2.00 (1.20)	2.00 (1.20)	2.00 (1.20)	2.00 (1.20)	
Problems with peers	3.30 (0.46)	3.25 (0.47)	3.12 (0.46)	2.97 (0.67)	3.17 (0.51)	3.13 (0.50)	3.27 (0.42)	3.12 (0.53)	3.10 (0.47)	3.07 (0.52)	3.10 (0.47)	3.07 (0.52)	2.96 (0.44)	2.96 (0.44)	2.96 (0.44)	2.96 (0.44)	2.96 (0.44)	2.96 (0.44)	2.96 (0.44)	2.96 (0.44)	2.96 (0.44)	2.96 (0.44)	2.96 (0.44)	2.96 (0.44)	

Higher scores indicate greater delinquency, greater alcohol frequency, greater number of drinks, greater parental relationship quality, greater parental psychological control, greater parental criticism, greater depression, greater emotional reactivity, greater self-esteem, greater social anxiety, greater past year ideation, greater likelihood of future attempt, and greater friendship quality

experienced 20 depressive symptoms (e.g., felt sad) on a 5-point scale from 1 (*none of the time*) to 5 (*most of the time*). Emotional reactivity was assessed using 13 items from the Emotion Reactivity Scale (e.g., I get angry at people very easily) (Nock et al. 2008), which required participants to indicate on a 5-point scale the extent to which each statement was 1 (not at all like me) to 5 (completely like me). Self-esteem was assessed using Rosenberg's (1965) 10-item scale, and required participants to indicate the extent to which they agreed or disagreed to items such as "I take a positive attitude toward myself" using a 5-point scale from 1 (*strongly disagree*) to 5 (*strongly agree*). Finally, social anxiety was assessed using 14 items (e.g., I feel shy around people my age that I do not know) from the Social Anxiety Scale for Children-Revised (SASC-R, La Greca and Stone 1993). Participants responded using a 4-point scale from 1 (*almost never or never*) to 4 (*almost always or always*). All four measures of internalizing behaviors demonstrated acceptable inter-item reliability at Time 1 and Time 2 (Cronbachs = .90–.93), and loaded onto one factor at each time point (factor scores ranged from .71 to .76). Thus, a standardized composite score of internalizing behaviors was created at each time point, with higher scores indicating greater internalizing behaviors.

### Suicidal Ideation

Participants completed two items from the Suicide Behaviors Questionnaire-Revised (SBQR; Osman 2002) at both time points. First, participants indicated: (1) their frequency of suicidal ideation over the past 12 months (i.e., past year suicidal ideation) on a scale from 1 (*never*) to 5 (*very often*), and (2) their likelihood of a future suicidal attempt (i.e., future suicidal behaviour) from 1 (*never*) to 7 (*very likely*). The two measures were combined into a composite measure of suicidal ideation (i.e., factor scores .75 and .78). The SBQR has been shown to have good internal consistency and validity in previous research (Osman 2002). Cronbach's alpha at Time 1 was .73 and Time 2 was .79.

### Problem Relations with Peers

Friendship quality was assessed at both time points using 18 items (e.g., My friends accept me as I am) from Armsden and Greenberg's (1987) Parent and Peer Attachment Scale. Participants used a 4-point scale of 1 (*almost never or never*) to 4 (*almost always or always*) to indicate the extent to which each statement applied to them. The Cronbach's alpha was .89 at Time 1 and .91 at Time 2.

### Missing Data

Missing data occurred within each assessment time point because some students did not finish the entire questionnaire (5 % of data at Time 1 and 2 % at Time 2). Missing data also occurred at Time 2 due to attrition (i.e., students who were no longer registered could not be reached due to outdated contact information, or participants chose not to participate again at Time 2). As missing data were not dependent on the values of the study measures, it is reasonable to assume that these data are missing at random (Schafer and Graham 2002). Missing values were imputed using the EM (expectation-maximum) algorithm. EM is an iterative maximum-likelihood (ML) procedure in which a cycle of calculating means and covariances followed by data imputation is repeated until a stable set of estimated missing values is reached. Methodological research has demonstrated that ML estimation is preferable to pair-wise deletion, list-wise deletion, or means substitution (Schafer and Graham 2002).

### Plan of Analysis

Participants who indicated on the ISAS that they had engaged in NSSI were divided first into different groups depending on their engagement in NSSI (e.g., new beginners, recovered injurers, relapsers, desisters, and persistent injurers). Group differences in NSSI characteristics at Time 1 then were assessed using ANOVAs and follow up analyses. Next, groups were compared on several markers of psychosocial risk at Time 1 and Time 2, again using ANOVA and follow up analyses. Given the use of multiple ANOVAs, a Bonferroni correction was applied and a reduced alpha of 0.003 was used to determine significance. Finally, to examine whether change in psychosocial risk over time was associated with NSSI group membership, we conducted a Discriminant Function Analysis (DFA).

## Results

### Preliminary Analyses

Among self-injuring participants at Time 1, 5.9 % of participants had engaged in NSSI once, 15.8 % engaged in the behavior 2–4 times, 24 % engaged in the behavior 5–10 times, 33.0 % engaged in the behavior 11–50 times, 7.1 % engaged in the behavior 51–100 times and 14.2 % engaged in the behavior more than 100 times. The most commonly endorsed types of self-injury were pinching (24 %), self-hitting and head banging (21.9 %), and cutting (12.1 %).

## Group Membership

Participants who reported a lifetime history of NSSI at Time 1 were subdivided depending on whether they reported *current* engagement in NSSI (i.e., engagement in NSSI within the year prior to assessment) at Time 1 and Time 2. The first group of participants ( $N = 27$ ) had no prior history of NSSI at Time 1 but started self-injuring for the first time within the past year at Time 2 (i.e., new beginners). The second group ( $N = 195$ ) had not engaged in NSSI within the past year at Time 1 or within the past year at Time 2 (i.e., recovered injurers). A third group of participants ( $N = 47$ ) had not engaged in NSSI within the past year at Time 1, but did report engagement in NSSI within the past year at Time 2 (i.e., relapsers). A fourth group ( $N = 134$ ) reported engagement in NSSI within the past year at Time 1 but had not engaged in NSSI within the past year at Time 2 (i.e., desisters). Finally, the fifth group ( $N = 69$ ) reported engagement in NSSI within the past year both at Time 1 and at Time 2 (i.e., persistent injurers). We also randomly selected a comparison group of non-injuring participants ( $N = 200$ ) from the larger sample.

## Group Differences at Time 1

First we examined whether the four NSSI groups that reported a lifetime history of NSSI at Time 1 (i.e., recovered injurers, relapsers, desisters, persistent injurers) differed on NSSI characteristics at Time 1 (i.e., lifetime frequency, pain during NSSI, time elapsed between urge and act, whether they were alone during NSSI, and desire to stop self-injuring). The new beginners were excluded from this analysis, because they did not report on NSSI characteristics at Time 1 (since they had not yet started self-injuring). Results of the ANOVA analyses indicated that the assumption of homogeneity of variance was violated for some comparisons, so the Welch significance test is presented for those ANOVA results. There were significant differences among groups in NSSI frequency at Time 1,  $F(3, 435) = 36.36$ ,  $p < 0.001$  and desire to stop self-

injuring, Welch's  $F(3, 128.24) = 8.02$ ,  $p < 0.001$ . Follow-up analyses indicated that recovered injurers and relapsers reported significantly lower frequency of lifetime engagement in NSSI at Time 1 than desisters and persistent injurers (see Table 2). Recovered injurers and desisters also reported significantly greater desire to stop self-injuring at Time 1 compared to persistent injurers.

We then examined whether the 5 NSSI groups (i.e., new beginners, recovered injurers, relapsers, desisters, persistent injurers), as well as the comparison group of non-injuring participants, significantly differed at Time 1 and at Time 2 on several measures of psychosocial risk (i.e., problem behaviors, problems with parents, internalizing behaviors, suicidal ideation, and problem relations with peers). Results of the ANOVA analyses indicated that the assumption of homogeneity of variance was violated for some comparisons, so the Welch significance test is presented for those ANOVA results. Results indicated that at both time periods, there were significant group differences in problems with parents at Time 1 and Time 2,  $F(5, 660) = 6.496$ ,  $p < 0.001$  and  $F(5, 660) = 7.499$ ,  $p < 0.001$ , internalizing behaviors at Time 1 and Time 2,  $F(5, 660) = 12.487$ ,  $p < 0.001$  and  $F(5, 660) = 15.843$ ,  $p < 0.001$ , suicidal ideation at Time 1 and Time 2, Welch's  $F(5, 139.79) = 18.36$ ,  $p < 0.001$  and Welch's  $F(5, 136.961) = 21.323$ ,  $p < 0.001$ , and problem relations with peers at Time 1 and Time 2,  $F(5, 660) = 6.677$ ,  $p < 0.001$  and  $F(5, 660) = 4.856$ ,  $p < 0.001$ . Significant follow-up comparisons among groups at Time 1 and Time 2 are presented in Table 3 and group means on all measures of psychosocial risk are depicted in Fig. 1.

At Time 1, individuals in the persistent group (i.e., current NSSI at Time 1 and Time 2) were at highest risk relative to the other groups. Persistent injurers reported significantly greater problems with parents than the new beginners and non-injurers and significantly greater internalizing behaviors than the other groups (except for the desisters). Persistent injurers reported significantly greater suicidal ideation than all the other groups, and more problems with peers than relapsers and non-injurers.

**Table 2** Group differences in NSSI characteristics at Time 1

	Recovered (N = 195)	Relapsers (N = 42)	Desisters (N = 134)	Persistent (N = 68)
Lifetime frequency of NSSI	3.05 (1.19) <sup>a</sup>	3.00 (1.23) <sup>a</sup>	4.19 (1.26) <sup>b</sup>	4.41 (1.32) <sup>b</sup>
Pain when self-injuring	1.99 (0.71) <sup>a</sup>	2.06 (0.78) <sup>a</sup>	2.08 (0.73) <sup>a</sup>	2.20 (0.71) <sup>a</sup>
Time elapsed	2.35 (1.67) <sup>a</sup>	2.20 (1.87) <sup>a</sup>	1.98 (1.58) <sup>a</sup>	2.00 (1.65) <sup>a</sup>
Alone when self-injuring	2.39 (0.73) <sup>a</sup>	2.26 (0.85) <sup>a</sup>	2.31 (0.76) <sup>a</sup>	2.19 (0.72) <sup>a</sup>
Desire to stop self-injuring	2.66 (0.52) <sup>a</sup>	2.37 (0.78) <sup>a,b</sup>	2.53 (0.67) <sup>a</sup>	2.21 (0.76) <sup>b</sup>

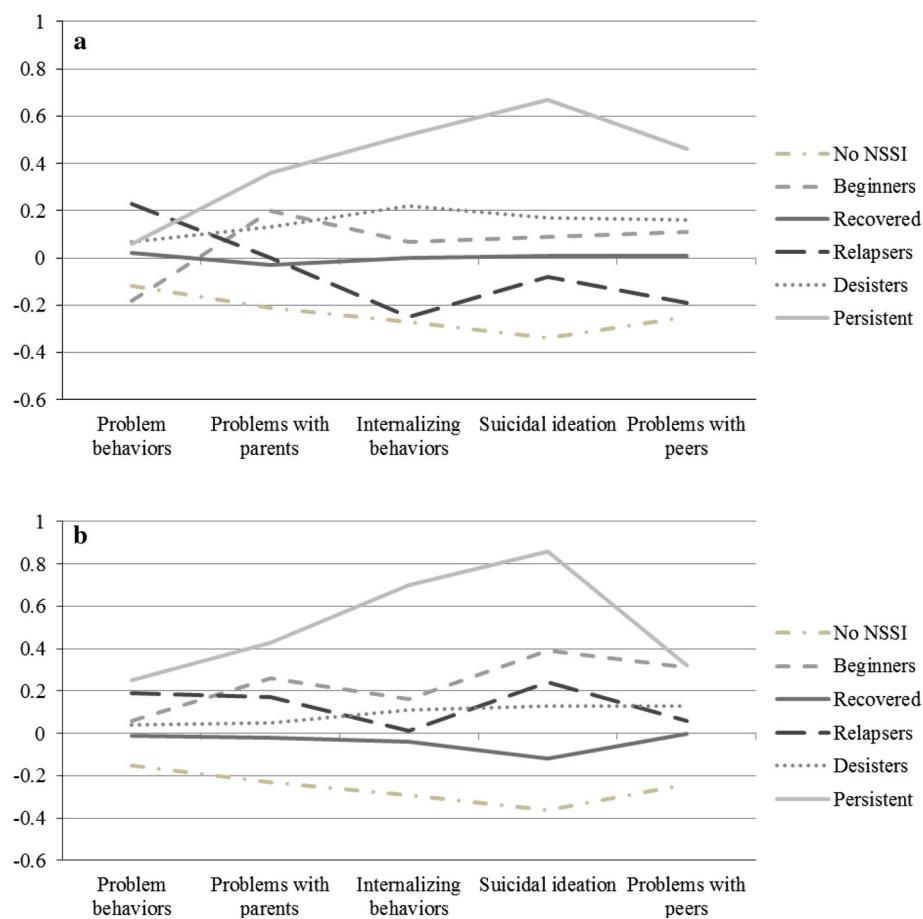
Means in the same row with different superscripts are significantly different at  $p < .001$ . Means in the same row with the same subscripts do not significantly differ. Higher scores indicate higher frequency of engagement in NSSI, greater pain during NSSI, greater time elapsed between urge to self-injure and act of NSSI, more likely to be alone when engaging in NSSI, and greater desire to stop NSSI

**Table 3** Standardized means differences among groups at Time 1 and Time 2

	Beginners (N = 27)	Recovered (N = 195)	Relapsers (N = 42)	Desisters (N = 134)	Persistent (N = 68)	No NSSI (N = 200)
Time 1						
Problem behaviors	-0.18 (0.94) <sup>a</sup>	0.02 (0.82) <sup>a</sup>	0.23 (1.13) <sup>a</sup>	0.07 (0.89) <sup>a</sup>	0.07 (0.87) <sup>a</sup>	-0.12 (0.82) <sup>a</sup>
Problems with parents	0.20 (0.89) <sup>a</sup>	-0.03 (0.79) <sup>a,b</sup>	0.00 (0.81) <sup>a,b</sup>	0.13 (0.85) <sup>a,b</sup>	0.36 (0.86) <sup>b</sup>	-0.21 (0.76) <sup>a</sup>
Internalizing behaviors	0.07 (0.79) <sup>a,b</sup>	0.00 (0.80) <sup>a,b</sup>	-0.25 (0.58) <sup>a</sup>	0.22 (0.93) <sup>b,c</sup>	0.52 (0.86) <sup>c</sup>	-0.27 (0.80) <sup>a</sup>
Suicidal ideation	0.09 (0.75) <sup>b</sup>	0.01 (0.85) <sup>b</sup>	-0.08 (0.70) <sup>a,b</sup>	0.17 (0.98) <sup>b</sup>	0.67 (1.26) <sup>c</sup>	-0.34 (0.40) <sup>a</sup>
Problem relations with peers	0.11 (0.95) <sup>a,b</sup>	0.01 (1.06) <sup>a,b</sup>	-0.19 (0.87) <sup>a</sup>	0.16 (0.98) <sup>a,b</sup>	0.46 (0.92) <sup>b</sup>	-0.25 (0.94) <sup>a</sup>
Time 2						
Problem behaviors	0.06 (1.08) <sup>a</sup>	-0.01 (0.81) <sup>a</sup>	0.19 (1.03) <sup>a</sup>	0.04 (0.79) <sup>a</sup>	0.25 (0.01) <sup>a</sup>	-0.15 (0.78) <sup>a</sup>
Problems with parents	0.26 (1.05) <sup>b,c</sup>	-0.02 (0.85) <sup>a,b</sup>	0.17 (0.88) <sup>a,b,c</sup>	0.05 (0.84) <sup>a,b,c</sup>	0.43 (0.89) <sup>c</sup>	-0.23 (0.78) <sup>a</sup>
Internalizing behaviors	0.16 (0.92) <sup>b</sup>	-0.04 (0.77) <sup>a,b</sup>	0.01 (0.74) <sup>a,b</sup>	0.11 (0.87) <sup>b</sup>	0.70 (0.97) <sup>c</sup>	-0.29 (0.77) <sup>a</sup>
Suicidal ideation	0.39 (1.20) <sup>c</sup>	-0.12 (0.77) <sup>a,b</sup>	0.24 (1.03) <sup>c</sup>	0.13 (0.88) <sup>b,c</sup>	0.86 (1.32) <sup>d</sup>	-0.36 (0.42) <sup>a</sup>
Problem relations with peers	0.31 (1.31) <sup>b</sup>	0.00 (0.98) <sup>a,b</sup>	0.06 (1.02) <sup>a,b</sup>	0.13 (1.01) <sup>a,b</sup>	0.32 (0.94) <sup>b</sup>	-0.24 (0.93) <sup>a</sup>

Means in the same row with different superscripts are significantly different at  $p < .001$ . Means in the same row with the same subscripts do not significantly differ. Higher scores indicate greater problem behaviors, problems with parents, internalizing behaviors, suicidal ideation, and problem relations with peers

**Fig. 1** **a** Standardized group means on measures of psychosocial risk at Time 1, **b** standardized group means on measures of psychosocial risk at Time 2



Although the other NSSI groups did not differ from each other across many measures of psychosocial risk, the desisters reported significantly greater internalizing behaviors

than the relapsers and non-injurers. The new beginners, recovered injurers, and desisters also reported greater suicidal ideation than the non-injurers.

## Group Differences at Time 2

At Time 2, the persistent injurers were still at greater risk relative to the other groups. Persistent injurers reported significantly more problems with parents than the recovered injurers and non-injurers, greater internalizing behaviors and suicidal ideation than all the other groups, and more problems with peers than the non-injurers. Individuals in the desisters group also reported greater internalizing behaviors and suicidal ideation than non-injurers, and relapsers reported greater suicidal ideation than recovered injurers and non-injurers. New beginners reported greater suicidal ideation than recovered-injurers and non-injurers, and new beginners also reported significantly greater problems with parents, internalizing behaviors, and problems with peers than the non-injurers.

## Discriminating Groups by Change in Psychosocial Risk

To examine whether change over time in each of the measures of psychosocial risk discriminated among the 5 self-injury groups (i.e., new beginners, recovered injurers, relapsers, desisters, persistent injurers) and the comparison group of non-injurers, we conducted a discriminant function analysis. Standardized residual change scores for each of the five measures of psychosocial risk (i.e., problem behaviors, problems with parents, internalizing behaviors, suicidal ideation, and problem relations with peers) were simultaneously entered into a discriminant function analysis (DFA) as predictors to determine which risk factors best discriminated among the six groups (see Tabachnick and Fidell 2007). Unlike the univariate analyses, DFA provides an estimate of the relative importance of change in each of the risk factors to the separation among the groups when examined simultaneously (Meyers et al. 2003). The relative importance of each measure to the discriminant function was indexed using the standardized canonical discriminant function coefficients. Given that equality of variance among groups could not be assumed for all predictors, the DFA was classified using separate covariance matrixes.

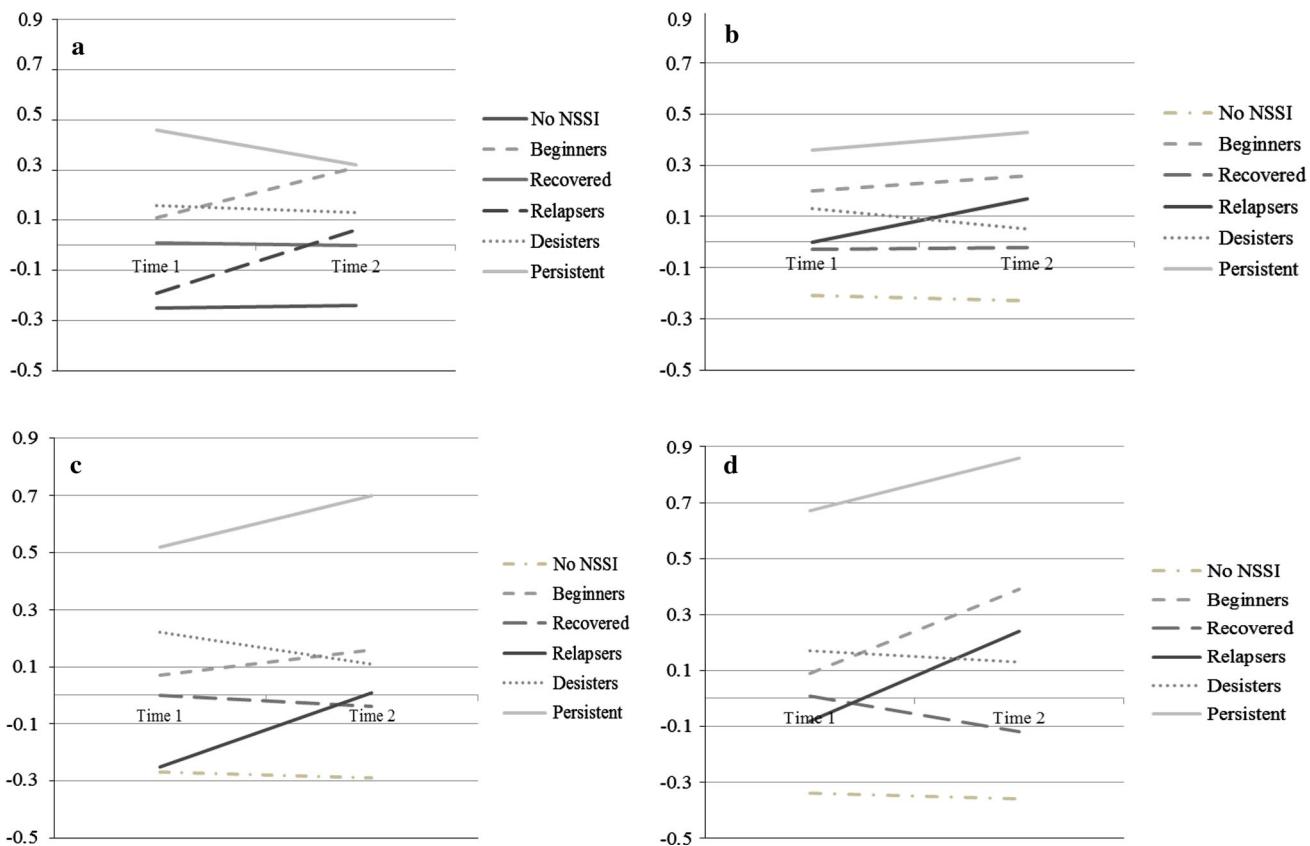
One significant discriminant function was identified, Wilk's  $\lambda = .865$ ,  $p < 0.001$ , explaining 81 % of the separation among groups. An examination of the discriminant function means (i.e., centroids) for persistent injurers, new beginners, relapsers, desisters, recovered injurers, and non-injurers (.800, .597, .483, -.057, -.179, -.241) indicated that the function best discriminated the persistent injurers, new beginners, and relapsers from the other groups. The measures making notable, unique contributions to the discriminant function when controlling for the other measures entered into the analysis (i.e., standardized discriminant function coefficients of .10 or greater) included increased

suicidal ideation (.67), increased internalizing behaviors (.36), increased problem behaviors (.42), and increased problems with parents (.13) (see Fig. 2a–d).

## Discussion

Despite the widespread prevalence of NSSI among young adults (Cawood and Huprich 2011; Gratz et al. 2002; Klonsky and Glenn 2009; Whitlock et al. 2006), little is known about the development and maintenance of NSSI during the young adult years. Moreover, researchers have yet to examine whether individuals with varying patterns of NSSI engagement can be differentiated on the basis of psychosocial risk. Longitudinal examinations of NSSI also have been largely variable-centered, and thus do not take into account individual variability in NSSI engagement among self-injurers. Importantly, identifying individuals at risk for NSSI onset and continued engagement may provide invaluable insight into the factors that promote NSSI engagement over time, as well as inform intervention and prevention programming aimed at targeting individuals most at risk for NSSI. To address these important gaps in the literature, we conducted a person-centered examination of individuals with different patterns of NSSI engagement over time (i.e., new beginners, recovered injurers, relapsers, desisters, and persistent injurers). We found that 46 % of self-injurers reported current engagement in NSSI in first year university, which is consistent with studies that find that many undergraduates with lifetime histories of NSSI report current (i.e., past year) engagement in NSSI (Glenn and Klonsky 2011; Heath et al. 2009; Klonsky and Olino 2008; Whitlock et al. 2006; Wilcox et al. 2011). Although most self-injurers showed decreased NSSI engagement 1 year later (i.e., recovered injurers, desisters), many self-injurers continued to engage in NSSI (i.e., persistent injurers) and some self-injurers started self-injuring for the first time, or again (i.e., new beginners and relapsers). Our findings highlight that NSSI is a transiently occurring behavior, and that the transition from first- to second-year university is associated with both NSSI engagement (i.e., new beginners, relapsers, persistent injurers) and cessation (i.e., recovered injurers, desisters).

According to Nock's (2010) model of the development and maintenance of NSSI, increases in psychosocial risk over time may undermine an individual's ability to cope with distress, and thus lead to NSSI (i.e., a form of coping behavior). In the present study, we examined whether individuals with different patterns of NSSI engagement could be differentiated on measures of psychosocial risk at Time 1 and Time 2, as well as change in psychosocial risk from Time 1 to Time 2. Consistent with Nock's model, we found that individuals who engaged in NSSI in first- and



**Fig. 2** **a** Changes in problem behaviors over time, **b** changes in problems with parents over time, **c** changes in internalizing behaviors over time, **d** changes in suicidal ideation over time

second-year university (i.e., persistent injurers), reported significantly higher levels of internalizing behaviors (e.g., depressive symptoms, emotional reactivity) and greater suicidal ideation than the other self-injuring groups. As predicted, these individuals not only reported greater psychosocial risk at both time points, but the discriminant function analysis revealed that these individuals also were discriminated from the comparison group of recovered injurers, desisters, and non-injurers by increases in problem behaviors, problems with parents, internalizing behaviors, and suicidal ideation over time. Individuals who engage in NSSI in both first- and second-year of university, therefore, may be at increased risk for psychosocial problems more generally, and may be a high risk group which is especially important for clinicians to identify.

Another important gap in the literature on change in NSSI engagement over time is that researchers have yet to examine first time NSSI onset among young adults, using a longitudinal study design. To address this gap in the literature, we examined the prevalence of new NSSI onset from first- to second-year university, as well as the risk factors associated with first time engagement in NSSI. Over the 1 year period, only 27 young adults started engaging in NSSI for the first time (i.e., new beginners).

Although no previous research has examined NSSI onset over time among young adults, previous studies relying on concurrent retrospective self-report data indicate that close to 40 % of self-injurers begin self-injuring some time between the ages of 17–24 (Heath et al. 2008; Whitlock et al. 2006). Our findings reveal that most young adults in university, however, likely have their onset of NSSI in late adolescence, rather than early adulthood, because we found that very few young adults reported new NSSI onset from first- to second-year university. Although new beginners reported similar levels of psychosocial risk as compared to the comparison group of non-injurers at baseline, 1 year later the new beginners reported significantly greater problems with parents, internalizing behaviors, suicidal ideation, and problems with peers than the non-injuring young adults. New onset NSSI in university, therefore, seems to coincide with increased psychosocial risk over time, as predicted by Nock's model on the development and maintenance of NSSI.

The results of our study also underscore the importance of assessing recency of NSSI engagement among young adults. More specifically, at Time 1 recovered injurers (i.e., individuals with a lifetime history of NSSI who had not engaged in NSSI within the past year at Time 1 or Time 2,

$N = 195$ ) reported higher suicidal ideation than the non-injuring group, although the two groups did not differ on other measures of psychosocial risk. Interestingly, at Time 2, the recovered injurers did not differ from the non-injurers on any of the measures of psychosocial risk, including suicidal ideation. In contrast, young adults who stopped self-injuring from Time 1 to Time 2 (i.e., desisters) still reported greater internalizing behaviors and suicidal ideation than the comparison group of non-injurers at Time 2. In several studies on NSSI, researchers have grouped together individuals who report lifetime histories of NSSI, regardless of most recent NSSI episode (Cawood and Huprich 2011; Heath et al. 2009; Kerr and Muehlenkamp 2010). Our results indicate that there are differences in psychosocial risk among self-injurers depending on most recent engagement in NSSI. Future research on NSSI, therefore, should take into account individual variability among self-injurers in NSSI recovery status, as individuals with longer remission periods may be at lower risk than individuals who report more recent engagement. In particular, and of critical importance to clinicians, our results indicate that more recent engagement in NSSI is associated with greater risk of suicidal behavior.

Overall, consistent with Nock's model, we found that change in psychosocial risk over time largely differentiated amongst our self-injuring groups. More specifically, the discriminant function analysis revealed that new beginners, relapsers, and persistent injurers were differentiated from recovered injurers and desisters by increases over time in problem behavior involvement, problems with parents, internalizing behaviors, and suicidal ideation. The finding that increased psychosocial risk was associated with NSSI onset and continued engagement in NSSI is consistent with a larger body of literature that has shown that problem behavior engagement (Gollust et al. 2008; Serras et al. 2010), depression and anxiety (Heilbron and Prinstein 2010), suicidality (Hamza et al. 2012; Whitlock and Knox 2007), difficulty regulating emotions (Heath et al. 2008; Muehlenkamp et al. 2010a, b), and problems with parents and peers (Gratz et al. 2002; Heath et al. 2009; Yates et al. 2008) are associated with NSSI engagement among young adults.

Our results also highlight that differentiating between intrapersonal and interpersonal risk factors for NSSI engagement may be useful when trying to identify individuals most at risk. Given that research has shown that NSSI is a way for individuals to regulate intrapersonal functions (i.e., to reduce stress, anxiety) and interpersonal functions (i.e., to elicit help from others) (Klonsky and Glenn 2009; Nock and Prinstein 2004), it is not surprising that individuals who experience increases in psychosocial risk over time show increased risk for NSSI onset, as NSSI may serve as a form of coping behavior (Nock 2010). Importantly, we found that intrapersonal factors (i.e.,

internalizing behaviors, suicidal ideation) were more strongly associated with NSSI engagement than interpersonal factors (i.e., problems with parents and peers), which is consistent with a broader literature that has found that individuals who engage in NSSI do so primarily for intrapersonal functions (Klonsky and Glenn 2009). Moreover, recent research indicates that individuals who engage in NSSI for intrapersonal reasons may be at greater risk for suicidal behavior as compared to individuals who engage in NSSI for interpersonal reasons (Klonsky and Olino 2008; Nock and Prinstein 2005). Our results indicate that individuals who engage in NSSI for intrapersonal functions, who report high levels of internalizing behaviors (i.e., depressive symptoms, high emotional reactivity), therefore, may be especially important for clinicians to identify as these individuals may be at risk for continued NSSI engagement and suicidal behaviors.

Despite increased consensus among researchers that NSSI and suicidal behaviors are differentiated with respect to intention, frequency and lethality of behavior (Baetens et al. 2011; Guertin et al. 2001; Hamza et al. 2012; Muehlenkamp and Gutierrez 2004; Whitlock and Knox 2007), the results of our study indicate that these two behaviors are associated among young adults over time. More specifically, increases in suicidal ideation over time differentiated new beginners, relapsers, and persistent injurers from the other groups (i.e., recovered injurers and desisters). Interestingly, individuals who were not currently self-injuring at Time 1, but had started self-injuring again at Time 2 (i.e., relapsers) reported higher levels of suicidal ideation from the non-injurers at Time 2, but not at Time 1, a finding that is consistent with a larger literature that engagement in NSSI, may in turn, lead to increased engagement in suicidal behavior (Asarnow et al. 2011; Prinstein et al. 2008; Wilkinson et al. 2011). It is also noteworthy, however, that new beginners (i.e., individuals who had not yet started self-injuring at Time 1, but who started over the 1 year period) reported greater suicidal ideation than the non-injurers at Time 1 and Time 2. This finding indicates that suicidal ideation (i.e., thinking about ending one's own life) may have preceded the development of NSSI among a minority of our sample (i.e., new beginners). Indeed, NSSI may serve as a way to prevent or inhibit the desire to engage in more lethal forms of self-injury (Nixon et al. 2002; Laye-Gindhu and Schonert-Reichl 2005), which Klonsky (2007) has referred to as an anti-suicide function of NSSI. Clinicians may want to assess past year suicidal ideation, therefore, to identify individuals who may be at increased risk for first time NSSI engagement. Future research should also examine the developmental timelines of NSSI onset, suicidal ideation and suicidal behavior to better understand associations among these self-injurious thoughts and behaviors, with varying intents.

According to the theory on the stages of change model, an individual's own willingness to terminate a behavior is an important determinant of behavior engagement (Norcross et al. 2011; Prochaska and DiClemente 1983). No previous research, however, has explored whether an individual's desire to stop self-injuring is associated with their NSSI engagement over time. To address this gap in the literature we examined whether self-injurers varied on self-reported willingness to stop engaging in NSSI. Although individuals who engaged in past year NSSI at Time 1 (i.e., both the desisters and persistent groups) reported greater lifetime frequencies of NSSI than the other self-injuring groups, individuals who stopped self-injuring over the 1 year period (i.e., the desisters) reported significantly greater desire to stop self-injuring than individuals who continued to engage in NSSI over the 1 year period (i.e., persistent injurers). Unlike Glenn and Klonsky (2011), therefore, we did not find a difference between persistent injurers and desisters in NSSI frequency; however, their study was limited by a small sample size. Moreover, Glenn and Klonsky did not assess motivation to stop self-injuring, which we found to be an important discriminator between persistent injurers and desisters. An important goal for NSSI intervention efforts, therefore, should be to target motivation to stop self-injuring among self-injurers.

Despite the many strengths of our study, including the use of a large sample, the use of a longitudinal design, and our assessment of associations among change in psychosocial risk and NSSI engagement, our study is not without limitations. First, although our study specifically examines longitudinal patterns of NSSI over time, we did not specifically test bidirectional associations between NSSI and psychosocial risk factors. Although we tested whether psychosocial risk factors were associated with different patterns of NSSI engagement over time (e.g., relapse, recovery) it may be that the observed effects are bidirectional and that NSSI engagement also predicts change in psychosocial risk over time. Nevertheless, our findings provide clinicians with several measures of psychosocial risk that can be used to discriminate self-injurers at high risk for current and future engagement in NSSI. Future research could specifically test whether interventions aimed at reducing psychosocial risk factors indirectly reduce NSSI engagement.

Second, although the present sample included a large sample representative of a particular university in Canada, the majority of the participants enrolled in the study were Caucasian and born in Canada; therefore, our findings may not generalize to other geographic regions, including those with differing ethnic and/or demographic backgrounds. Furthermore, our study specifically sampled first-year university students and may not be generalizable to the

wider student population (i.e., upper year students) or young adults not attending university. Regardless, research has shown that first year university may represent a period of increased NSSI initiation as well as increased risk for suicidal ideation (Heath et al. 2008; Whitlock et al. 2008), so understanding risk for NSSI and suicidal behavior during this time period is important to clinicians in the areas of risk assessment and intervention.

Third, another limitation of the present study was the reliance on a single source of information (i.e., self-reports). The study would have benefited from corroboration by other sources (i.e., parents, peers, etc.) at multiple assessment periods. Moreover, our study required participants to recall their lifetime engagement in NSSI. Thus, it is possible that our study is subject to recall errors. To address this limitation, in addition to assessing lifetime NSSI, we incorporated assessments of more recent self-injurious behavior engagement, as well as past year suicidal ideation. Regardless, it would be useful for future research to assess frequency of NSSI behavior in real time using ecological moments sampling, such as the use of daily diaries. Reporting on multiple incidents of NSSI behaviors also would provide an opportunity to assess the characteristics of multiple episodes of self-injurious behaviors.

## Conclusions

NSSI appears to be a widely occurring behavior among young adults (Glenn and Klonsky 2011; Heath et al. 2009; Klonsky and Olino 2008; Wilcox et al. 2011), yet little research has examined the development and maintenance of NSSI over time during this age period. Moreover, researchers have yet to examine whether individuals with varying patterns of NSSI engagement can be differentiated on the basis of psychosocial risk, but identifying individuals at risk for NSSI onset and continued engagement has critical implications for prevention and intervention efforts. To address these gaps in the literature, we conducted a person-centered longitudinal examination of varying patterns of NSSI engagement (i.e., new engagement over time, continued recovery over time, relapse, continuation over time, and cessation) among a large sample of young adults. Overall, we found that many self-injurers reported current engagement in NSSI in first year university, though the majority of these individuals stopped self-injuring 1 year later. Self-injurers who reported persistent engagement in NSSI at Time 1 and Time 2 reported the highest levels of psychosocial risk relative to the other groups, particularly the comparison group of non-injurers. Importantly, we also found that first time engagement, relapsed injuring, and persistent injuring among university students coincided with increases in

problem behaviors, problems with parents, internalizing behaviors, and suicidal ideation. Finally, individuals who stopped engaging in NSSI from Time 1 to Time 2 also reported significantly greater motivation to stop self-injuring as compared to individuals who persisted, highlighting the role of individual motivation in the cessation of NSSI. Our findings indicate that change in psychosocial risk factors over time, as well as desire to stop self-injuring, are important factors to consider when determining risk for future NSSI engagement among self-injurers.

**Acknowledgments** Teena Willoughby acknowledges funding received from the Social Sciences and Humanities Research Council of Canada.

**Author Contributions** Both authors have contributed significantly to the manuscript and consent to their names on the paper. C.H. conceived the study, participated in the design and interpretation of data, and helped to draft the manuscript. T.W. helped conceive the study, participated in the design and interpretation of data, and helped to draft the manuscript. All authors read and approved the final manuscript.

## References

- Armsden, G. C., & Greenberg, M. T. (1987). The inventory of parent and peer attachment: Individual differences and their relationship to psychological well-being in adolescence. *Journal of Youth and Adolescence*, 16, 427–454.
- Asarnow, J. R., Porta, G., Spirito, A., Emslie, G., Clarke, G., Wagner, K. D., et al. (2011). Suicide attempts and nonsuicidal self-injury in the treatment of resistant depression in adolescents: Findings from the TORDIA study. *Journal of the American Academy of Child and Adolescent Psychiatry*, 50, 772–781.
- Baetens, I., Claes, L., Muehlenkamp, J., Grietens, H., & Onghena, P. (2011). Nonsuicidal and suicidal self-injurious behavior among Flemish adolescents: A web-base survey. *Archives of Suicide Research*, 15, 56–57.
- Barber, B. K. (1996). Parental psychological control: Revisiting a neglected construct. *Child Development*, 67, 3296–3319.
- Bjarehed, J., Pettersson, K., Wangby-Lundh, M., & Lundh, L.-G. (2012). Examining the acceptability of attractiveness, and the effects of a school-based validating interview for adolescents who self-injure. *The Journal of School Nursing*, 29, 225–234.
- Cawood, C. D., & Huprich, S. K. (2011). Late adolescent nonsuicidal self-injury: The roles of coping style, self-esteem, and personality pathology. *Journal of Personality Disorders*, 25, 765–781.
- Frost, R. O., Marten, P., Lahart, C., & Rosenblate, R. (1990). The dimensions of perfectionism. *Cognitive Therapy and Research*, 14, 449–468.
- Glenn, C. R., & Klonsky, E. D. (2009). Social context during non-suicidal self-injury indicates suicide risk. *Personality and Individual Differences*, 46, 25–29.
- Glenn, C. R., & Klonsky, E. D. (2011). Prospective prediction of nonsuicidal self-injury: A 1-year longitudinal study in young adults. *Behavior Therapy*, 42, 751–762.
- Gollust, S. A., Eisenberg, D., & Golberstein, E. (2008). Prevalence and correlates of self-injury among university students. *Journal of American College Health*, 56, 491–498.
- Gould, M. S., Morrocco, F. A., Kleinman, M., Thomas, J. G., Mostkoff, K., Cote, J., et al. (2005). Evaluating Iatrogenic risk of youth suicide screening programs: A randomized controlled Trial. *The Journal of the American Medical Association*, 293, 1635–1643.
- Gratz, K. L., Conrad, S. D., & Roemer, L. (2002). Risk factors for deliberate self-harm among college students. *American Journal of Orthopsychiatry*, 72, 128–140.
- Guertin, T., Lloyd-Richardson, E., Spirito, A., Donaldson, D., & Boergers, J. (2001). Self-mutilative behavior in adolescents who attempt suicide by overdose. *Journal of the American Academy of Child and Adolescent Psychiatry*, 39, 470–480.
- Hakin, B. L., & Abela, J. R. Z. (2011). Nonsuicidal self-injury in adolescence: Prospective rates and risk factors in a 2 ½ year longitudinal study. *Psychiatry Research*, 186, 65–70.
- Hamza, C. A., Stewart, S. L., & Willoughby, T. (2012). Examining the link between nonsuicidal self-injury and suicidal behavior: A review of the literature and an integrated model. *Clinical Psychology Review*, 32, 482–495.
- Heath, N. L., Ross, S., Toste, J. R., Charlebois, A., & Nedcheva, T. (2009). Retrospective analysis of social factors and nonsuicidal self-injury among young adults. *Canadian Journal of Behavioral Science*, 41, 180–186.
- Heath, N. L., Toste, J. R., Nedcheva, T., & Charlebois, A. (2008). An examination of nonsuicidal self-injury among college students. *Journal of Mental Health Counselling*, 30, 137–156.
- Heilbron, N., & Prinstein, M. J. (2010). Adolescent peer victimization, peer status, suicidal ideation, and nonsuicidal self-injury examining concurrent and longitudinal associations. *Merrill-Palmer Quarterly*, 56, 388–419.
- Jutengren, G., Kerr, M., & Stattin, H. (2011). Adolescents' deliberate self-harm, interpersonal stress, and the moderating effects of self-regulation: A two-wave longitudinal analysis. *Journal of School Psychology*, 49, 249–264.
- Kerr, P., & Muehlenkamp, J. J. (2010). Features of psychopathology in self-injuring female college students. *Journal of Mental Health Counseling*, 32, 290–308.
- Klonsky, E. D. (2007). The functions of deliberate self-injury: A review of the evidence. *Clinical Psychology Review*, 27, 226–239.
- 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. *Journal of Psychopathology and Behavioural Assessment*, 31, 215–219.
- Klonsky, E. D., & Olino, T. M. (2008). Identifying clinically distinct subgroups of self-injurers among young adults: A latent class analysis. *Journal of Consulting and Clinical Psychology*, 76, 22–27.
- La Greca, A. M., & Stone, W. L. (1993). The Social anxiety scale for children-revised: Factor structure and concurrent validity. *Journal of Clinical Child Psychology*, 22, 17–27.
- 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.
- Lewis, S. P., Rosenrot, S. A., & Santor, D. A. (2011). An integrated model of self-harm: Identifying predictors of intent. *Canadian Journal of Behavioral Science*, 43, 20–29.
- Lewis, S., & Santor, D. (2010). Self-harm reasons, goal achievement, and prediction of future self-harm intent. *The Journal of Nervous and Mental Disease*, 198, 362–369.
- Martin, J., Bureau, J.-F., Cloutier, P., Cloutier, P., & Lafontaine, M. F. (2011). A comparison of invalidating family environment characteristics between university students engaging in self-injurious thoughts and actions and non-self-injuring university students. *Journal of Youth and Adolescence*, 40, 1477–1488.
- Mathias, C. W., Furr, M., Sheftall, A. H., Hill-Kapturczak, N., Crum, P., & Dougherty, D. M. (2012). What's the harm in

- asking about suicidal ideation? *Suicide and Life-Threatening Behavior*, 42, 341–351.
- Meyers, L. S., Gamst, G., & Guarino, A. J. (2003). *Applied multivariate research. Design and interpretations*. Thousand Oaks, CA: Sage Publications Inc.
- Muehlenkamp, J. J., & Gutierrez, P. M. (2004). An investigation of differences between self-injurious behavior and suicide attempts in a sample of adolescents. *Suicide and Life-Threatening Behavior*, 34, 12–22.
- Muehlenkamp, J. J., Kerr, P. L., Bradley, A. R., & Larsen, M. A. (2010a). Abuse subtypes and nonsuicidal self-injury: preliminary evidence of complex emotion regulation patterns. *The Journal of Nervous and Mental Disease*, 198, 258–263.
- Muehlenkamp, J. J., Walsh, B. W., & McDade, M. (2010b). Preventing non-suicidal self-injury in adolescents: the signs of self-injury program. *Journal of Youth and Adolescence*, 39, 306–314.
- Nixon, M. K., Cloutier, P. F., & Aggarwal, S. (2002). Affect regulation and the addictive aspects of repetitive self-injury in hospitalized adolescents. *Journal of the American Academy of Child and Adolescent Psychiatry*, 41, 1333–1341.
- Nock, M. K. (2010). Self-injury. *Annual Review of Clinical Psychology*, 6, 339–363.
- Nock, M. K., & Favazza, A. (2009). Non-suicidal self-injury: definition and classifications. In M. K. Nock (Ed.), *Understanding nonsuicidal self-injury: Origins, assessment and treatment*. Washington, DC: American Psychological Association.
- Nock, M. K., & Prinstein, M. J. (2004). A functional approach to the assessment of self-mutilative behavior. *Journal of Consulting and Clinical Psychology*, 72, 885–890.
- Nock, M. K., & Prinstein, M. J. (2005). Contextual features and behavioral traits of self-mutilation among adolescents. *Journal of Abnormal Psychology*, 114, 140–146.
- Nock, M. K., Wedig, M. M., Holmberg, E. B., & Hooley, J. M. (2008). The emotion reactivity scale: development, evaluation, and relation to self-injurious thoughts and behaviors. *Behavior Therapy*, 39, 107–116.
- Norcross, J. C., Krebs, P. M., & Prochaska, J. O. (2011). Stages of change. *Journal of Clinical Psychology: In Session*, 67, 143–154.
- Osman, A. (2002). *Suicide Behavior Questionnaire-Revised (SBQ-R)*. University of Northern Iowa, Department of Psychology.
- Prinstein, M. J., Heilbron, N., Guerry, J. D., Franklin, J. C., Rancourt, D., Simon, V., et al. (2010). Peer influence and nonsuicidal self-injury: Longitudinal results in community and clinically-referred adolescent samples. *Journal of Abnormal Child Psychology*, 38, 669–682.
- Prinstein, M. J., Nock, M. K., Simon, V., Aikin, J. W., Cheah, C. S. L., & Spirito, A. (2008). Longitudinal trajectories and predictors of adolescent suicide ideation and attempts following inpatient hospitalization. *Journal of Consulting and Clinical Psychology*, 76, 92–103.
- Prochaska, J. O., & DiClemente, C. C. (1983). Stages and processes of self-change in smoking: toward an integrative model of change. *Journal of Consulting and Clinical Psychology*, 51, 390–395.
- Radloff, L. S. (1977). The CES-D scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement*, 1, 385–401.
- Reynolds, S. K., Noam, L., Comtois, K. A., Murray, A., & Linehan, M. M. (2006). Risky assessments: Participant suicidality and distress associated with research assessments in a treatment study of suicidal behavior. *Suicide and Life-threatening behavior*, 26, 19–34.
- Rosenberg, M. (1965). *Society and the adolescent self-image*. Princeton, NJ: Princeton University Press.
- Schafer, J. L., & Graham, J. W. (2002). Missing data: Our view of the state of the art. *Psychological Methods*, 7, 147–177.
- Serras, A., Saules, K. K., & Cranford, J. A. (2010). Self-injury, substance use, and associated risk factors in a multi-campus probability sample of college students. *Psychology of Addictive Behavior*, 24, 119–128.
- Stats Canada. (2006). *Population by selected ethnic origins* [on-line]. Available: <http://www40.statcan.ca/l01/cst01/demo27i-eng.htm>.
- Tabachnick, B. G., & Fidell, L. (2007). *Using multivariate statistics* (5th ed.). Toronto: Allyn and Bacon.
- Whitlock, J., Eckenrode, J., & Silverman, D. (2006). Self-injurious behaviors in a college population. *Pediatrics*, 117, 1939–1948.
- Whitlock, J., & Knox, K. L. (2007). The relationship between self-injurious behavior and suicide in a young adult population. *Archives of Pediatrics and Adolescent Medicine*, 161, 634–640.
- Whitlock, J., Muehlenkamp, J., & Eckenrode, J. (2008). Variation in nonsuicidal self-injury: Identification and features of latent classes in a college population of emerging adults. *Journal of Clinical Child and Adolescent Psychology*, 37, 725–735.
- Whitlock, J., Pietrusza, C., & Purington, A. (2013). Young adult respondent experiences of disclosing self-injury, suicide-related behavior, and psychological distress in a web-based survey. *Archives of Suicide Research*, 17, 20–32.
- Wilcox, H. C., Arria, A. M., Caldeira, K. M., Vincent, K. B., Pinchevsky, G. M., & O’Grady, K. E. (2011). Longitudinal predictors of past-year non-suicidal self-injury and motives among college students. *Psychological Medicine*. Advance online publication. doi:10.1017/S0033291711001814.
- Wilkinson, P., Kelvin, R., Roberts, C., Dubicka, B., & Goodyear, I. (2011). Clinical and psychosocial predictors of suicide attempts and nonsuicidal self-injury in the adolescent depression antidepressants and psychotherapy trial. *American Journal of Psychiatry*, 168, 495–501.
- Yates, T. M., Tracy, A. J., & Luthar, S. A. (2008). Nonsuicidal self-injury among privileged youths: Longitudinal and cross-sectional approaches to developmental process. *Journal of Consulting and Clinical Psychology*, 76, 52–62.
- Yu, J., Leung, F., & Fu, K. (2012). Exploring the reciprocal relations between nonsuicidal self-injury, negative emotions and relationship problems in Chinese adolescents: A longitudinal cross-lag study. *Journal of Abnormal Child Psychology*, 40, 829–836.

## Author Biographies

**Chloe A. Hamza** is a doctoral student in lifespan developmental psychology at Brock University. Her research interests include self-injury, suicide, and adjustment among adolescents and young adults.

**Teena Willoughby** is a Professor in the Department of Psychology. Her research interests include adolescent development, particularly with regard to resilience, academic achievement, risk behaviours, and media/technology influences on lifestyle choices.