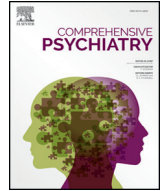




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Clinical and personality characteristics of adolescents with anorexia nervosa with or without non-suicidal self-injurious behavior

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ABSTRACT

Purpose: About one-fifth of patients with anorexia nervosa (AN) engage in non-suicidal self-injury (NSSI). This study examined clinical and temperament profile of female adolescents with both disorders (AN+NSSI) as compared with peers with AN only.

Methods: A consecutive sample of 73 female adolescents with AN (mean age: 13.77 years), who had been admitted to inpatient or day-hospital services, received clinical, cognitive, and temperament/character evaluations. Of them, 32 met DSM-5 criteria also for NSSI. Assessments included demographics, standard nutrition parameters, Youth Self-Report (YSR), Wechsler Intelligence Scale for Children IV (WISC-IV), Temperament and Character Inventory (TCI), and Global Assessment of Functioning (GAF).

Results: No differences were detected between AN+NSSI and AN in demographics, body mass index, or age at onset of AN. AN+NSSI had higher rate of bingeing and purging, higher YSR scores for both internalizing and externalizing psychopathology, lower total IQ, and lower Self-directedness and Cooperativeness scores.

Conclusions: These data suggest that adolescents with AN+NSSI have psychopathological, cognitive and overall character features that differ from patients with AN only. These characteristics may have implications for treatment and outcome.

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1. Introduction

Both anorexia nervosa (AN) and non-suicidal self-injury (NSSI) are self-damaging behaviors with typical onset in early adolescence, greater prevalence in females and strong association with distorted personality traits [1]. NSSI is defined by recurrent episodes of intentional self-inflicted damage to body tissue, such as cutting, scratching, bruising, burning, or biting, without suicidal intent and outside socially sanctioned purposes, with the purpose of obtaining relief from negative feelings, resolving interpersonal difficulties, or inducing positive feelings [2,3].

NSSI was present in DSM-IV as a possible symptom of borderline personality disorder (BPD), and has been included in DSM-5 among the conditions in need of further study [4]. The DSM-5 diagnostic criteria for NSSI include: 1) presence of intentional self-inflicted damage to the surface of his or her body, without suicidal intent; 2) expectation

to obtain relief from a negative feeling or cognitive state, and/or to resolve an interpersonal difficulty and/or to induce a positive feeling state; 3) the behavior has occurred on 5 or more days in the last year; 4) the intentional self-injury is associated with one between interpersonal difficulties or negative feelings or thoughts, such as depression, anxiety, tension, anger, generalized distress, or self-criticism or a period of preoccupation with the intended behavior that is difficult to control or thinking about self-injury that occurs frequently, even when it is not acted upon [4].

Onset of NSSI behaviors peaks between 12 and 14 years of age, with cumulative prevalence estimated to be about 17% by 17 years of age in adolescent population samples [5,6] and as high as 60% in clinically referred samples [7]. NSSI is associated with emotional dysregulation and an increased rate of psychopathology, including both internalizing and externalizing symptoms [8]. In particular, the co-occurrence of NSSI with depression, anxiety, social phobia and PTSD, and substance use disorder has been documented [9–11].

AN has an estimated one-year point prevalence of 0.3% in young females, with a female/male ratio of 10:1 [12]. An association between ED and NSSI has been reported in the literature since 1989, when Favazza and coworkers concluded that patients with eating disorder are at

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high risk of self-mutilation [13–15]. The association seems to be higher in AN binge eating/purging subtype than in AN restrictive subtype (27.8–68.1% vs 13.6–42.1%) based on some data [15], but others did not detect any difference in NSSI rate between two subgroups [16]. Female gender, adolescent age, impulsivity, affect dysregulation, dissociation, self-criticism, need for control, identity confusion, and early trauma may function as risk factors in the co-occurrence of NSSI and eating disorders (EDs) [14,15]. In both these conditions emotional dysregulation is acted up on her own body, which is perceived as negative [17]. The association between EDs, multiple NSSI methods, self-criticism and affect dysregulation is well documented [14,15]. Both EDs and NSSI can be conceptualized as dysfunctional coping behaviors.

Despite common epidemiological characteristics, AN and NSSI seem to differ from each other with respect to temperament and character traits. Personality traits have been widely explored in AN. One of the most frequently applied instruments has been the Temperament and Character Inventory (TCI) [18], which permits to trace specific personality profiles that distinguishing each ED subtype [19]. In particular restricting AN is characterized by high harm avoidance and persistence with low novelty seeking, coupled with low self-directedness, while bingeing-purging AN display relatively higher novelty seeking. Moreover, personality traits of EDs have been consistently related to eating and general psychopathology of ED subjects tracing the hypothesis that personality contributes to the specific AN psychopathological expression [20]. Adolescents with NSSI tend to score high on novelty seeking and harm avoidance, and lower on persistence, self-directedness, and cooperativeness than clinical controls [21]. Emotionally dysregulated personality disorders are often present in adolescent inpatients with NSSI [22]. Thus, it is possible that patients with both AN and NSSI may display temperament and character features related to BDP rather than the typical AN profile. It is also possible that they may display mixed features [23,24].

On the other hand, neuropsychological assessments of AN patients have consistently evidenced weaknesses in intelligence and executive functioning, and specifically poor set-shifting and weak central coherence [25,26]. In particular, cognitive inflexibility has been associated with poor outcomes, such as longer duration of illness, more severe eating behaviors, lower self-esteem, higher comorbid anxiety and, of interest for this study, higher rate of self-harm [26]. While the clinical and cognitive characteristics of AN patients have been described in clinical and population samples, little is known about the subgroup that engages also in NSSI. In adolescent population samples, IQ was not associated with eating disorders [27], but, in clinical samples, AN patients have been found to have higher than average IQ by some [28,29], but not other investigators [27,30]. At the best of our knowledge, no study addressing wide profile of intelligence in patients with both AN with NSSI (AN+NSSI) in adolescence population has been reported. Since emotional intelligence is strictly related to the ability of mentalization and coping with troubling emotions [31,32] it is possible that subjects with AN who engage in NSSI may have lower IQ levels than AN peers who do not engage in such behaviors.

The primary aim of the present study is to examine whether adolescents who present with AN+NSSI differ from those with only AN with respect to intelligence, psychopathology, global functioning, or temperament and character traits. The secondary aim is to find out if these possible differences may be independent or related to each other. Although the approach was mainly exploratory, it is guided by the specific hypothesis that AN+NSSI adolescents would present with: a) greater general psychopathology; b) lower level of global functioning, possibly comprising also lower global cognitive functioning, particularly regarding working memory index, processing speed and lower verbal comprehension indexes; c) and differences in personality traits, and, in particular, higher scores on novelty seeking, harm-avoidance, and persistence, and lower scores self-directedness, and cooperativeness.

2. Materials and methods

2.1. Procedure

The data for this study were collected as part of routine patient care at the University of Turin pediatric hospital Regina Margherita, Turin, Italy. All patients consecutively admitted from January 2012 to January 2018 were enrolled in the study. Patients' legal guardians gave permission to use de-identified hospital data for teaching and research purposes. Data were de-identified prior to the analyses. All the procedures were conducted according to the 1995 Declaration of Helsinki as revised in Edinburgh in 2000.

2.2. Sample

We considered all adolescents who were consecutively admitted to the psychiatric inpatient unit or partial hospitalization program, which are tertiary care services, specialized in the treatment of severe adolescent psychopathology, including eating disorders, suicide attempts, mood, anxiety, and personality disorders. The sample for the study was selected based on the following inclusion criteria: age under 18 years, diagnosis of AN, and having received cognitive assessments.

A total of 75 adolescents were identified. Of these, 2 were males, who were excluded from the analyses in order to maintain gender homogeneity. The study sample consisted of 73 female adolescents (age 8–17 years, mean age at admission 13.8 years, SD \pm 1.93, CI 95% 13.32–14.22). Of them, $n = 41$ had only AN and $n = 32$ had AN and NSSI (AN+NSSI).

2.3. Assessments

Diagnoses of AN were made according to DSM-5, based on a comprehensive and systematic psychiatric evaluation conducted by trained child and adolescent neuropsychiatrists. Self-administered and rater-administered scales were applied to assess general psychopathology, global functioning, cognitive global functioning, and temperament/character traits. The diagnosis of NSSI was based on DSM-5 criteria.

Psychopathology: The Youth Self-Report for ages ranging from 11 to 18 [33] measures perceived competencies, adaptive functioning and problems of adolescents within the past 6 months. It has been shown to have adequate reliability and validity [33]. The questionnaire includes 132 items, of which 20 are competence items (social, activity and academic competence score) and 112 measure eight symptom subscales: withdrawn, somatic complaints, anxiety/depression (grouped into the internalizing problems cluster), aggressive behavior and rule-breaking behavior (grouped into the externalizing problems cluster) and three subscales measuring problems that are both internalizing and externalizing (thought, attention and social problems). Each item is scored on three level (0 = not true, 1 = sometimes true, 3 = always true). The total problem scale consists of the accumulation of the scores on the 8 symptom subscales and one subscale called "other problems". The item scores can also be converted into 6 DSM-oriented scales: anxiety, affective, somatic, conduct, oppositional-defiant and attention deficit/hyperactivity problems. Mean scores on the YSR subscales can be compared with the scores of normal controls of the same age and gender, obtaining a T score, that are considered in normal range (T score < 65), borderline clinical range (T score between 65 and 70) and clinical range (T score > 70).

Global functioning: The Global Assessment of Functioning (GAF) [34], assesses overall patient functioning and symptom severity in a scale from 0 (most severe) to 100 (less severe). Each interval of the GAF is accompanied by a behavioral descriptor ranging from "superior functioning in a wide range of activities...no symptoms" to "persistent danger of severely hurting self or others...persistent inability to maintain minimal personal hygiene".

These characteristics have been reliably associated with clinical diagnosis, psychopathologic symptoms and other clinical outcome ratings [35]. Endicott and coworkers [36] performed the first series of test-retest reliability studies on the GAS and found intraclass correlation coefficients (ICC's) ranging from 0.61 to 0.91 with standard error of measurement scores ranging from 5.0 to 8.0.

Cognitive functioning: The Wechsler Intelligence Scale for Children, fourth version (WISC-IV) [37,38] was used to measure intellectual functioning. All participants were administered the Italian version of the WISC-IV [39]. For the purposes of the present study, we examined the scores obtained in the 10 core subtests of the WISC-IV, i.e. Block Design, Similarities, Digit Span, Picture Concepts, Coding, Vocabulary, Letter – Number Sequencing, Matrix Reasoning, Comprehension and Symbol Search. We calculated the Full Scale IQ from the sum of the 10 subtests, and the four factor indices: the Perceptual Reasoning Index (PRI), which includes Block Design, Picture Concepts and Matrix Reasoning; the Verbal Comprehension Index (VCI), including Similarities, Vocabulary and Comprehension; the Working Memory Index (WMI) including Digit Span and Letter – Number Sequencing; and the Processing Speed Index (PSI) including Coding and Symbol Search.

Temperament and character: The Temperament and Character Inventory (TCI) is a 240 item true/false questionnaire, self-rated instrument that provides a comprehensive inventory of dimensions of temperament (Harm Avoidance, HA; Novelty Seeking, NS; Reward Dependence, RD; Persistence, P) and character (Self-directedness, SD; Cooperativeness, C; Self-transcendence, ST) [40]. The items are divided into positive and negative items and the scoring for each item is dichotomous (TRUE/FALSE), with a 1/0 score for positive items and 0/1 for negative items. The sum of the points obtained gives a "Raw Score" to which it is possible to match a "Percentile Score" and a "T-Score" which, shown on the graph, allows defining a personality profile. A percentile value above 67% and one below 33% are, according to the literature, considered abnormal. The TCI displays good internal consistency and reasonable test-retest correlation at 6 months [18].

2.4. Data analysis

Standard descriptive analyses were applied to the data. The *t*-test was applied to compare continuous demographic (age of onset of NSSI, age of onset of AN, age at admission) and clinical (BMI) variables. The chi-square test was applied to categorical variables.

As first step, differences between groups of interest (AN and AN+NSSI) were explored with MANOVA separately for each test to evidence the differences in each measure, then a second analysis was performed considering all the tests together to evidence the reciprocal influences between personality, psychopathology and IQ. To account for multiple comparisons, we used the global scores for WISC-IV (FSIQ) and YSR (Total Problems, Externalizing Problems and Internalizing Problems scores) as omnibus tests considering significant a *P* value < .05, and then applied Bonferroni corrections for subscores. For the TCI, in which there is no global score, the Bonferroni correction was applied to each of the seven dimension scores.

The MANOVA comparison was performed also between the restrictive (AN-R) and the binge purging (AN-BP) subgroups to evidence possible confounding effect. Then the subtype diagnosis was applied as covariate performing a MANCOVA on the variables which distinguished the groups of interest to evidence possible confounding effects on the AN vs AN+NSSI differences.

Finally, a MANCOVA was performed among the functioning and psychopathology dimension scores that differed between the AN and the AN+NSSI subgroups using as covariates the personality dimensions which distinguished the subgroups. This was to evidence what between-group differences were related to personality characteristics and what were unrelated from them. SPSS software version 13.0 (SPSS Inc., Chicago, IL, USA) was used for statistical analysis.

3. Results

3.1. Demographics and clinical characteristics

The AN+NSSI group did not differ from the AN group with respect to age, age at AN onset, age at NSSI onset, BMI, or BMI percentile (Table 1). 63 patients were diagnosed with AN-R and 10 patients with AN-BP (Table 1). AN+NSSI presented more frequently with the binge-purging subtype (25%) than AN (5%). AN+NSSI were also more impaired in overall functioning as shown by lower GAF scores.

3.2. MANOVA comparison of psychopathology, personality traits, cognitive and global functioning

The MANOVA analysis, done separately for each test, evidenced that AN+NSSI scored higher than AN for Total Problems and Externalizing Problems. In addition, AN+NSSI reported more frequently Anxious/Depressed Symptoms, Somatic Complaints, Social Problems, Thought Problems, Affective Problems, and Anxiety Problems (Table 2).

AN+NSSI showed a trend for lower IQ Total Scale than AN but it was not significant at Bonferroni correction. AN+NSSI scored lower than AN for Self-directedness and Cooperativeness. The AN+NSSI also displayed lower GAF score (Table 2).

The MANOVA analysis conducted on all tests together evidenced that the differences were all maintained except for the trend of IQ Total Score, with little reduction in significance levels for the other dimensions. The MANCOVA with the AN-R vs AN-BP diagnosis as covariate evidenced no significant effect diagnosis on the between-group differences, except for Social Problems which reduced their significance under Bonferroni correction level.

3.3. MANCOVA analysis using SD and C as confounders

The application of SD and C as covariates evidenced that they were related to the diagnosis, without a mediation of personality traits, the

Table 1
Demographics and clinical characteristics.

t-test analysis for continuous variables				
	AN (n = 41) m ± sd	AN + NSSI (n = 32) m ± sd	t	P
Age at admission, mean ± SD	13.5 ± 2.1	14.1 ± 1.6	-1.195	0.236
Age at AN onset, mean ± SD	13.3 ± 1.8	13.4 ± 2.0	-0.262	0.794
Age at NSSI onset, mean ± SD	-	14.4 ± 1.4	-	-
BMI, mean ± SD	14.81 ± 1.75	15.22 ± 1.88	-1.450	0.152
Chi-square test for categorical variables				
	AN (n = 41) n (%)	AN + NSSI (n = 32) n (%)	Chi-square	P
AN restricting type	39 (95)	24 (75)	6.155	0.013
AN binge-eating/purging type	2 (5)	8 (25)	-	ns
Familiar history positive for psychiatric disorders	14 (34)	15 (47)	-	ns
BMI percentile				
<3	29 (71)	23 (72)	-	ns
3 < 10	9 (22)	6 (19)		
>10	3 (7)	3 (9)		
GAF				
21–30	3 (7)	5 (16)	8.913	0.030
31–40	16 (39)	19 (59)		
41–50	15 (37)	8 (25)		
51–60	7 (17)	0 (0)		

AN: Anorexia nervosa only; AN + NSSI: Anorexia nervosa with non-suicidal self-injury; BMI: Body Mass Index; GAF: Global Assessment of Functioning. ns: non significant.

Table 2
MANOVA exploring differences between groups of interest (AN and AN+NSSI).

	AN (n = 41) m ± sd	AN + NSSI (n = 32) m ± sd	MANOVA 1		MANOVA2		MANCOVA	
			F	P	F	P	F	P
YSR								
Anxious depressed	1.40 ± 0.775	2.61 ± 0.722	35.620	0.000	26.469	0.000	15.581	0.000
Somatic complaints	1.11 ± 0.404	1.87 ± 0.869	20.016	0.000	17.943	0.000	13.973	0.000
Social problems	1.114 ± 0.494	1.83 ± 0.887	14.178	0.000	12.081	0.001	5.855	0.005
Thought problems	1.17 ± 0.514	2.04 ± 0.928	21.164	0.000	21.656	0.000	12.150	0.000
Externalizing probl.	1.09 ± 0.373	1.65 ± 0.832	12.495	0.001	13.128	0.001	6.879	0.002
Total problems	1.26 ± 0.611	2.30 ± 0.876	28.839	0.000	20.005	0.000	12.162	0.000
Affective problems	1.31 ± 0.676	2.17 ± 0.887	17.485	0.000	12.197	0.001	7.633	0.001
Anxiety problems	1.29 ± 0.667	2.17 ± 0.984	16.823	0.000	14.707	0.000	7.965	0.001
WISC IV indexes								
Full Scale IQ	112.93 ± 14.14	104.41 ± 15.58	5.964	0.017	ns	ns	ns	ns
GAF								
Total score	41.53 ± 8.420	34.79 ± 6.214	9.177	0.004	9.177	0.004	6.807	0.002
TCI								
Self-directedness	45.54 ± 8.20	36.20 ± 8.28	13.410	0.001	13.410	0.001	7.980	0.001
Cooperativeness	51.13 ± 6.90	43.11 ± 12.14	10.377	0.002	10.377	0.002	4.832	0.12

MANOVA1: MANOVA performed separately for each test; corrected $p < .003$ for the YSR; $p < .007$ for TCI; $p < .001$ for WISC.

MANOVA2: MANOVA performed considering all the tests together.

MANCOVA: performed using the AN-R and AN-BP subtypes as covariate.

AN: Anorexia nervosa only; AN + NSSI: Anorexia nervosa with non-suicidal self-injury; GAF: Global Assessment of Functioning; TCI: Temperament and Character Inventory; WISC: Weschler Intelligence Scale for Children; YSR: youth self-report; ns: non significant.

GAF score and the psychopathology dimensions: YSR total problems, YSR anxious depressed, YSR somatic complaints, YSR thought problems, YSR affective problems. Instead they were related to Self-directedness the between group differences in: YSR anxiety depression problems, YSR attention problems, YSR internalizing problems, YSR total problems and YSR ADHD problems. They were related to Cooperativeness the between group differences in: YSR Disruptive Behavior Problems, YSR externalizing problems, YSR conduct problems (Table 3).

4. Discussion

Consistent with previous reports, our data document higher levels of psychopathology in female adolescents with AN who also present with NSSI syndrome, as defined by DSM 5, as compared with peers with AN only [23,24].

We did not find differences in BMI or BMI percentile between AN + NSSI and AN, which suggests that NSSI is not associated with severity of AN malnutrition. Purging was more common among AN+NSSI (Table 1). This finding is consistent with several reports of higher rates of NSSI among binge eating/purging patients with eating disorders [41,42], even though other reports did not find an association

[15,23,43]. As proposed by Bühren and coworkers [44], the association between NSSI and purging may be due to a broadly dysregulated behavioral pattern, related to the underlying borderline features evidenced in many NSSI subjects [22]. Nevertheless the MANCOVA analysis did not evidence a significant impact of the ED subtype on the between group difference, suggesting a substantial independence of the two psychopathological expressions.

Indexes for externalizing problems were elevated in AN+NSSI, especially for anxiety and affective symptoms. This is consistent with the known association between NSSI and emotional dysregulation [8,10,45]. From an intelligence perspective, the AN+NSSI group displayed a trend towards lower levels than AN on the Full Scale IQ of the WISC-IV, even though both groups were in the normal range of functioning. It is worth noting that the diagnosis of NSSI itself, independently from personality traits, was found to be associated with thought problems. This two indexes are somewhat related to executive functioning, and this finding seem to confirm the hypotheses of an association between NSSI and worse functional impairment, maybe because of a lower competence in executive functioning. Lack of executive functions, in turn, seems to be associated with poor mentalization competences [31,32]. The lack in mentalization could impair the management of depressive feelings and favour the use of the NSSI and somatic complaints as copying mechanisms.

Contrary to the expectation, the temperamental features of novelty seeking and harm avoidance, as assessed with the TCI, did not differ between the two groups. We found, however, that AN+NSSI had lower levels of self-directedness and cooperativeness. Self-directedness is a character dimension that relates to the person's level of autonomy, reliability, and maturity. In our sample it is strictly related to depression and anxiety, internalizing problems and also with ADHD problems, which have been frequently found as associated to ED [46]. Cooperativeness indicates skills in social interaction and capacity for collaboration [40,47]. These findings therefore suggest that AN+NSSI adolescents are less emotionally and functionally independent, and have more difficulties in social interactions. Consistently with this description cooperativeness was related to the difference in conduct problems, disruptive behavior problems and externalizing problems in our sample. These deficits and the greater psychopathology are consistent with AN+NSSI having a lower level of global functioning, as measured with the GAF.

Table 3
MANCOVA performed using SD and C as covariates.

		F	P
MANCOVA fixed factor			
AN vs AN+NSSI	GAF	9.940	0.003
	YSR anxiety depression problems	10.086	0.003
	YSR somatic complaints	10.311	0.002
	YSR thought problems	9.876	0.003
Covariates			
Self-directedness	YSR anxiety depression problems	11.543	0.001
	YSR attention problems	11.007	0.002
	YSR internalizing problems	13.521	0.001
	YSR total problems	12.741	0.001
	YSR ADHD problems	10.622	0.002
Cooperativeness	YSR Disruptive Behavior Problems	12.214	0.001
	YSR externalizing problems	23.129	0.000
	YSR conduct problems	13.564	0.001

Bonferroni correction with $p < .003$.

Indeed, the lower Self-directedness and Cooperativeness scores in our AN+NSSI sample point to a character functioning that has been related by the authors of the TCI to severe personality troubles [48] and in particular to borderline personality features [49]. The fact that this “character core” is related to the NSSI also in our sample which does not display the “borderline” temperament traits (namely higher novelty seeking, high harm avoidance and lower persistence) considered typical for the NSSI in adolescents [21], supports that NSSI conducts could be due to a specific impairment of character development instead of a consequence of a full borderline personality disorder as diagnosed by DSM criteria. This may also account for the transient nature of NSSI in adolescent population already evidenced by literature [50,51].

The relevance of low SD and C personality core for our AN+NSSI participants is evidenced also by its extensive relationship with worse general functioning of these youth, consistently with literature findings [52].

4.1. Clinical implications

The evidence emerging from our study grants a better understanding of the psychopathological mechanisms underlying the NSSI behaviors in adolescents. The data are consistent with the DSM-5 position of including NSSI as a syndrome with a stand-alone diagnosis, in addition to listing the presence of NSSI behavior among the criteria for BPD. In fact, from a dimensional perspective, NSSI syndrome results more specifically related to an impairment in the development of the two character dimensions of self-directedness and cooperativeness, and not to specific temperament traits. Literature suggests that such impairment is frequently transient in adolescent population [50] and hence psychotherapeutic interventions oriented at the character development [49,53] may be effective for a more rapid extinction of these behaviors. The fact that these personality traits are also related to worse psychopathology and general functioning in our sample, as far as to a mild cognitive impairment, may suggest that the promotion of their development may benefit also these associated problems of adolescent population.

4.2. Limitations

The results of the study must be interpreted in the light of several methodological limitations. First of all the limited number of participants and the gender of the sample (only female). Because the sample consisted of adolescents with AN referred to hospital facilities for the severity of their condition, the findings do not necessarily apply to the general AN population. The high prevalence of NSSI (43.8%) in our sample of AN adolescents can be explained by the severe psychopathology of the patients typically referred for hospital care. In fact, in clinical samples of patients with eating disorders, rates of NSSI as high as 50% have been reported [6], while rates are lower in population samples. Other important limitations are the retrospective nature of the study and the relatively small sample size, which prevents more in-depth analyses of clinically relevant subgroups of patients. Thus, AN-R and AN-BP could not be considered separately in the analyses because of the small number of patients. Despite these limitations, the study was able to identify statistically and clinically significant differences in psychopathology, intelligence, character dimensions, and global functioning between AN+NSSI and AN adolescents.

5. Conclusion

Among early adolescents who were clinically referred to a university pediatric hospital services for AN, those who also engaged in NSSI had greater psychopathology, lower global cognitive scores, more impaired overall functioning, and character features which were subthreshold for a full borderline personality profile. The NSSI syndrome in AN subjects could be thus related to a borderline-like impairment in their character development, although not necessarily related to a full BPD. This

supports a comorbid diagnosis between AN and NSSI. These differences between AN+NSSI and AN may have implications for clinical care and course of illness, and warrant further investigation in larger and more representative samples.

6. References

- Islam MA, Steiger H, Jimenez-Murcia S, Israel M, Granero R, Agüera Z, et al. Non-suicidal self-injury in different eating disorder types: relevance of personality traits and gender. *Eur Eating Disord Rev* 2015;23(6):553–60. <https://doi.org/10.1002/erv.2374>.
- Wilkinson P, Goodyer I. Non-suicidal self-injury. *Eur Child Adolesc Psychiatry* 2011; 20:103–8. <https://doi.org/10.1007/s00787-010-0156-y>.
- Cipriano A, Cella S, Cotrufo P. Nonsuicidal self-injury: a systematic review. *Front Psychol* 2017;8:1946. <https://doi.org/10.3389/fpsyg.2017.01946>.
- American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders: Diagnostic and Statistical Manual of Mental Disorders*. 5th ed. Arlington, VA: American Psychiatric Association; 2013. <https://doi.org/10.1176/appi.books.9780890425596>.
- Gillies D, Christou MA, Dixon AC, Featherston OJ, Rapti I, Garcia-Anguita A, et al. Prevalence and characteristics of self-harm in adolescents: meta-analyses of community-based studies 1990–2015. *J Am Acad Child Adolesc Psychiatry* 2018;57(10):733–41. <https://doi.org/10.1016/j.jaac.2018.06.018>.
- Plener PL, Libal G, Keller F, Fegert JM, Muehlenkamp JJ. An international comparison of adolescent non-suicidal self-injury (NSSI) and suicide attempts: Germany and the USA. *Psychol Med* 2009;39(9):1549–58. <https://doi.org/10.1017/S0033291708005114>.
- Brown RC, Plener PL. Non-suicidal self-injury in adolescence. *Current Psychiatry Rep* 2017;19(3):20. <https://doi.org/10.1007/s11920-017-0767-9>.
- Nock MK, Joiner TE, Gordon KH, Lloyd-Richardson E, Prinstein MJ. Non-suicidal self-injury among adolescents: diagnostic correlates and relation to suicide attempts. *Psychiatry Res* 2006;144(1):65–72. <https://doi.org/10.1016/j.psychres.2006.05.010> Sep 30.
- Preyde M, Watkins H, Csuzdi N, Carter J, Lazure K, White S, et al. Non-suicidal self-injury and suicidal behaviour in children and adolescents accessing residential or intensive home-based mental health services. *J Can Acad Child Adolesc Psychiatry Nov* 2012;21(4):270–81.
- In-Albon T, Ruf C, Schmid M. Proposed diagnostic criteria for the DSM-5 of nonsuicidal self-injury in female adolescents: diagnostic and clinical correlates. *Psychiatry J* 2013;2013:159208. <https://doi.org/10.1155/2013/159208>.
- Tuisku V, Pelkonen M, Kiviruusu O, Karlsson L, Ruutu T, Marttunen M. Factors associated with deliberate self-harm behaviour among depressed adolescent outpatients. *J of Adolesc Oct* 2009;32(5):1125–36. <https://doi.org/10.1016/j.adolescence.2009.03.001>.
- Hoek HW, van Hoeken D. Review of the prevalence and incidence of eating disorders. *Int J of Eat Dis* Dec 2003;34(4):383–96. <https://doi.org/10.1002/eat.10222>.
- Favazza AR, Conterio K. Female habitual self-mutilators. *Acta Psychiatr Scand* 1989; 79:283–9. <https://doi.org/10.1111/j.1600-0447.1989.tb10259.x>.
- Claes L, Luyckx K, Bijttebier P, Turner B, Ghandi A, Smets J, et al. (2015). Non-suicidal self-injury in patients with eating disorder: associations with identity formation above and beyond anxiety and depression. *Eur Eat Disorders Rev*, 23, pages 119–125. <https://doi.org/10.1002/erv.2341>.
- Svirko E, Hawton K. Self-injurious behavior and eating disorders: the extent and nature of the association. *Suicide Life Threat Behav* 2007;37:409–21. <https://doi.org/10.1521/suli.2007.37.4.409>.
- Claes L, Fagundo AB, Jiménez-Murcia S, Agüera Z, Giner-Bartolome C, Granero R, et al. (2014). Is Non-suicidal self-injury related to impulsivity in anorexia nervosa? Results from self-report and performance-based tasks. *Eur Eat Disorders Rev*, 23; pages 28–33. <https://doi.org/10.1002/erv.2329>.
- Sansone RA, Sansone LA. Personality disorders as risk factors for eating disorders. *Nutr Clin Pract* 2010;25:116–21. <https://doi.org/10.1177/0884533609357563>.
- Cloninger CR, Przybeck TR, Svrakic DM, Wetzel RD. *The temperament and character inventory: a guide to its development and use*. St Louis: Center for Psychobiology of Personality; 1994.
- Fassino S, Abbate-Daga G, Amianto F, Leombruni P, Boggio S, Rovera GG. Temperament and character profile of eating disorders: a controlled study with the temperament and character inventory. *Int J Eat Disord* 2002;32:412–25. <https://doi.org/10.1002/eat.10099>.
- Amianto F, Abbate-Daga G, Morando S, Sobrero C, Fassino S. Personality development characteristics of women with anorexia nervosa, their healthy siblings and healthy controls: what prevents and what relates to psychopathology? *Psychiatry Res* 2011;187:401–8. <https://doi.org/10.1016/j.psychres.2010.10.028>.
- Tschan T, Peter-Ruf C, Schmid M, In-Albon T (2017). Temperament and character traits in female adolescents with nonsuicidal self-injury disorder with and without comorbid borderline personality disorder. *Child Adolesc Psychiatry Ment Health Jan* 13;11:4. <https://doi.org/10.1186/s13034-016-0142-3>.
- Ferrara M, Terrinoni A, Williams R (2012). Non-suicidal self-injury (Nssi) in adolescent inpatients: assessing personality features and attitude toward death. *Child Adolesc Psychiatry Ment Health Mar* 30;6:12. <https://doi.org/10.1186/1753-2000-6-12>.
- Claes L, Vandereycken W, Vertommen H. Eating-disordered patients with and without self-injurious behaviours: a comparison of psycho-pathological features. *Europ Eat Disord Rev* 2003;11:379–96. <https://doi.org/10.1002/erv.510>.
- Claes L, Vandereycken W, Vertommen H (2004). Personality traits in eating-disordered patients with and without self-injurious behaviors. *J Personal Disord*. 18, 399–404. <https://doi.org/10.1521/peci.18.4.399.40346>.

- [25] Calderoni S, Muratori F, Leggero C, Narzisi A, Apicella F, Balottin U, et al. Neuropsychological functioning in children and adolescents with restrictive-type anorexia nervosa: an in-depth investigation with NEPSY-II. *J Clin Exp Neuropsychol* 2013. <https://doi.org/10.1080/13803395.2012.760536>.
- [26] Hatch A, Madden S, Kohn M.R., Clarke S., Touyz S., Gordon E., et al. (2010). In first presentation adolescent anorexia nervosa, do cognitive markers of underweight status change with weight gain following a refeeding intervention? *Int J Eat Disord*. 43 (4):295–306.4. <https://doi.org/10.1002/eat.20695>.
- [27] Keyes KM, Platt J, Kaufman AS, McLaughlin KA (2017). Association of fluid intelligence and psychiatric disorders in a population-representative sample of us adolescents. *JAMA Psychiat*. Feb 1;74(2):179–188. <https://doi.org/10.1001/jamapsychiatry.2016.3723>.
- [28] Schilder CMT, van Elburg AA, Snellen WM, Sternheim LC, Hoek HW, Danner UN. Intellectual functioning of adolescent and adult patients with eating disorders. *Int J Eat Disord* May 2017;50(5):481–9. <https://doi.org/10.1002/eat.22594>.
- [29] Lopez C, Stahl D, Tchanturia K. Estimated intelligence quotient in anorexia nervosa: a systematic review and meta-analysis of the literature. *Ann Gen Psychiatry* 2010;9:40. <https://doi.org/10.1186/1744-859X-9-40>.
- [30] Weider S, Indredavik MS, Lydersen S, Hestad K. Neuropsychological function in patients with anorexia nervosa or bulimia nervosa. *Int J Eat Disord* May 2015;48(4):397–405. <https://doi.org/10.1002/eat.22283>.
- [31] Rossouw T, Fonagy P (2012). Mentalization-based treatment for self-harm in adolescents: a randomized controlled trial. *J Am Acad Child Adolesc Psychiatry*. 51. 1304–1313.e3. <https://doi.org/10.1016/j.jaac.2012.09.018>.
- [32] Baez S, Marengo J, Perez A, Huepe D, Font MF, Rial V, et al. Theory of mind and its relationship to executive functions and emotion recognition in borderline personality disorder. *J Neuropsychol* 2014;9. <https://doi.org/10.1111/jnp.12046>.
- [33] Achenbach TM, Rescorla LA. *Manual for the ASEBA school-age forms & profiles*. Burlington: Research Centre for Children, Youth and Families, University of Vermont; 2001.
- [34] American Psychiatric Association. 2000. *Diagnostic and statistical manual of mental disorders* (4th ed., text revision). Washington, DC.
- [35] Moos HR, McCoy L, Moos SB (2000). Global assessment of functioning (GAF) ratings: determinants and role as predictors of one-year treatment outcomes. *J Clin Psychiatry*. 56. 449–61. [https://doi.org/10.1002/\(SICI\)1097-4679\(200004\)56:43.O.CO;2-8](https://doi.org/10.1002/(SICI)1097-4679(200004)56:43.O.CO;2-8).
- [36] Endicott J, Spitzer RL, Fleiss JL, Cohen J. The global assessment scale: a procedure for measuring overall severity of psychiatric disturbance. *Arch Gen Psychiatry* 1976;33 (6):766–71. <https://doi.org/10.1001/archpsyc.1976.01770060086012>.
- [37] Wechsler D. *Wechsler intelligence scale for children*. 4th ed. San Antonio, TX: The Psychological Corporation; 2003.
- [38] Wechsler D. *The Wechsler intelligence scale for children*. 4th ed. London, UK: Pearson Assessment; 2004.
- [39] Orsini A, Pezzuti L, Picone L. *WISC-IV: Contributo alla Taratura Italiana*. WISC-IV. Italian edition Florence, Italy: Giunti OS; 2012.
- [40] Cloninger CR, Svrakic DM, Przybeck TR. A psychobiological model of temperament and character. *Arch Gen Psychiatry* 1993;50:975–89. <https://doi.org/10.1001/archpsyc.1993.01820240059008>.
- [41] Favaro A, Santonastaso P. Self-injurious behavior in anorexia nervosa. *J Nerv Ment Dis* 2000;188:537–42. <https://doi.org/10.1097/00005053-200008000-00010>.
- [42] Pérez S, Marco JH, Cañabate M. Non-suicidal self-injury in patients with eating disorders: prevalence, forms, functions, and body image correlates. *Compr Psychiatry* Jul 2018;84:32–8. <https://doi.org/10.1016/j.comppsy.2018.04.003>.
- [43] Svirko E, Hawton K. Self-injurious behavior and eating disorders: the extent and nature of the association. *Suicide Life Threat Behav* 2007;37:409–21. <https://doi.org/10.1521/suli.2007.37.4.409>.
- [44] Bühren K, Schwarte R, Fluck F, Timmesfeld N, Krei M, Egberts K, et al. Comorbid psychiatric disorders in female adolescents with first-onset anorexia nervosa. *Eur Eat Disord Rev* 2014;22:9–44. <https://doi.org/10.1002/erv.2254>.
- [45] Smith KE, Hayes NA, Styer DM, Washburn JJ. Emotional reactivity in a clinical sample of patients with eating disorders and nonsuicidal self-injury. *Psy Res* 2017;257: 519–25. <https://doi.org/10.1016/j.psychres.2017.08.014>.
- [46] Fernández-Aranda F, Agüera Z, Amiel Castro R, Jiménez-Murcia S, Antoni Ramos-Quiroga J, Bosch R, et al. (2013). ADHD symptomatology in eating disorders: a secondary psychopathological measure of severity? *BMC psychiatry*. 13. 166. <https://doi.org/10.1186/1471-244X-13-166>.
- [47] Martinotti G, Mandelli L, Di Nicola M, Serretti A, Fossati A, Borroni S, et al. Psychometric characteristic of the Italian version of the temperament and character inventory-revised, personality, psychopathology, and attachment styles. *Compr Psychiatry* Sep-Oct 2008;49(5):514–22. <https://doi.org/10.1016/j.comppsy.2007.11.002>.
- [48] Svrakic DM, Draganic S, Hill K, Bayon C, Przybeck TR, Cloninger CR. Temperament, character, and personality disorders: etiologic, diagnostic, treatment issues. *Acta Psychiatr Scand* Sep 2002;106(3):189–95. <https://doi.org/10.1034/j.1600-0447.2002.02196.x>.
- [49] Fassino S, Amianto F, Gastaldi F, Abbate-Daga G, Brambilla F, Leombruni P (2009). Personality trait interactions in parents of patients with borderline personality disorder: a controlled study using the temperament and character inventory. *Psychiatry Res* Jan 30;165(1-2):128–36. <https://doi.org/10.1016/j.psychres.2007.10.010>.
- [50] Wang B, You J, Lin MP, Xu S, Leung F. Developmental trajectories of nonsuicidal self injury in adolescence and intrapersonal/interpersonal risk factors. *J Res Adolesc Jun* 2017;27(2):392–406. <https://doi.org/10.1111/jora.12273>.
- [51] Victor, SE, Styer D, Washburn JJ (2016). Functions of nonsuicidal self injury (NSSI): cross-sectional associations with NSSI duration and longitudinal changes over time and following treatment. *Psychiatry Res* Jul30; 241:83–90. <https://doi.org/10.1016/j.psychres.2016.04.083>.
- [52] Kaess M, Resch F, Parzer P, von Ceumern-Lindenstjerna IA, Henze R, Brunner R. Temperamental patterns in female adolescents with borderline personality disorder. *J Nerv Ment Dis* Feb 2013;201(2):109–15. <https://doi.org/10.1097/NMD.0b013e31827f6480>.
- [53] Zipfel S, Wild B, Groß G, Friederich HC, Teufel M, Schellberg D, et al. (2014). Focal psychodynamic therapy, cognitive behaviour therapy, and optimised treatment as usual in outpatients with anorexia nervosa (ANTOP study): randomised controlled trial. *Lancet* Jan 11;383(9912):127–37. [https://doi.org/10.1016/S0140-6736\(13\)61746-8](https://doi.org/10.1016/S0140-6736(13)61746-8).