

**Emotion Profiles of University Students Engaging in Non-suicidal Self-injury:
Association with Functions of Self-injury and other Mental Health Concerns**

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Abstract

We investigated emotion profiles among undergraduate students with lived experience of non-suicidal self-injury (NSSI) and their associations with different NSSI functions and other dysregulated behaviors, including risky drinking, symptoms of borderline personality disorder, eating disorders, anxiety, depression, and stress. A sample of 270 undergraduate students (84% female, $M_{\text{age}} = 21.5$ years) with a history of self-injury completed well-validated measures of self-injury, emotion regulation, alexithymia, coping strategies and of other dysregulated behaviors. A K-means cluster analysis was conducted to extract emotion profiles from the data. Analyses of variance were used to test associations between emotion profiles, demographic factors, functions of NSSI and comorbid dysregulated behaviors. A three-cluster solution was supported. Similar characteristics were presented regarding difficulties in emotion regulation and alexithymia between the considerate emotion difficulties group and the passive moderate emotion difficulties group, although they demonstrated different associations with the functions of NSSI and other dysregulating behaviors. This emphasizes the importance of investigating the type of coping strategies used during functional assessment to inform future treatment. The no emotion difficulties group engaged in more adaptive coping strategies compared to the other two groups. These emotion profiles and their association with NSSI functions could be used to develop more person-centered interventions for NSSI.

Keywords: coping, dysregulated behavior, alexithymia, NSSI

1. Introduction

Non-suicidal self-injury (NSSI) is a prevalent behavior characterized by “deliberate and self-inflicted damage of body tissue without suicidal intent and for purposes not socially or culturally sanctioned” (International Society for the Study of Self-injury, 2018). NSSI typically begins, and is most commonly reported, in adolescence (Klonsky et al., 2011). Additionally, a second onset peak is present in young adulthood (around the age of 20 to 24 years), which, for many, coincides with university years (Gandhi et al., 2018). College years have been reported as a “sensitive period” for the onset of NSSI, since 7.0% of students report onset of repetitive NSSI during the first two years of college (Kiekens et al., 2019). Among students, engagement in NSSI is associated with poorer academic performance, attributed to overall stress, test anxiety, and general difficulties in regulating emotions (Kiekens et al., 2016). Difficulties in emotion regulation may reflect nonacceptance of the emotional response, difficulty in engaging in goal-directed behaviors, lack of impulse control, lack of emotional awareness, limited access to emotion regulation strategies and lack of emotional clarity (Gratz & Roemer, 2004). Although not engaged with suicidal intent, individuals with a history of NSSI are at increased risk of suicide (Grandclerc et al., 2016; Ribeiro et al., 2016), which is the second leading cause of death among young adults (Centers for Disease Control and Prevention, 2018). Therefore, it is of primary importance to investigate the risk factors and trait characteristics of university students engaging in NSSI to understand the factors that initiate and maintain it.

1.1 Functions of NSSI

Studies have focused on the functions of NSSI in order to identify potential underlying risk factors, but also in order to direct clinicians towards potentially effective therapies (Turner et al., 2012). The functions of NSSI have been described as intrapersonal functions when the

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aim of the act is to change one's internal state and interpersonal, when the aim is to modify the external environment (Turner et al., 2012). There are several models postulating an intrapersonal function of emotion regulation, which is also the most frequently reported function of NSSI (Taylor et al., 2018). For example, the experiential avoidance model, which suggests that NSSI shifts the attention to the NSSI act, helping the individual to manage or regulate their emotions (Chapman et al., 2006) and the emotional cascade model, which suggests that experiencing elevated levels of negative emotions, increases the odds of using NSSI as a distraction (Hughes et al., 2019; Nicolai et al., 2016; Selby et al., 2013).

Additionally, models of dissociation suggest that individuals engage in NSSI to produce an emotional response (e.g. pain) after emotional numbness (Rallis et al., 2012; Selby et al., 2014).

A theoretical model developed by Nock (2009), suggested that both interpersonal and intrapersonal experiences elicit a stressor for the individual, leading to NSSI in order to regulate either the affective experience, the social experience or both. This could be interpreted that both intrapersonal and interpersonal functions lead to an overarching theme to regulate the stressor, and potentially regulate the emotional experience, raising the question of how emotion regulation as a risk factor is associated empirically with the affect regulation function and other functions of NSSI.

Examples of other functions of NSSI are reported in a recent meta-analysis suggesting that individuals engage in NSSI to punish themselves, to communicate their levels of distress with others, and to influence or punish others (Taylor et al., 2018). NSSI as a form of punishment arises from its relation to pain. Individuals who are highly self-critical might perceive the pain arising from NSSI as a form of punishment, which then makes them feel better (Fox et al., 2019). Additionally, NSSI can be used a physical way to express distress to others, when words or other actions are not enough to communicate the experienced emotion to others or

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to influence their behavior, a need arising because of the magnitude of the negative emotion. Furthermore, according to Klonsky and Glenn (2009), NSSI is used to avoid suicide, to increase autonomy, to form interpersonal boundaries, to bond with peers, to enact revenge on someone, to self-care, and to increase toughness. According to Suyemoto's (1998) anti-suicide model, NSSI can serve as a replacement to suicide, because it also leads to a form of self-harm. Furthermore, NSSI can be perceived as an increase in autonomy, toughness and self-care because the individual is independently taking care of their own needs, which could be to feel pain or in association to another function to punish themselves.

1.2 Emotion Profiles and NSSI

One way of investigating the association of emotion regulation as a risk factor to the functions of NSSI is to identify distinct profiles reflecting differences in the experience and regulation of emotion, and relating these to the different functions of NSSI to potentially inform functional assessment and intervention efforts. Differences in the emotional experience, such as the way an experience is perceived or coped with, might lead to differences in the unmet needs from the situation, leading to a different function of NSSI. For example, difficulties in coping with emotions, such as having limited access to emotion regulation strategies, might be associated to more intrapersonal functions, such as affect regulation (Turner et al., 2012), because the individual is still experiencing an unmet need to feel better. While difficulties in awareness of emotions (i.e. being aware of the emotions experienced as an outcome of interacting with other people), might be associated with interpersonal functions, since the individual might not react accordingly to the situation (i.e. by setting limits to the relationship if needed), leading to an unmet need to set boundaries.

Preliminary studies investigating emotion profiles among participants engaging in NSSI have identified distinct profiles based on participants' difficulties in emotion regulation. However,

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they have been inconclusive, suggesting that further research is needed. Thomassin et al. (2017) identified three emotion profiles among an inpatient sample engaging in NSSI: 1) a “low deficit” group, 2) an “unaware/anger dysregulated” group and 3) an “anger inhibited group”. While Peterson et al. (2019) identified four different emotion profiles associated with forms of NSSI among undergraduate students. Two profiles demonstrated moderate emotion regulation difficulties and use of different NSSI behaviors, one profile demonstrated high emotion regulation difficulties and the last profile demonstrated low emotion regulation difficulties. Although both studies indicate a profile with less difficulties with emotion regulation, the categorization of the other “more risk-related” profiles makes them difficult to compare.

Thomassin et al. (2017) analyzed the identified profiles with regards to other NSSI characteristics, but not functions, while Peterson et al. (2019) broaden the investigation by associating the derived profiles with suicide-related factors and other behavioral factors, such as impulsivity and negative urgency. Interestingly, none of those studies have attempted to associate those profiles with other behaviors, which are highly associated to emotion regulation difficulties, such as risky drinking, borderline personality disorder, eating disorders, depression, anxiety and stress. NSSI has been associated with all of these behaviors (Bentley et al., 2015; Brickman et al., 2014; Hasking & Claes, 2020; Muehlenkamp et al., 2012), raising the question of whether their comorbidity is associated to underlying emotion profiles. This is important to consider since comorbid disorders influence treatment outcomes and should be evaluated during the assessment process for developing an appropriate treatment plan. Additionally, it has been found that comorbid disorders may increase the risk of NSSI (Auerbach et al., 2014). Therefore, while expanding on the previous studies on distinct emotion profiles is crucial to include comorbid disorders in this study, along with other variables described below. Characteristics of emotional awareness and coping strategies

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were considered in the Thomassin et al. (2017) study, but there was no indication of the level of difficulty with emotion experienced by the participants because of those characteristics.

Emotional awareness is considered part of emotion regulation, but also of alexithymia, which is a multi-dimensional difficulty, with individuals demonstrating difficulties in identifying and describing their subjective feelings and difficulties in distinguishing their feelings from physiological arousal (Timoney & Holder, 2013). These difficulties presented in alexithymia influence emotion-focused coping, causing general difficulties in emotion regulation. A strong association exists between alexithymia and NSSI, with individuals engaging in NSSI presenting more difficulties in identifying and describing their feelings (Greene et al., 2020; Norman et al., 2020). Therefore, it is important to include symptoms of alexithymia within the profile analyses to evaluate emotion-focused coping. Emotion-focused coping styles, which are strategies used to actively modify emotions by focusing on the emotion, may reflect an underlying difficulty in coping with intense emotions (Thomassin, Marion, et al., 2017), because focusing on the emotion can consume the individual, who is immersed into the negative emotion experience, potentially influencing the individual's functioning (Simons & Gaher, 2005). Therefore, considering alexithymia and other coping strategies within the emotion profiles, as forms of difficulties with emotion, could be helpful in identifying more specific emotion profiles with different levels of emotion regulation difficulties, which are not only focusing on the level of difficulty, as presented by Peterson et al. (2019), but also on emotion-focused coping.

1.3 The Current Study

In the current study we aimed to conduct an exploratory analysis to identify emotion profiles derived from variables of emotion regulation, levels of alexithymia and coping strategies among university students engaging in NSSI and to associate those profiles with the functions of NSSI. Both specific coping strategies and difficulties with emotion regulation were taken

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into consideration. Although related, coping strategies are specifically used to cope with stress, whereas difficulties with emotion regulation comprise efforts to regulate emotion in a range of contexts (Pascual et al., 2016). As such, we see value in assessing both specific coping strategies and more general difficulties in emotion regulation. Helpful coping strategies were considered to be strategies that aid the individual to cope adaptively with the emotional experience, such as acceptance, positive reappraisal and putting into perspective. Less helpful coping strategies, were considered to be strategies that could lead to more distress or avoidance of the problem without finding a solution to it, such as self-blame, catastrophizing and avoidant coping (Cawood & Huprich, 2011).

Additionally, although alexithymia has been found to be associated with emotion regulation, with some conceptual overlap, particularly with regards to emotional awareness, studies have shown that there is independence of concepts (Pandey et al., 2011). Although further understanding on the concepts of emotion regulation and alexithymia is needed to specifically determine their differences, symptoms of alexithymia, not considered part of emotion regulation, could influence the emotion profile of participants with a history of NSSI. Therefore, assessing levels of alexithymia was also considered valuable for this study. A secondary aim of this study was to investigate whether these emotion profiles were associated with other dysregulated behaviors, including risky drinking, symptoms of borderline personality disorder, eating disorders, anxiety, depression, and stress.

2. Method

2.1 Procedure & Ethical Considerations

After ethical approval was granted by the University's Human Research Ethics Committee, the study was advertised via an online portal at a large metropolitan university in Australia,

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which encourages undergraduate psychology students to participate in studies for course credit. Interested students were directed to an online information sheet, with information about the study, explanation of participation requirements, confidentiality procedures and the right to withdraw at any time prior to submitting responses. After providing consent participants were directed to an online survey. The survey took approximately 45-60 minutes to complete. Resources regarding NSSI and risky drinking were provided to the participants at the beginning and end of the study, along with on-campus counselling numbers and websites providing information about mental health. The inclusion criterion was to have at least one experience with NSSI (i.e. lifetime history of NSSI) assessed by the question: “Have you ever engaged in self-injury?”. This way a sample of 270 individuals with a history of NSSI was recruited (84.1% women, 13.7% men; 2.2% described themselves as another gender, such as transgender, genderqueer and agender).

2.2 Measures

2.2.1 Inventory of Statements about Self-injury (ISAS; Klonsky & Glenn, 2009)

Participants were asked about the lifetime history, characteristics, and functions of their NSSI behavior using the ISAS. Contextual questions (such as whether they experienced pain during self-injury or whether they self-injure alone) required a “Yes” or “No” answer. The functions of self-injury were assessed by a series of statements which are rated on 3-point Likert scale ranging from 0 (Not Relevant) to 2 (Very Relevant). The functions are separated into 13 subscales (affect regulation, interpersonal boundaries, self-punishment, self-care, anti-dissociation/feeling-generation, anti-suicide, sensation-seeking, peer-bonding, interpersonal influence, toughness, marking distress, revenge and autonomy). Higher scores on each subscale demonstrate higher endorsement of that function. In the original study, the 13

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functions were validated as a two-factor structure, classifying the 13 functions into interpersonal and intrapersonal functions. However, due to the specific emphasis of this study on the different functions of NSSI, all 13 functions were taken into consideration. The validity and reliability of the ISAS has been supported in many studies (Glenn & Klonsky, 2011; Klonsky & Glenn, 2009; Kortge et al., 2013). The Cronbach's alpha scores of the 13 subscales ranged from 0.67 to 0.88 in this study, demonstrating adequate to good internal consistency.

2.2.2 Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004)

The DERS was used to assess difficulties in emotion regulation. The DERS is a 36-item measure rated on a 5-point Likert scale ranging from 1 (Almost Never) to 5 (Almost Always). Higher scores suggest that the individuals are exhibiting greater difficulties in regulating their emotions. Although subscales have been identified and validated, the DERS total score, is widely used in the literature and hence, was chosen for the purposes of this study to allow a better comparison with previous profile studies (i.e. Peterson et al., 2019). The total score demonstrated high internal consistency ($\alpha = 0.93$), good test-retest reliability and adequate construct and predictive validity (Gratz & Roemer, 2004). In the current sample, the Cronbach's alpha score was 0.94.

2.2.3 Cognitive Emotion Regulation Questionnaire – Short (CERQ-short; Garnefski & Kraaij, 2006)

The cognitive techniques utilized by the participants to regulate difficult emotional states were assessed using the short version of the CERQ (Garnefski & Kraaij, 2006). The CERQ-short consists of 18 items, while maintaining the nine subscales (self-blame, rumination, catastrophizing, positive refocusing, planning, positive reappraisal, putting into perspective and acceptance) of the original version (Garnefski et al., 2001). The items of the CERQ-short

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are rated on a 5-point Likert scale from 1 (Almost Never) to 5 (Almost Always). Subscale scores are calculated by summing the two items belonging to each subscale. Higher scores demonstrate more frequent use of that particular cognitive emotion regulation strategy.

Reliability and validity analyses indicated that the CERQ-short has acceptable reliability for all subscales (Cronbach's alpha score range: 0.68 – 0.81) and good predictive validity. The current sample demonstrated similarly acceptable internal consistency scores with the original study (Cronbach's alpha score range: 0.68 – 0.91).

2.2.4 Toronto Alexithymia Scale (TAS-20; Bagby et al., 1994)

The TAS-20 was used to investigate alexithymia. The TAS-20 consists of 20 items describing symptoms of alexithymia, which were rated on a 5-point Likert scale from 1 (Strongly Disagree) to 5 (Strongly Agree). Higher scores indicate higher levels of alexithymia. The total scale, which is widely used, demonstrated good test-retest reliability ($r = 0.77$) and acceptable internal consistency ($\alpha = 0.81$; Bagby et al., 1994). A similar reliability was observed with this sample ($\alpha = 0.86$).

2.2.5 Brief Cope (Carver, 1997)

The Brief Cope is a 28-item questionnaire developed by shortening the original 60-item version of the COPE (Carver et al., 1989; Carver, 1997). Respondents are asked to rate on a 4-point Likert scale ranging from 1 (I haven't been doing this at all) to 4 (I have been doing this a lot) how much they were using specific coping strategies. Higher scores indicate greater use of that particular coping strategy. For this study, we used the scoring reported by Hasking et al. (2011) to calculate subscales reflecting problem-focused, emotion-focused, and avoidant coping. These subscales have been found to have good internal consistency (problem-focused: $\alpha = 0.79$, emotion-focused: $\alpha = 0.83$, avoidant coping: $\alpha = 0.75$) in the

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Hasking et al. (2011) study and in the current study (α problem-focused = 0.84, α emotion-focused = 0.89, α avoidant coping = 0.78).

2.2.6 Australian Alcohol Use Disorders Identification Test (AusAUDIT; Degenhardt et al., 2001)

Risky drinking was assessed using the AusAUDIT (Degenhardt et al., 2001), which is a 10-item self-report scale. The items refer to volume, frequency and consequences arising from alcohol consumption and are summated to produce a total score. Higher scores reflect more harmful drinking. The AusAUDIT has sound internal consistency ($\alpha = 0.76$) and discriminant validity (Degenhardt et al., 2001). Internal consistency in the current sample was good ($\alpha = 0.85$).

2.2.7 Borderline Symptom List 23 (BSL-23; Bohus et al., 2009)

Symptoms of borderline personality disorder were screened using the short version of the Borderline Symptom List (Bohus et al., 2007; Bohus et al., 2009). The items refer to specific symptoms of borderline personality disorder as indicated within the DSM-IV (American Psychiatric Association, 2000), by clinical experts, and by patients diagnosed with borderline personality disorder (Bohus et al., 2007). The BSL-23 is a self-report measure and uses a 5-point Likert scale as a response to each item, from 1 (Not At All) to 5 (Very Strong). Higher scores indicate more symptoms and more intense symptomatology of borderline personality disorder. Initial validations of the BSL-23 have demonstrated high internal consistency (i.e. strong internal consistency; $\alpha = 0.97$) and convergent validity. Strong internal consistency was observed within this sample ($\alpha = 0.97$).

2.2.8 Eating Attitudes Test-26 (EAT-26; Garner et al., 1982)

The EAT-26 is a widely used self-report measure assessing eating disorder risk (Garner et al., 1982). It consists of 26 items, which are rated on a five-point Likert scale, ranging from

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“Never” to “Always”. Items assess general eating behaviors and risky attitudes and feelings towards eating. Higher scores indicate a greater risk of an eating disorder. The EAT-26 can be summed into an overall score, which demonstrated good reliability in a sample of individuals with anorexia nervosa ($\alpha = 0.90$; Garner et al., 1982), a comparison group of undergraduate psychology females ($\alpha = 0.83$; Garner et al., 1982) and in this sample ($\alpha = 0.96$). The EAT-26 has also demonstrated good convergent validity (Garner et al., 1982).

2.2.9 Depression, Anxiety and Stress Scale (DASS-21; Lovibond & Lovibond, 1995)

Symptoms of depression, anxiety, and stress were assessed with the commonly used self-report DASS-21 (Lovibond & Lovibond, 1995). Each subscale consists of seven items rated on a four-point Likert scale, ranging from 1 (Never) to 4 (Almost Always). The items assess characteristics of depression (e.g. dysphoria, hopelessness), anxiety (e.g. autonomic arousal, situational anxiety) and stress (e.g. difficulty relaxing, being easily upset). For each subscale, higher scores demonstrate greater levels of depression, anxiety, or stress. Several studies supported DASS-21’s reliability and validity with a variety of samples, both clinical and non-clinical (Antony et al., 1998; Henry & Crawford, 2005; Sinclair et al., 2012). Internal consistency for all three subscales was demonstrated within the current sample (α depression = 0.92, α anxiety = 0.86, α stress = 0.87).

2.2.10 Sociodemographic characteristics

We collected information on participants’ age, gender, country of origin, full-time/part-time student status, frequency of NSSI engagement during the last year and any prior mental health diagnosis.

2.3 Statistical Analysis

Descriptive and frequency analyses were performed to describe the demographic characteristics of the sample. Since less than 5% of the data was missing, and was missing

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completely at random, $\chi^2 (145, N = 270) = 137.27, p = 0.664$, missing data was imputed using expectation-maximization (Chavance, 2004). A series of K-means cluster analyses were conducted using the standardized values (i.e. Z-scores) of DERS total score, all subscales of the CERQ, the three subscales of COPE and the TAS-20 total score in order to identify the emotion profiles among the participants engaging in NSSI. Standardized scores were used to ensure that all variables were measured on the same scale for the analyses (Jajuga & Walesiak, 2000). A k-means cluster analysis is one of the most widely used exploratory clustering algorithms, which attempts to find a predefined number of non-overlapping clusters, developed by assigning each point in the data to the closest mean of one of the clusters (Wu, 2012). K-means analysis provides an exploratory approach, while still taking into consideration prior knowledge on the topic (Wu, 2012), and hence, it was chosen over other methods.

Solutions comprising of 2, 3, 4, and 5 possible clusters were considered since they are recommended for K-means cluster analysis (Everitt et al., 2011). The iteration history of the clusters in addition to significance of each measure were used to decide on the appropriate number of emotion profiles to best capture the data (Everitt et al., 2011). Additionally, the elbow method, which determines the true number of clusters within a dataset using a visual representation, was used to confirm the number of clusters selection (Kodinariya & Makwana, 2013). A priori considerations of the final cluster selection included the elbow method, a minimum number of 10 participants within a cluster and inclusion of most, if not all, emotion constructs considered for this study. In order to identify significant differences between the emotion profiles on demographic factors and other psychological constructs associated with emotion dysregulation (i.e. risky drinking, borderline personality disorder, eating disorders, anxiety, depression, and stress), two one-way ANOVA tests and two multivariate analyses of variance (MANOVA) were conducted. Although not all the variables

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were parametric, there is a growing evidence that ANOVA tests remain robust even with non-parametric data (Blanca et al., 2017). A series of Kruskal-Wallis tests were conducted for non-interval variables (main form of self-injury, time between urge and act, experience of pain and whether they self-injure alone). Lastly, chi-square analyses were conducted to identify differences between clusters with regards to gender and frequency of NSSI engagement. As preliminary analyses, a series of Spearman's correlation coefficient analyses were conducted to identify any correlations between the variables of interest (see Appendix).

3. Results

3.1 Sample Characteristics and Preliminary Analyses

The average age of the participants was 21.5 years old ($SD = 5.3$, Range = 17 – 56). Most of the participants were Australian (77.41%), first-year undergraduate students (41.1%), studying psychology full-time (87.0%). One hundred and thirty five participants (50%) reported they had been diagnosed with a mental health illness, such as anxiety (31.5%), depression (35.9%), anorexia nervosa (3.0%) or obsessive compulsive disorder (2.6%). Of the sample 45.6% reported engaging in self-injury in the last 12 months; 11.1% reported that they engaged in self-injury once during the last year, 7.4% participants twice, 8.9% participants three times, 4.1% participants four times and 14.1% participants 5 or more times. The most commonly endorsed behavior as a primary means of NSSI was cutting (42.2%), followed by severe scratching (13.3%) and banging or hitting oneself (11.1%). Eighty percent of participants reported that they experience pain during self-injury and 93.7% participants reported that they self-injure alone. The most commonly endorsed time between urge and act of self-injury was less than an hour (58.5%) followed by 1-3 hours (17.8%) and less than a

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day (13.7%). The average age of onset of NSSI behavior was 14.98 years ($SD = 3.53$). The most relevant function of NSSI was affect regulation ($M = 3.78$, $SD = 1.71$) followed by self-punishment ($M = 3.22$, $SD = 2.07$) and marking distress ($M = 2.05$, $SD = 1.87$). The least relevant function of NSSI was peer bonding ($M = 0.22$, $SD = 0.74$).

3.2 Cluster Analysis – Development of Emotion Profiles

The solutions that achieved convergence within the ten iterations performed by K-means cluster analysis were solutions with two or three possible clusters. The Self-blame and Blaming Others subscales of the CERQ did not significantly contribute to the development of the two-cluster solution ($p = 0.08$ and $p = 0.17$ respectively). However, all the variables included in the analysis contributed towards the development of the three-cluster solution. The elbow method (Kodinariya & Makwana, 2013) indicated three clusters within the dataset. Therefore, the three-cluster solution was considered more appropriate for the purposes of this study.

3.3 Characteristics of Emotion Profiles

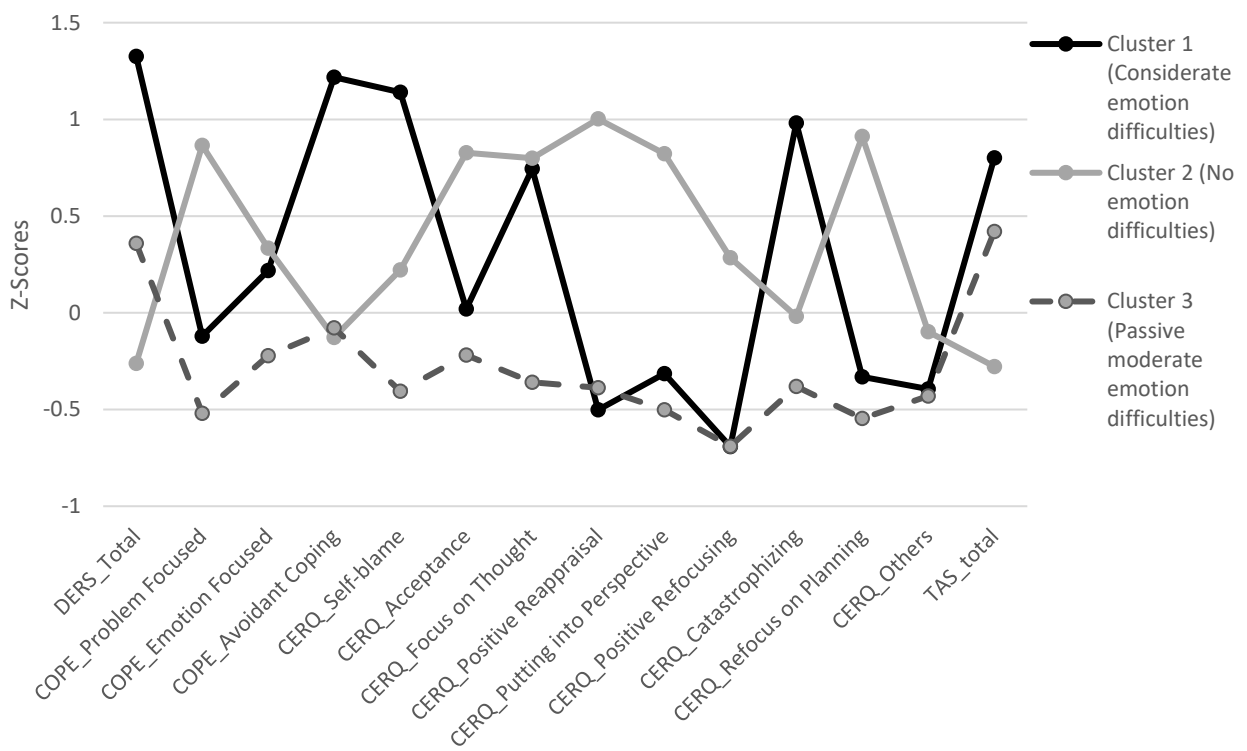
The three-cluster solution is presented in Figure 1. Cluster 1 comprised 98 participants and reflected an emotion profile with considerable difficulties in emotion regulation, use of less helpful coping strategies, and high levels of alexithymia. More specifically, individuals in this cluster demonstrated higher scores on the total DERS scale, as well as higher avoidant coping, self-blame, rumination, and catastrophizing scores. This cluster was named as “the considerate emotion difficulties group”. Cluster 2 was composed of 78 participants, who appeared to have less difficulty regulating their emotions and used more adaptive coping strategies as a response to negative emotions. Individuals belonging to Cluster 2 focused on their problems and emotions, accepted their emotions, reappraised the situation, put problems into perspective and focused on planning a solution to their difficulties (Cluster named as

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the “no emotion difficulties group”). Cluster 3 was composed of 94 participants, who demonstrated a general difficulty in regulating their emotions, a lack of any of the assessed coping strategies, and moderate levels of alexithymia (Cluster named as the “passive moderate emotion difficulties group”).

Figure 1

The Three Emotion Profiles derived from Cluster Analyses (Cluster 1 – Considerate emotion difficulties, Cluster 2 – No emotion difficulties, Cluster 3 – Passive moderate emotion difficulties).



3.4 Emotion Profiles, Demographics and NSSI

Significant differences between clusters were observed with regards to age, $F(2, 267) = 3.53$, $p = 0.03$. Participants from the no emotion difficulties group were older than those in the considerate emotion difficulties group, $t(1) = 2.55$, $p = 0.03$ (see Table 1). No significant differences in age were reported between the considerate emotion difficulties group and the group with passive moderate emotion difficulties, $t(1) = -1.82$, $p = 0.21$ or the group with no emotion difficulties and the group with passive moderate emotion difficulties, $t(1) = 0.83$, $p = 1.00$. Significant differences between clusters were also observed for the distribution of gender, $\chi^2(4, N = 270) = 11.18$, $p = 0.03$. More participants belonging to the considerate emotion difficulties group reported a gender other than “male” or “female” compared to the other two clusters. Of note, only six participants reported a gender other than male or female and five of them belonged to the considerate emotion difficulties group. The group with no emotion difficulties was comprised of more males and the group with passive moderate emotion difficulties of more females (see Table 1).

The only significant difference between clusters regarding NSSI behavior was demonstrated by the reported frequency of self-injury within the last year, $\chi^2(10, N = 270) = 50.36$, $p < 0.001$ (see Table 1). Individuals with considerate emotion difficulties were more likely to have self-injured 5 or more times within the last year (Standardized residual = 3.8) and less likely to have not self-injured in the past year (Standardized residual = -3.1). Individuals with no emotion difficulties were less likely to have self-injured 5 or more times in the past year (Standardized residual = -2.1). No significant differences were observed between clusters regarding the age of onset [$F(2, 257) = 0.15$, $p = 0.86$], main form of self-injury [$H(2) = 3.00$, $p = 0.22$], time between urge and act [$H(2) = 2.45$, $p = 0.29$], experience of pain [$H(2) = 2.73$, $p = 0.26$] and whether they usually self-injure alone [$H(2) = 0.46$, $p = 0.80$].

Table 1*Average Age, Gender and NSSI Frequencies For Each Cluster*

	Cluster 1 (<i>n</i> =98)	Cluster 2 (<i>n</i> =78)	Cluster 3 (<i>n</i> =94)	Post-hoc comparisons
Age				
<i>M (SD)</i>	20.45 (3.35)	22.49 (6.47)	21.83 (5.73)	1 < 2*, 1 < 3 (n.s.), 2 > 3 (n.s.)
Gender				
<i>N (% , SR) Males</i>	13 (13.3, -0.1)	16 (20.5, 1.6)	8 (8.5, -1.4)	1 < 2, 1 > 3, 2 > 3
<i>N (% , SR) Females</i>	80 (81.6, -0.3)	62 (79.5, -0.4)	85 (90.4, 0.7)	1 > 2, 1 < 3, 2 < 3
<i>N (% , SR) Other</i>	5 (5.1, 1.9)	0 (0, -1.3)	1 (1.1, -0.8)	1 > 2, 1 > 3, 2 < 3
<i>Gender</i>				
NSSI Frequency (last year)				
<i>N (% , SR) None</i>	31 (31.6, -3.1)	52 (66.7, 1.5)	64 (68.1, 1.8)	1 < 2, 1 < 3, 2 < 3
<i>N (% , SR) Once</i>	10 (10.2, -0.3)	11 (14.1, 0.8)	9 (9.6, -0.4)	1 < 2, 1 < 3, 2 < 3
<i>N (% , SR) Twice</i>	12 (12.2, 1.8)	3 (3.8, -1.2)	5 (5.3, -0.7)	1 > 2, 1 > 3, 2 < 3
<i>N (% , SR) Three</i> <i>times</i>	9 (9.2, 0.1)	6 (7.7, -0.4)	9 (9.6, 0.2)	1 > 2, 1 = 3, 2 < 3
<i>N (% , SR) Four</i> <i>times</i>	8 (8.2, 2.0)	2 (2.6, -0.7)	1 (1.1, -1.4)	1 > 2, 1 > 3, 2 > 3
<i>N (% , SR) 5 or more</i> <i>times</i>	28 (28.6, 3.8)	4 (5.1, -2.1)	6 (6.4, -2.0)	1 > 2, 1 > 3, 2 < 3

*Notes. SR = Standardized Residual; * $p < 0.05$, ** $p < 0.01$.*

3.5 Emotion Profiles and Functions of NSSI

A MANOVA revealed a significant difference in the functions of NSSI across clusters, $F(26, 506) = 3.16, p < 0.001$; Wilk's $\lambda = 0.74$, partial $\eta^2 = 0.14$. Participants from the considerate emotion difficulties group reported that affect regulation was a more relevant function for

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them compared to individuals from the passive moderate difficulties group (see Table 2). Additionally, self-punishment was a more relevant function for participants from the considerate emotion difficulties group compared to the other two groups. The anti-suicide and sensation-seeking functions were more relevant for the considerate difficulties group compared to the no emotion difficulties group. Lastly, peer bonding was more relevant for the passive moderate emotion difficulties group than the no emotion difficulties group. .

Table 2

Means (Standard Deviations) of NSSI Functions per Cluster and Post-hoc comparisons

	Cluster 1	Cluster 2	Cluster 3		
	<i>(n = 98)</i>	<i>(n = 77)</i>	<i>(n = 93)</i>		
	<i>M</i>	<i>M</i>	<i>M</i>	<i>F (2, 265)</i>	Post-hoc
	<i>(SD)</i>	<i>(SD)</i>	<i>(SD)</i>		comparisons
Affect Regulation	4.22 (1.50)	3.74 (1.83)	3.34 (1.71)	6.65*	1 > 2 (n.s), 1 > 3*, 2 > 3 (n.s.)
Interpersonal	0.96 (1.54)	0.99 (1.40)	0.91 (1.38)	0.06	n.s.
Boundaries					
Self-Punishment	4.07 (1.91)	2.56 (2.06)	2.87 (1.96)	14.99**	1 > 2**, 1 > 3**, 2 < 3 (n.s.)
Self-care	1.35 (1.66)	0.90 (1.36)	1.08 (1.49)	1.97	n.s.

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Anti-Dissociation/Feeling Generation	2.54 (1.86)	2.06 (1.91)	2.33 (1.88)	1.38	n.s.
Anti-Suicide	2.06 (2.08)	1.31 (1.85)	1.59 (1.88)	3.35*	1 > 2*, 1 > 3 (n.s.), 2 < 3 (n.s.)
Sensation-Seeking	0.95 (1.43)	0.47 (0.82)	0.77 (1.23)	3.42*	1 > 2*, 1 > 3 (n.s.), 2 < 3 (n.s.)
Peer Bonding	0.17 (0.66)	0.06 (0.30)	0.39 (1.01)	4.32*	1 < 2 (n.s.), 1 < 3 (n.s.), 2 < 3*
Interpersonal Influence	0.87 (1.34)	1.00 (1.35)	0.76 (1.16)	0.72	n.s.
Toughness	1.65 (1.78)	1.26 (1.53)	1.20 (1.48)	2.19	n.s.
Marking Distress	2.28 (1.96)	1.82 (1.92)	2.00 (1.73)	1.33	n.s.
Revenge	0.40 (0.97)	0.32 (0.88)	0.70 (1.37)	2.85	n.s.
Autonomy	0.79 (1.41)	0.36 (0.92)	0.62 (1.24)	2.57	n.s.

Note. * $p < 0.05$, ** $p < 0.01$.

3.6 Emotion Profiles and Comorbid Behaviors

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The MANOVA assessing other dysregulated behaviors revealed a significant difference in the combined variables based on cluster membership, $F(12, 448) = 10.35, p < 0.001$; Wilk's $\lambda = 0.61$, partial $\eta^2 = 0.22$. Bonferroni post-hoc tests demonstrated that there was no difference in means between the no emotion difficulties group and the passive moderate difficulties group on any of the variables. The considerate emotion difficulties group was significantly different from the other two groups on all variables (Table 3).

Table 3

Means (Standard Deviations) of Dysfunctional Behaviors Variables Per Cluster and Post-hoc Comparisons

	Cluster 1	Cluster 2	Cluster 3		
	(n = 84)	(n = 63)	(n = 85)		
	<i>M</i>	<i>M</i>	<i>M</i>	<i>F</i> (2, 229)	Post-hoc
	<i>(SD)</i>	<i>(SD)</i>	<i>(SD)</i>		comparisons
AusAUDIT	5.67 (5.54)	3.11 (3.79)	3.77 (5.16)	5.43*	1 > 2*, 1 > 3*, 2 < 3 (n.s.)
BSL-23	50.12 (23.23)	23.54 (19.04)	23.36 (19.12)	44.58**	1 > 2**, 1 > 3**, 2 > 3 (n.s.)
EAT-26	20.31 (14.91)	13.97 (11.05)	13.35 (14.26)	6.42*	1 > 2*, 1 > 3*, 2 > 3 (n.s.)
DASS-21					
Depression	19.71 (5.25)	12.46 (4.18)	13.88 (4.94)	48.30**	1 > 2**, 1 > 3**, 2 < 3 (n.s.)
Anxiety	16.87 (5.19)	13.29 (4.19)	12.78 (4.37)	18.95**	1 > 2**, 1 > 3**, 2 > 3 (n.s.)

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Stress	20.06	15.16	15.23	34.38**	1 > 2**, 1 > 3**, 2 < 3 (n.s.)
	(3.98)	(4.59)	(4.36)		

Note. * $p < 0.05$, ** $p < 0.01$.

4. Discussion

The aim of the current study was to identify specific emotion profiles among participants with a history of NSSI and to associate these profiles to the functions of NSSI and other dysregulated behaviors, such as risky drinking, symptoms of borderline personality disorder, eating disorders, depression, anxiety and stress. The findings demonstrated three distinct emotion profiles among participants engaging in NSSI; a group with considerate emotion difficulties, a group with no emotion difficulties and a group with moderate emotion difficulties, who demonstrated a passive response to these difficulties.

The group with considerate emotion difficulties reflects a subgroup of individuals with current and more frequent involvement in NSSI compared to the other two groups. What particularly distinguishes this group from the other clusters is the use of coping mechanisms which are less helpful, such as avoidance, self-blame and rumination. All these variables have been associated with NSSI in the literature (Anderson & Crowther, 2012; Kelada et al., 2018; Voon et al., 2014). However, this is the first study that investigates how these variables can provide a more accurate assessment when used together with levels of alexithymia and difficulties in emotion regulation to determine a “high risk” profile for NSSI. Previous studies have focused on the severity of emotion regulation difficulties, however, the outcomes of this study suggest as an alternative, that considering specific coping strategies used might also provide an accurate assessment of the risk of engaging in frequent NSSI. Similarly to the high risk group with considerate emotion regulation difficulties reported in the Peterson et al.

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(2019) study, the group with considerate emotion difficulties in this study was associated to other dysregulated behaviors. Although it is difficult to compare these high risk groups with the groups presented in the Thomassin et al. (2017) study, there are indications of poor emotional awareness, due to the high levels of alexithymia presented in the considerate emotion difficulties group, like in the “unaware/anger dysregulated group” from the Thomassin et al. (2017) study.

In contrast, the group with no emotion difficulties reflects a resilient profile with participants less likely to engage in frequent NSSI acts, with lesser endorsement of any of the NSSI functions and with fewer comorbid dysregulated behaviors. This profile may be composed of individuals who engaged in NSSI once or twice due to curiosity or circumstance, but stop engaging in NSSI – possibly because of the availability of other adaptive coping strategies. It may also be the case that these individuals were previously engaging in NSSI but are either receiving (or completed) therapy, which may have aided them in adopting more helpful coping strategies; however, this is speculative and more research is clearly needed to investigate this possibility. Interestingly, in this sample more people belonging to this group engaged in NSSI three times than two times within the last year. Although the difference between two and three times might not be clinically significant, individuals engaged in NSSI for three times within the past year might have engaged in more frequent NSSI in the past. Frequency of NSSI beyond the last year might have provided further information on the severity of NSSI engagement in the past for those participants.

Cluster 3 represents a subgroup of individuals engaging in NSSI with a more passive response to the emotion experiences. Similarly to the other two groups, the most relevant functions for the moderate emotion difficulties group were emotion regulation and self-punishment. However, an interesting difference was reported with regards to the function of forming stronger bonds with peers, with this function demonstrating a higher relevance for

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the moderate emotion difficulties group compared to the no emotion difficulties group and the considerate emotion difficulties group. This could be an indication that individuals from this group might endorse this interpersonal function more than the other two groups.

The presence of emotion dysregulation in both groups with considerate and moderate emotion difficulties makes us wonder why the group with moderate difficulties did not present similar associations with other dysregulated behaviors as the group with considerate emotion difficulties. One possible explanation is that the absence of the less helpful coping mechanisms, such as focus on thought (i.e. rumination) and their passive response to their emotions, reduces the possibility of increasing their distress following a stressful experience (Hu et al., 2014), potentially reducing escalations of feelings leading to symptoms of eating disorders, depression, anxiety and stress. Additionally, the majority of the participants with moderate emotion difficulties were not engaging in NSSI during the last year, suggesting that NSSI might have been an “exploratory” experience for them or that they engaged in NSSI for a specific purpose, such as for peer bonding as previously mentioned. Another possible explanation is that other variables, such as positive affect, may be important. Positive affect experienced after engaging in NSSI has been associated with increased NSSI acts due to its positive reinforcement properties (Jenkins & Schmitz, 2012). However, there is also accumulating evidence that positive affect is negatively associated with NSSI (Boyes et al., 2019; Cohen et al., 2015). Recent evidence indicates that negative and positive affect are both associated with self-injury and that positive affect may be protective against NSSI even when negative affect is high (Bresin, 2014; Burke et al., 2018; Cohen et al., 2015; Hasking et al., 2018). Therefore, it could be that individuals with moderate emotion difficulties are already experiencing high levels of positive affect in their life, regardless of their NSSI behavior. Positive affect in general helps to broaden an individual’s thoughts and actions, building personal resources to regulate emotions, which might offer a level of resilience to other

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dysregulated behaviors (Tugade & Fredrickson, 2007). Future studies could investigate whether the group of individuals with moderate emotion difficulties is indeed associated with higher levels of positive affect before an NSSI act and whether the positive affect experienced after an NSSI act is not significantly different from the pre-NSSI measures.

Our findings were in accordance with previous studies suggesting that emotion regulation is the most commonly endorsed function of NSSI (Klonsky & Glenn, 2009; Taylor et al., 2018), further supporting emotion regulatory models of self-injury (Chapman et al., 2006; Selby et al., 2008). However, significant differences were reported between the emotion profiles with regards to function. Although peer bonding was considered the least relevant function of NSSI within the sample, it was more relevant for individuals belonging to cluster 3 compared to cluster 2. These differences are only minor, but clinicians might benefit from assessing peer bonding functions of NSSI, when the individual is presenting moderate difficulties in regulating emotions, absence of other coping mechanisms and moderate levels of alexithymia. Targeting specific functions adopted by those engaging in NSSI, instead of focusing generally on emotion regulation might more efficient in reducing NSSI engagement in a shorter period of time for those with more specific functions. However, further research is needed to support this. Adopting a more person-centered approach has been recognized as a promising avenue for improving clinical care and outcomes (Lewis & Hasking, in press; Lewis & Hasking, in press; Yun & Choi, 2019). Individuals with considerate emotion difficulties could benefit from psychoeducation on more helpful coping mechanisms in order to indirectly address a variety of functions (Horn et al., 2011; Lam et al., 2020) or from an emotion regulation group therapy (Sahlin et al., 2017). While individuals with passive moderate emotion difficulties, might benefit by more targeted treatments based on the functions of the behavior identified, such as the treatment for self-injurious behaviors (Andover et al., 2017), which adopts a functional/behavioral approach; or for peer bonding

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purposes, a social skills training might be more appropriate (Hotton & Coles, 2016).

Individuals from cluster 2 seem to already engage in adaptive coping mechanisms and are not frequently engaging in NSSI. Future studies could investigate whether young adults could transit from one emotion-regulation profile to another and which factors drive this change.

One possibility to consider is the potential role of therapy and whether this is associated with learning/developing alternative emotion regulation strategies.

Our study is not without limitations. The sample size was relatively small; replications with more participants, and more varied samples, are needed. However, although the subgroups formed by the emotion profiles were small, they highlight the importance of considering the potential of subgroups in terms of both theoretical and clinical implications. Additionally, the cross-sectional design of the study limits our ability to provide a temporal link between the emotion profiles and the associated variables. It could be that specific characteristics of the emotion profiles (e.g. rumination) were developed after engaging in NSSI (Buelens et al., 2019) and other dysregulated behaviors; while other characteristics (e.g. avoidance and other difficulties in regulating emotions) preceded the acts of NSSI (Chapman et al., 2006; Heffer & Willoughby, 2018). Future research using longitudinal designs is clearly needed to address issues of temporality.

Nonetheless, the study is one of the first to explore specific emotion profiles within the NSSI literature and their association to NSSI functions and other dysregulated behaviors, providing clarification on individual differences existing within NSSI populations. We observed three distinct emotion profiles among participants engaging in NSSI. Significant differences were reported between emotion profiles with regards to the functions of NSSI, NSSI behavior and comorbidity with other dysregulated behaviors, such as risky drinking, symptoms of borderline personality disorder, eating disorders, depression, anxiety, and stress. Future studies could investigate whether the suggested profiles could be used transdiagnostically and

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how these profiles could inform therapeutic practice. Lastly, this paper focused on the emotion-related variables to the difficulties presented in emotion regulation, although cognitive variables are also important, such as rumination and other cognitive vulnerabilities. Therefore, future studies could investigate specific profiles based on the cognitive variables of individuals with history of NSSI.

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11. CERQ_Catastro phizing	0.50**	-0.10	-0.01	0.42**	0.47**	-0.13**	0.37*	-0.24**	-0.20**	-0.03	1.00									
12. CERQ_Refocus on Planning	0.33**	0.53**	0.15**	-0.18**	0.10*	0.44**	0.24*	0.65**	0.50**	0.20**	-0.05	1.00								
13. CERQ_Others	0.10	0.08	0.03	0.12*	-	0.21**	-0.25**	0.19*	-0.10*	-0.06	0.48**	0.25**	-0.07	1.00						
14. TAS_total	0.66**	-	0.26**	-	0.28**	0.45**	0.21**	-0.21**	-0.04	-0.31**	-0.09	-0.06	0.25**	-0.22**	0.09	1.00				
15. AusAUDIT	0.11**	-0.06	-0.05	0.29	-0.04	-0.14**	-	0.14*	-0.14**	-0.04	0.06	0.08	-0.06	0.21**	-0.01	1.00				
16. BSL-23	0.70**	-0.05	-0.09	0.59**	0.47**	-0.07	0.20*	-0.22**	-0.09	-0.17**	0.44**	-0.18**	0.02	0.52**	0.13*	1.00				
17. EAT-26	0.36**	0.08	-0.00	0.41**	0.30	0.02	0.11	-0.06	-0.06	-0.09	0.21**	0.01	0.01	0.24**	0.20*	0.40*	1.00			
18. DASS-21 Depression	0.64**	-	0.15**	-0.12*	0.55**	0.30**	-0.10*	0.08	-0.20**	-0.06	-0.11*	0.23**	-0.17**	0.18	0.53**	0.01	0.86*	0.34*	1.00	
19. DASS-21 Anxiety	0.53**	0.44	0.90	0.00	0.20**	-0.04	0.09*	-0.8*	-0.01	-0.01	0.21**	-0.02	0.07	0.46**	-0.00	0.72*	0.38*	0.064**	1.00	
20. DASS-21 Stress	0.63**	-0.02	0.06	0.00	0.20**	-0.06	0.15*	-0.12**	-0.05	-0.10*	0.24**	-0.09*	0.03	0.44**	-0.03	0.70*	0.29*	0.68*	0.73*	1.00

