Claes L, Fagundo AB, Jiménez-Murcia S, Agüera Z, Giner-Bartolone C, Granero R, Sánchez I, Riesco I, Menchón JM, Tárrega S, Fernández-Aranda F. (2015). Is non-suicidal self-injury related to impulsivity in anorexia nervosa? Results from self-report and performance-based task. ***European Eating Disorders Review, 23(1),*** **28-33. doi:10.1002/erv.2329**

Abstract

The present study investigates the association between non-suicidal self-injury (NSSI) and impulsivity in anorexia nervosa (AN) patients by means of self-report and behavioural tasks. In total, 60 female AN patients were included in the study, filled out the Barratt Impul- siveness Scale-11 (BIS-11) and performed three performance-based tasks to assess different facets of impulsivity. Overall, 30% of the AN patients engaged in at least one form of NSSI during their lifetime. AN patients with and without NSSI did not significantly differ on the BIS-11 impulsiveness scale. On the performance-based measures, few differences emerged between AN patients with and without NSSI. Patients with NSSI showed more perseverations and perseveration errors ($p < .05$). The associations between self-report and performance-based measures were rather low, except for the association between the BIS-11 and Wisconsin Card Sorting Task persev- eration responses and errors (correlations $|r|$ range between .32 and .42). The implications for theory and treatment of AN patients with and without NSSI will be discussed.

Keywords: anorexia nervosa; impulsivity; neuropsychology; non-suicidal self-injury

Introduction

Non-suicidal self-injury (NSSI) refers to the direct and deliberate destruction of one's own body tissue without suicidal intent (Nock, 2009). Common forms of NSSI are skin cutting, burning and scratching oneself (Glenn & Klonsky, 2010). NSSI is a common behaviour among patients with an ED, and its prevalence ranges between 13.6% and 42.1% in restrictive anorexia nervosa (AN) patients and between 27.8% and 68.1% in binge eating/purging AN patients (Svirko & Hawton, 2007; Vansteelandt et al., 2013; Vansteenkiste et al., 2013).

Prior research in ED samples has shown that self-reported im- pulsiveness in an important correlate of NSSI. ED patients with NSSI score significantly higher on different self-reported dimen- sions of impulsivity compared with ED patients without NSSI (e.g. Claes, Jiménez-Murcia, et al., 2012; Claes, Norré, Van Assche, & Bijttebier, 2014). Additionally, self-reported impulsivity has been correlated with the frequency and severity of NSSI and with the absence of forethought before engaging in NSSI (Janis & Nock, 2009). However, prior studies have primarily relied on self-report measures of impulsiveness to investigate the associa- tion of NSSI and impulsivity (Evans et al., 2000). Therefore, more recently, researchers started to investigate the association between NSSI and impulsivity by means of both self-report measures of impulsivity and performance-based tasks. Janis and Nock (2009) reported on two studies in which they administered self-report measures of impulsivity (e.g. BIS-11) and performance-based tasks to assess behavioural disinhibition (e.g. Conners' Continu- ous Performance Test) and risky decision-making [e.g. Iowa Gambling Task (IGT)] in mixed samples of community and clin- ical adolescents and young adults. In both studies, participants with NSSI reported higher levels of impulsiveness; however, performance-based tasks failed to detect differences between indi- viduals with and without NSSI. Also, the association between the self-report and performance-based tasks was rather low. Both conceptual and methodological explanations have been offered to explain the low correlations between self-report and performance-based tasks (Sharma, Markon, & Clark, 2014); the low correlations can result from the following: (i) inconsistent definitions of impulsivity across self-report and performance- based measures (conceptually), or (ii) the inherent limitation in relating trait (self-report) to state (performance-based) measures (Cyders & Coskunpinar, 2011, 2012, in Sharma et al., 2014). A comparable study was performed by Glenn and Klonsky (2010) in a college student population. They administered the UPPS Impulsive Behavior Scale to assess self-reported dimensions of impulsivity as well as the stop-signal task, a performance-based task to assess behavioural disinhibition. In the same vein as Janis and Nock, their findings showed that self-report measures of impulsivity were able to differentiate college students with and without NSSI: students with NSSI scored significantly higher on negative urgency (tendency to engage in rash behaviours in the face of negative affect), sensation seeking and lack of premedita- tion (the inability

to delay action in order plan). However, on the stop-signal task, no differences emerged between students with and without NSSI. Although the aforementioned studies are very relevant to increase our knowledge about the association between NSSI and impulsivity, both research groups mentioned that their findings need to be replicated in more homogenous clinical samples (Glenn & Klonsky, 2010; Janis & Nock, 2009).

Claes, Van den Eynde, Guillaume, Vogels, and Audenaert (2012), for example, investigated the association between NSSI and impulsivity in a sample of borderline personality disorder (BPD) patients with and without NSSI, by means of the Barratt Impulsiveness Scale-11 (BIS-11) and six performance-based tasks to assess different dimensions of impulsiveness [e.g.Wisconsin Card Sorting Task (WCST), IGT and Stroop Color and Word Test (SCWT)]. In line with earlier findings in community samples, they found significant differences between BPD patients with and without NSSI on the self-report measures of impulsivity; however, no differences emerged on any of the six performance- based measures. On the self-report measure, BPD patients with NSSI scored significantly higher on motor and non-planning im- pulsivity compared with BPD patients without NSSI. However, as far as we know, no studies exist that investigated the association between NSSI and impulsivity by means of self-report and performance-based tasks in a sample of homogenous ED patients, and no studies investigated the association between self-report and performance-based measures of impulsivity in this population. Therefore, the aim of the present study was threefold: (i) to inves- tigate whether AN patients with and without NSSI differ on a self- report measure of impulsivity; (ii) to investigate whether they differ on performance-based measures that assess different aspects of impulsivity (i.e. inattention, inhibition, impulsive decision-making, executive functioning and more specific set shifting; Sharma et al., 2014); and (iii) to investigate the association between both types of measures (self-reported vs performance based).

Method

Participants and procedure

The sample consisted of 60 female AN patients. All patients were diagnosed according to the Diagnostic and Statistical Manual of Mental Disorders, fourth edition (DSM-IV), criteria, using the Structured Clinical Interview for DSM-IV Axis I disorders (First, Spitzer, Gibbon, & Williams, 1996), conducted by experienced psychologists and psychiatrists. Almost 52% (51.7%, n=31) of the patients were diagnosed as AN, restrictive type; 31.7% (n=19) as AN, binge eating/purging type; and 16.7% (n=10) as ED not otherwise specified. The mean age of the patients was 27.8 years (SD=8.77). The features of the ED as well as the socio-demographic characteristics of the AN patients are de- scribed in Table 1. With respect to ED features, AN patients with and without NSSI did not statistically differ in age, age of onset, duration of the ED or body mass index (BMI). No statistical differences emerged on socio-demographic characteristics, educa- tion level, civil status and employment status.

All participants were consecutive referrals for assessment and treatment at the Department of Psychiatry of the University Hospital of Bellvitge in Barcelona. The study was approved by the Ethics Committee of the hospital, and all participants agreed to participate in the study and gave informed consent.

Instruments

All participants underwent a comprehensive clinical and neuropsy- chological assessment. During the clinical assessment, participants provided information about demographic characteristics, includ- ing age, educational level, civil status and employment status, as well as characteristics of the ED, including age of onset, duration of ED, weight, length and BMI (weight/length in square metres).

The presence/absence of NSSI was investigated by a one-item question asking, ‘Have you ever engaged in self-injury without the intent to die?’ Using a single-item measure of NSSI is com- mon to NSSI research and has been shown to render consistent estimates of prevalence (e.g.Muehlenkamp, Claes, Havertape, & Plener, 2012).

Self-reported impulsiveness was assessed by means of the BIS- 11 (Patton, Stanford, & Barratt, 1995). The BIS assesses different aspects of impulsiveness as a personality trait. The questionnaire consists of 30 items to be rated on a 4-point Likert scale ranging from 1 (rarely/never) to 4 (almost often). The items are divided over three subscales, being attentional impulsiveness (cognitive instability and inattention), motor impulsiveness (acting on the spur of the moment and lack of perseverance) and non-planning impulsiveness

(intolerance of cognitive complexity and lack of self-control), and a total score. The total score can range from 30 to 120, with a higher score indicating more impulsiveness.

All participants were assessed with the following performance- based tasks, which are considered to assess different dimensions of impulsivity (Sharma et al., 2014): the SCWT (Golden, 1978), measuring inattention; the IGT (Bechara, Damasio, Tranel, & Damasio, 1997), measuring aspects of inhibition and impulsive decision-making; and the WCST (Heaton, 1981), measuring problems with set shifting (certainly the perseveration errors).

The SCWT (Golden, 1978) exists with three cards: (1) one card with colour names printed in black ink; (2) a card with 'printed in colour; and (3) a card with names of colours printed in an incongruent colour (i.e. the word RED, printed in blue ink). Patients have 45 seconds to read as many words as possible on Card 1 (score P) and name as many ink colours on Card 2 (score C) and Card 3 (score PC). The interference score is calcu- lated as [PC? (P×C/P+C)], and a higher score indicates a better capacity to inhibit an automatic response (i.e. reading the word in instead of naming the colour in which it is printed).

The IGT (Bechara et al., 1997) evaluates decision-making un- der conditions of uncertainty. Patients are required to make 100 picks from four identical-looking decks of cards (A, B, C and D). The objective is to win as much money as possible. Decks A and B are the 'disadvantageous' decks (higher rewards, but also greater losses). Decks C and D are the 'advantageous' decks (small gains, but also rare small losses). The test is scored by subtracting the amount of cards selected from decks A and B from the amount of cards selected from decks C and D. Impulsive patients show the tendency to choose more cards from the disadvanta- geous decks than from the advantageous deck (and thus receive a negative score).

The WCST (Heaton, 1981) is a neuropsychological task that measures cognitive flexibility, that is, the ability to alter a behav- ioural response mode in the face of changing contingencies (set shifting). The patients were asked to match test cards to reference cards according to the colour, shape or number of stimuli on the cards. Feedback is provided after each match, enabling the patient to acquire the correct rule of classification. After a fixed number of correct matches, the rule is changed without notice, and the patient must shift to a new mode of classification. The test ends when the patient has completed six categories or 128 trials.

Analyses

Statistical analyses were performed with SPSS 22 for Windows (SPSS system; SPSS, Chicago, IL). The comparison between ED patients with and without NSSI for the mean scores of the im- pulsivity questionnaire and the neurocognitive tasks (outcomes) was carried out through analysis of variance procedures (Cohen's d coefficients measured the effect size of the associa- tions). Bivariate correlations measured the association between BIS-11 and SCWT, IGT and WCST scores (good effect size was considered for $|r| > .30$).

Results

Non-suicidal self-injury in anorexia nervosa patients

Of the 60 AN patients, 18 patients (30%; 95% CI [19.9%, 42.5%]) engaged in at least one type of NSSI during their lifetime, and the presence/absence of NSSI was unrelated to AN subtype [$\chi 2(2) = 2.74$, $p = .26$]. Of the 18 patients with NSSI, 12 (66.7%; 95% CI [43.7%, 83.7%]) patients engaged in NSSI only, whereas six (33.3%; 95% CI [16.3%, 56.3%]) patients engaged in NSSI and suicidal behaviour.

Differences between anorexia nervosa patients with and without non-suicidal self-injury on self-reported impulsiveness (Barratt Impulsiveness Scale-11)

Table 2 shows the means (standard deviations) of the AN patients with and without NSSI on the BIS-11 subscales. Overall, we did not find significant differences between AN patients with and without NSSI with respect to self-reported dimensions of impul- sivity [Wilks's lambda = 0.947, $F(3, 49) = 0.909$, $p = .444$]. Effect sizes for mean differences were also in the small range ($|d| < 0.50$).

Differences between anorexia nervosa patients with and without non-suicidal self-injury on neurocognitive tasks

Table 3 displays the means (standard deviations) of the different indices of the performance-based measures for AN patients with and without NSSI. Concerning the SCWT interference score (inattention), we did not find significant differences between AN patients with and without NSSI (effect size for mean difference was also low).

Also on the IGT, we did not find significant differences between AN patients with and without NSSI [Wilks's lambda= 0.926, F(5, 44) = 0.707, p= .621, partial η2 = 0.076]. However, on different blocks, AN patients with NSSI chose (sig- nificantly) more cards from the disadvantageous desks (i.e., were more impulsive) compared to patients without NSSI. This differ- ence reached statistically significance for Block 2 of the IGT (effect size for mean difference was moderate, d=0.60). Additionally, patients without NSSI reached a positive net score at block 3; whereas patients with NSSI only reached a positive net score at block 5, indicating that this last group learned slower to choose cards from the advantageous decks A and B.

Finally, also the WCST indices did not show significant differ- ences between AN patients with and without NSSI [Wilks's lambda= 0.839, F(5, 45) = 1.725, p= .148, partial η2 = 0.161]. However, on the univariate level, AN patients with NSSI made more perseverative responses and more perseverative errors com- pared with AN patients without NSSI (Table 3).

Correlations between self-reported impulsiveness scales (Barratt Impulsiveness Scale) and neurocognitive tasks

Overall, the BIS subscales did not significantly correlate with the SCWT interference score and the IGT net scores of Blocks 1–5 and the total net score. However, we found moderate to good associations (|r|> .30) between several WCST indices and the BIS subscales (Table 4). Motor impulsiveness correlated signifi- cantly positively with all error indices of the WCST and negatively with conceptual-level responses (i.e. number of three consecutive correct category selections). Additionally, attentional and non-planning impulsivity correlated significantly positively with the number of perseverations and perseveration errors and negatively with conceptual-level responses.

Discussion

Our study was the first to systematically investigate differences in impulsivity dimensions in AN patients with and without NSSI, on the basis of self-report and performance-based measures. Overall, 30% of our AN patients engaged at least one type of NSSI during lifetime, which confirms the prevalence findings of previous stud- ies (e.g. Claes & Muehlenkamp, 2014; Svirko & Hawton, 2007). Additionally, as expected (e.g. Claes & Muehlenkamp, 2014), we did not find significant differences in the prevalence of NSSI in different AN subtypes. Furthermore, the results showed the AN patients who engaged in NSSI showed a tendency (p< .07) to have an earlier onset and a longer duration of their ED as well as a slightly higher BMI.

Concerning the self-report dimensions of impulsivity, we did not find significant differences between AN patients with NSSI and without NSSI. This result is in contradiction with findings of previous studies in both community (Glenn & Klonsky, 2010; Janis & Nock, 2009) and clinical samples (Claes, Van den Eynde, et al., 2012), which found significantly higher scores on (motor) impulsiveness in self-injurious participants. A possible explana- tion could be that in the present sample of AN patients, NSSI is not driven by impulsivity (impulsive NSSI) but by obsessionality (compulsive NSSI) as described by Favaro and Santonastaso (2000) in AN patients.

Taking into account the differences between AN patients with and without NSSI, on performance-based measures of impulsivity dimensions, our results are straightforward. Overall, we did not find significant differences between AN patients with and without NSSI, hereby confirming the findings of previous studies in com- munity and clinical samples (Claes, Van den Eynde, et al., 2012; Glenn & Klonsky, 2010; Janis & Nock, 2009). The only performance-based measure that showed significant differences between AN patients with and without NSSI is the WCST, which measures executive functioning, including set shifting. AN patients with NSSI gave more perseverative answers and made more perseverative errors compared with AN patients without NSSI. Several studies have already shown that AN patients have problems with set shifting (e.g. Lindner, Fichter, & Quadflieg, 2013; Roberts, Tchanturia, Stahl, Southgate, & Treasure,

2007; Roberts, Tchanturia, & Treasure, 2010; Tchanturia et al., 2012); however, this study adds to the existing literature, by illustrating that AN patients with NSSI have even more problems in this domain.

Finally, we also focused on the association between self-report and performance-based measures of impulsivity in AN patients. Self-reported impulsiveness was not related to the SCWT interfer- ence score nor to the IGT scores, confirming prior findings (see, for a review, Sharma et al., 2014). However, motor impulsivity was significantly related to perseverative and non-perseverative errors in the WCST, whereas attentional and non-planning im- pulsivity were positively related to perseverative errors.

These findings must however be interpreted in the context of several important limitations. First, our sample consisted of female patients with AN, so future studies need to include female as well as male patients with other ED diagnoses. Secondly, ques- tions on self-report measures of impulsivity (such as the BIS-11) may lead patients with NSSI to reflect on their NSSI and report that they are impulsive because they engage in NSSI (also Janis & Nock, 2009). Thirdly, patients with NSSI may only behave impulsively when they are under distress; so future studies can in- clude emotion induction strategies before patients perform the neurocognitive tasks to test this hypothesis (also Janis & Nock, 2009). Finally, our performance-based measures only focus on particular dimensions of impulsivity (inattention, risky decision- making and set shifting); so future studies could include tasks that focus on other dimensions of impulsiveness, such as delay discounting and behavioural inhibition.

In sum, we can conclude that the results of our study are in contradiction with similar studies in other samples and that AN patients with NSSI do not differ on different impulsivity measures from AN patients without NSSI. The only significant finding was that AN patients with NSSI make more perseverative errors (WCST) compared with AN patients without NSSI. Therefore, behavioural treatments for AN patients with NSSI certainly need to address their problems with cognitive inflexibility or set shifting (e.g. cognitive remediation therapy; Davies & Tchanturia, 2005; Pretorius et al., 2012). It is possible that NSSI in AN patients is more often driven by obsessionality instead of impulsivity (Favaro & Santonastaso, 2000).

REFERENCES

Bechara, A., Damasio, H., Tranel, D., & Damasio, A. R. (1997). Deciding advantageously before knowing the advantageous strategy. Science, 275, 1293–1295.

Claes, L., Jiménez-Murcia, S., Agüera, Z., Castro, R., Sanchez, I., Menchon, J. M., et al. (2012). Male eating disorder patients with and without non-suicidal self-injury: A comparison of psychopathological and per- sonality features. European Eating Disorders Review, 20, 335–338.

Claes, L., & Muehlenkamp, J. J. (Eds.). (2014). Non-suicidal self- injury in eating disorders. Germany, Heidelberg: Springer.

Claes, L., Norré, J., Van Assche, L., & Bijttebier, P. (2014). Non- suicidal self-injury (functions) in eating disorders: Associations with reactive and regulative temperament. Personality and Indi- vidual Differences, 57, 65–69.

Claes, L., Van den Eynde, F., Guillaume, S., Vogels, C., & Audenaert, K. (2012). Executive functioning in borderline personality disor- der with and without self-harming behaviors. In A. M. Columbus (Ed.), Advances in psychology research (Vol. 89). New York: Nova Science Publishers, pp. 177–189.

Cyders, M. A., & Coskunpinar, A. (2011). Measurement of con- structs using self-report and behavioral lab tasks: Is there overlap in nomothetic span and construct representation for impulsivity? Clinical Psychology Review, 31, 965–982.

Cyders, M. A., & Coskunpinar, A. (2012). The relationship between self-report and lab task conceptualizations of impulsivity. Journal of Research in Personality, 46, 121–124.

Davies, H., & Tchanturia, K. (2005). Cognitive remediation therapy as an intervention for acute anorexia nervosa: A case report. European Eating Disorders Review, 13, 311–316.

Evans, J., Reeves, B., Platt, H., Leibenau, A., Goldman, D., Jeffer- son, K., et al. (2000). Impulsiveness, serotonin genes and repe- tition of deliberate self-harm (DSH). Psychological Medicine, 30, 1327–1334.

Favaro, A., & Santonastaso, P. (2000). Self-injurious behavior in anorexia nervosa. Journal of Nervous and Mental Disease, 188, 537–542.

First, M. B., Spitzer, R. L., Gibbon, M., & Williams, J. B. W. (1996). Structured Clinical Interview for DSM-IV-TR Axis I disorders. Washington, DC: American Psychiatric Press.

Glenn, C. R., & Klonsky, E. D. (2010). A multimethod analysis of im- pulsivity in nonsuicidal self-injury. Personality Disorders: Theory, Research, and Treatment, 1, 67–75.

Golden, C. J. (1978). Stroop Color and Word Test: Manual for clin- ical and experimental uses. Chicago, IL: Stoeling.

Heaton, R. K. (1981). Wisconsin Card Sorting Test Manual. Odessa, FL: Psychological Assessment Resources.

Janis, I. B., & Nock, M. K. (2009). Are self-injurers impulsive? Re- sults from two behavioral laboratory studies. Psychiatry Research, 169, 261–267.

Lindner, S. E., Fichter, M. M., & Quadflieg, N. (2013). Central coher- ence in full recovery of anorexia nervosa. European Eating Disor- ders Review, 21, 115–120.

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

Nock, M. K. (2009). Non-suicidal self-injury: Origins, assessment, and treatment. Washington, DC: American Psychological Association.

Patton, J. H., Stanford,M. S., & Barratt, E. S. (1995). Factor structure of the Barratt Impulsiveness Scale. Journal of Clinical Psychology, 6, 768–774.

Pretorius, N., Dimmer, M., Power, E., Eisler, I., Simic, M., & Tchanturia, K. (2012). Evaluation of a cognitive remediation therapy group for adolescents with anorexia nervosa: Pilot STUDY. European Eating Disorders Review, 20, 321–325.

Roberts, M. E., Tchanturia, K., Stahl, D., Southgate, L., & Treasure, J. (2007). A systematic review an meta-analysis of set-shifting abi- lity in eating disorders. Psychological Medicine, 37, 1075–1084.

Roberts, M. E., Tchanturia, K., & Treasure, J. L. (2010). Explor- ing the neurocognitive signature of poor set-shifting in anorexia and bulimia nervosa. Journal of Psychiatry Research, 44, 964–970.

Sharma, L., Markon, K. E., & Clark, L. A. (2014). Toward a theory of distinct types of impulsive behaviors: A meta-analysis of self- report and behavioral measures. Psychological Bulletin, 140, 374–408.

Svirko, E., & Hawton, K. (2007). Self-injurious behavior and eating disorders: The extent and nature of the association. Suicide and Life-Threatening Behavior, 37, 409–421.

Tchanturia, K., Forcano, L., Fernandez-Aranda, F., Uher, R. Schmidt, U., Penelo, E., et al. (2012). Poor decision making in male patients with anorexia nervosa. European Eating Disorders Review, 20, 169–173.

Vansteelandt, K., Claes, L., Muehlenkamp, J., De Cuyper, K., Lemmens, J., Probst, M., Vanderlinden, J., & Pieters, G. (2013). Variability in Affective Activation Predicts Non-suicidal Self-injury in Eating Disorders. European Eating Disorders Review, 21, 143–147.

Vansteenkiste, M., Claes, L., Soenens, B., & Verstuyf, J. (2013). Mo- tivational Dynamics Among Eating-disordered Patients With and Without Nonsuicidal Self-injury: A Self-Determination Theory Approach. European Eating Disorders Review, 21, 209–214.

Table 1

		NSSI = absent ($n = 42$)	NSSI = present ($n = 18$)	Test statistic	p
Age (years), mean (SD)		28.30 (9.10)	26.7 (8.0)	$F_{(1, 58)} = 0.38$	.538
Age of onset (years), mean (SD)		23.00 (9.10)	18.1 (6.6)	$F_{(1, 46)} = 3.11$	.084
Duration of the ED problem (years), mean (SD)		5.73 (6.00)	9.1 (5.1)	$F_{(1, 46)} = 3.21$	.080
Body mass index (kg/m^2)		16.40 (1.3)	17.1 (1.2)	$F_{(1, 53)} = 3.32$	.074
Education level (%)	Primary	20.50	28.6	$\chi^2(2) = 4.82$	.103
	Secondary	41.00	64.3		
	University	38.50	7.1		
Civil status (%)	Single	79.50	76.5	$\chi^2(2) = 2.17$	.356
	Married—in couple	12.80	23.5		
	Divorced—separated	7.70	0.0		
Employment status (%)	Employed	34.20	21.4	$\chi^2(2) = 2.41$	.355
	Unemployed	34.20	57.1		
	Student	31.60	21.4		

Table 2

	NSSI = absent ($n = 42$)		NSSI = present ($n = 18$)		Statistic	Significance	Effect size
	Mean	SD	Mean	SD	$F_{(1, 51)}$	p	$\lvert d \rvert$
Cognitive	13.34	4.88	15.27	5.51	1.556	.218	0.37
Motor	13.53	5.01	16.00	6.84	2.120	.152	0.41
No planning	14.16	6.41	15.00	6.61	0.182	.671	0.13
Total score	41.03	12.73	46.27	15.54	1.605	.211	0.37

Table 3

	NSSI = absent ($n = 42$)		NSSI = present ($n = 18$)		Statistic	Significance	Effect size
	Mean	SD	Mean	SD	F	p	$\|d\|$
SCWT interference	6.53	10.35	5.87	8.23	$F_{(1, 44)} = 0.04$	.840	0.07
IGT: Block 1	−2.11	4.00	−2.77	3.88	$F_{(1, 48)} = 0.27$	.608	0.17
IGT: Block 2	−0.22	3.68	−2.31	3.25	$F_{(1, 48)} = 3.29$	.076	0.60†
IGT: Block 3	0.49	5.24	−0.77	4.73	$F_{(1, 48)} = 0.58$	.450	0.25
IGT: Block 4	0.38	8.26	−1.08	5.33	$F_{(1, 48)} = 0.35$	.557	0.21
IGT: Block 5	0.22	9.70	0.15	6.95	$F_{(1, 48)} = 0.00$	.983	0.01
IGT: total	−1.24	22.03	−6.77	15.46	$F_{(1, 48)} = 0.69$	.409	0.29
WCST: total trials	90.53	18.81	99.54	26.42	$F_{(1, 49)} = 1.80$	.186	0.39
WCST: correct responses	67.03	10.59	65.23	14.37	$F_{(1, 49)} = 0.23$	.633	0.14
WCST: total errors	23.50	22.28	34.31	31.76	$F_{(1, 49)} = 1.82$	.184	0.39
WCST: perseverative responses	11.26	8.04	23.31	32.56	$F_{(1, 49)} = 4.56$	.038*	0.51†
WCST: perseverative errors	10.47	7.28	20.08	24.65	$F_{(1, 49)} = 4.73$	.034*	0.53†
WCST: non-perseverative errors	13.03	16.68	14.23	15.17	$F_{(1, 49)} = 0.05$	.819	0.08
WCST: conceptual level	61.34	15.13	54.31	23.29	$F_{(1, 49)} = 1.57$	.216	0.36

Table 4

	BIS attentional impulsiveness	BIS motor impulsiveness	BIS non-planning impulsiveness
Total trials	.146	.473*	.143
Correct responses	−.280	−.231	−.350*
Total errors	.251	.502*	.281
Perseverative responses	.323*	.395*	.352*
Perseverative errors	.335*	.423*	.338*
Non-perseverative errors	.096	.408*	.139
Conceptual-level response	−.291	−.400*	−.332*