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A Neuropsychological Investigation of Perfectionism

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Abstract

Perfectionism entails a burdensome preoccupation with one's self-evaluation in the context of performance outcomes. Although perfectionism has been subject to extensive research, scant literature on its effect on cognitive functioning is available, let alone in nonclinical populations. The aim of the present study is to utilize a comprehensive neuropsychological battery to assess cognitive functions among college students with high and low levels of perfectionism. Participants were 98 college students who were screened for clinical status, completed a neuropsychological battery, and assessed for perfectionism and related symptomatology. Results revealed that the high negative perfectionism group had significantly higher levels of depression and stress compared to the low negative perfectionism group. However, no group differences were found across neuropsychological outcomes. Gradient differences on clinical outcome measures were found when three groups characterized by high adaptive, high maladaptive, and mixed perfectionism were compared. However, no differences were found on neuropsychological tests. These findings suggest that higher levels of negative perfectionism are associated with significant psychopathological burden, but with intact neuropsychological test performance. These results are important, particularly in the context of the need to identify and treat students struggling with high levels of perfectionism and related psychopathological burden, which can be overlooked given that they present with intact cognitive and academic performance.

Keywords: perfectionism; executive function; college students; neuropsychology

PERFECTIONISM IS A PERSONALITY TRAIT defined by setting high standards for performance accompanied by critical self-evaluations (Frost, Marten, Lahart, & Rosenblate, 1990). Previously thought to be an adverse unidimensional phenomenon, a number of contemporary models and conceptualizations of perfectionism highlight both a maladaptive, as well as an adaptive dimension of perfectionism (e.g., Frost et al., 1990; Hewitt & Flett, 1991). The maladaptive dimension is suggested to be more strongly related to negative outcomes, such as psychopathology, whereas the adaptive dimension is thought to be associated with more positive outcomes, similar to adaptive achievement striving (Frost, Heimberg, Holt, Mattia, & Neubauer, 1993). However, others argue that by definition perfectionism is dysfunctional and becomes clinically relevant when high standards are being repeatedly pursued despite significant adverse consequences (Shafran, Cooper, & Fairburn, 2002). In addition, Shafran et al. (2002) further noted that perfectionism should not be confused with an adaptive construct that is unrelated to perfectionism, termed "functional pursuit of excellence," which is akin to normal and adaptive striving for excellence.

In contrast to the clear dissociation suggested by Shafran et al. (2002), a more recent model of perfectionism offers a mixed perfectionism subtype, where the adaptive and the maladaptive dimension are both prominent, and termed "high evaluative

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concerns" and "high personal standards" (Gaudreau & Thompson, 2010). The authors propose that within-person combinations of the adaptive and maladaptive dimensions, rather than the dimensions themselves, are more relevant when differentiating the outcomes of distinct perfectionism subtypes (Gaudreau & Thompson, 2010). This model offers an interesting subtype involving the presentation of the seemingly contrasting dimensions. Although the nature of the construct of perfectionism and its subconstructs is still subject to contemporary debate (Stoeber, 2018), perfectionism is still commonly perceived to be a multidimensional construct comprising both adaptive and maladaptive dimensions.

Despite the various conceptualizations and models of perfectionism, the construct is consistently associated with psychopathology, and is commonly identified in multiple disorders, including obsessive-compulsive disorder (OCD), anorexia nervosa (AN), obsessive-compulsive personality disorder (OCPD), and social anxiety disorder (SAD; Limburg, Watson, Hagger, & Egan, 2017; Shafran & Mansell, 2001). However, perfectionism is a dimensional construct also seen in the general population, and high levels of maladaptive perfectionism in the general population have been consistently associated with symptoms of depression (e.g., Mehr & Adams, 2016), stress (e.g., Ashby, Noble, & Gnilka, 2012), and anxiety (e.g., Gnilka, Ashby, & Noble, 2012). Indeed, perfectionism is associated with both the somatic facets of anxiety as well as its cognitive facets, including worrisome thoughts (e.g., Handley, Egan, Kane, & Rees, 2014), intrusive thoughts (e.g., Flett, Madorsky, Hewitt, & Heisel, 2002), and obsessions (e.g., Tolin, Brady, & Hannan, 2008).

Surprisingly, although a growing interest in cognitive functions and psychopathology led to an accumulation of a large body of neurocognitive literature across clinical and nonclinical populations, very little is known about neuropsychological function in the context of perfectionism. This line of research in perfectionism is of theoretical and clinical importance for the following reasons: First, major clinical symptoms (e.g., anxiety, stress, depression, intrusive thoughts), and the majority of the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5; American Psychiatric Association, 2013) conditions have been associated with a moderate degree of deficient performance on most neuropsychological domains (e.g., Lipszyc & Schachar, 2010; Snyder, Hankin, & Miyake, 2015). Given the association between perfectionism and psychopathology, it is important to assess cognitive functions in perfectionism.

Second, perfectionism may be unique in that the core psychopathology entails a preoccupation with performance outcomes, concerns and evaluation of performance. And it is important to investigate the quality of performance across cognitive domains using objective cognitive measures. Third, perfectionism is associated with a fear of making mistakes (Frost et al., 1990) and performing poorly. This in turn leads to hypervigilant performance monitoring, doubting, and scrutinizing of performance and its outcomes (Shafran et al., 2002). Indeed, initial event-related electroencephalogram studies point to an error monitoring bias in perfectionism, including among nonclinical participants (Stahl, Acharki, Kresimon, Völler, & Gibbons, 2015). This bias is central to OCD (e.g., Bucci et al., 2004; Samuels et al., 2017) and is associated with slower processing speed, originally termed "obsessive slowness" (Rachman, 1974). Finally, elevated levels of perfectionism are associated with intrusive and obsessive thoughts (Flett et al., 2002; Tolin et al., 2008), which in turn may hinder cognitive functioning (Abramovitch, Dar, Hermesh, & Schweiger, 2012). Thus, although there is no comparative research directly examining the neuropsychology of perfectionism, it is plausible that the mechanism of hypercontrol and interference due to intrusive thoughts and obsessions may result in underperformance in certain neuropsychological domains.

Research directly examining cognitive functioning in the context of perfectionism is scarce, and the limited research available has been conducted almost exclusively with clinical populations. For example, Tchanturia et al. (2004) examined performance on set-shifting tasks in AN and found that childhood (but not current) perfectionism predicted performance Trail Making B In addition, Slade, Coppel, and Townes (2009) conducted the only study that utilized a comprehensive neuropsychological battery. The authors examined neuropsychological correlates of perfectionism using a bidimensional model in a single sample of mixed treatment-seeking individuals. The authors found that negative perfectionism was negatively correlated with tests of attention and spatial working memory. In contrast, positive perfectionism was positively correlated with performance on tasks of attention and working memory. The authors speculated that negative perfectionism is associated with a central motivational theme in which individuals primarily attempt to avoid making errors, which in turn, negatively affects attention and planning. Additionally, the authors suggest that the opposite motivation (i.e., striving to succeed on tasks) is associated with positive

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perfectionism (Slade et al., 2009). However, this study utilized a sample of mixed psychiatric and neurologic conditions, provided correlations without reporting information on task performance reported, and no comparison groups were included. Therefore, an evaluation of neurocognitive function associated with perfectionism is needed in nonclinical populations, where perfectionism may not be secondary to the core psychopathology.

To our knowledge, only one study assessed the association between cognitive functions and perfectionism in college students. In this study, Desnoyers and Arpin-Cribbie (2015) assessed the relationship between self-oriented and socially prescribed perfectionism, working memory, and attention. The authors found that only socially prescribed (i.e., maladaptive, or negative) perfectionism predicted accuracy on the verbal *N*-back working memory task. However, neither form of perfectionism was found to be associated with attention.

Because perfectionism is associated with various psychopathological symptoms, reduced work productivity (Sherry, Hewitt, Sherry, Flett, & Graham, 2010), and a core focus on evaluation of performance, ascertaining performance on cognitive tasks in individuals with high levels of perfectionism is an important venue for research. Moreover, a comparative examination of cognitive function in the context of adaptive versus maladaptive perfectionism is needed and may provide insight to the ongoing debate regarding the factor structure of perfectionism. To address this significant gap in the literature, the aim of the present study was to utilize a comprehensive neuropsychological battery to assess the association between perfectionism and cognitive functions while controlling for potential moderators, including severity of depression, anxiety, and stress symptoms, and DSM-5 clinical status. Given that there are several prominent models of perfectionism (e.g., Frost et al., 1990, Gaudreau & Thompson, 2010; Hewitt & Flett, 1991; Shafran et al., 2002), we chose to examine two different models to determine whether findings could be replicated using different conceptualizations of perfectionism. The first model was used to examine the impact of high negative perfectionism (HNP) versus low negative perfectionism (LNP) on cognitive functioning. This was modeled after the unidimensional definition of perfectionism proposed by Shafran et al. (2002). They posit that only characteristics associated with negative perfectionism (referred to as 'clinical perfectionism') are clinically relevant. A second multidimensional model employed here included three subtypes of perfectionism (i.e., adaptive, maladaptive, and mixed) that reflects Gaudreau and Thompson (2010) model of dispositional perfectionism. This model has been widely accepted in recent years and has been utilized in several recent studies (e.g., Gaudreau, 2015; Gaudreau & Verner-Filion, 2012; Mallinson, Hill, Hall, & Gotwals, 2014; Nordin-Bates, Raedeke, & Madigan, 2017). In addition, it is important to examine mixed perfectionism, which entails high maladaptive perfectionism, which may hinder cognitive performance, in addition to high adaptive perfectionism, which may mitigate the impact. Notably, adaptive and maladaptive perfectionism conceptually correspond to negative and positive perfectionism, respectively.

In light of the results from a handful of previous studies and extrapolations from perfectionism studies in clinical samples, we hypothesize that high negative and maladaptive perfectionism will be associated primarily with reduced processing speed, underperformance on higher load tasks of executive function, and worse grade point average (GPA). In contrast, we hypothesize that adaptive perfectionism will be associated with intact cognitive functions and higher GPA. Although no information is available on mixed perfectionism in the context of cognitive functioning, our exploratory hypothesis of mixed perfectionism relies on the fact that mixed perfectionism entails both high maladaptive and adaptive perfectionism. Because of this, the impact of maladaptive perfectionism on cognitive function may be mitigated. Therefore, it is expected that mixed perfectionism will be associated with a lower degree of cognitive underperformance compared to maladaptive perfectionism.

Method

PARTICIPANTS

Participants (n = 98) were recruited as part of a large neuropsychological study conducted at a university in the southwestern United States. Participants were recruited via ads, flyers, and e-mails. Inclusion criteria were age >18, intact or corrected vision, and fluency in English. Exclusion criteria included age >65 and a history of major neurological conditions (e.g., epilepsy, brain injury). The demographic breakdown of the sample can be found in Table 1. The mean age for the entire sample was 21.4 years (SD = 3.2) and 63.3% of the sample were female. Of the entire sample, 7 participants met criteria for substance abuse disorder (7.1%), 7 for attention-deficit/hyperactivity disorder (7.1%), 6 for general anxiety disorder (GAD; 6.1%), 4 for major depressive disorder (4.1%), 3 for SAD (3.1%), 3 for bulimia nervosa (3.1%), 2 for OCD, (2.0%), and 1

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Table 1
Demographic and Clinical Characteristics of High and Low Negative Perfectionism Groups and Entire Sample

	LNP (n = 49)		HNP (n = 42)				Entire sample (N = 98)	
	Mean/%	*SD*	Mean/%	*SD*	$F(1, 89)/X^2$	Sig	Mean/%	*SD*
Age (years)	21.06	2.59	21.52	3.26	0.453	.45	21.41	3.20
Education (years)	15.06	1.36	15.21	1.33	0.591	.59	15.16	1.36
% females	68.6%	–	58.7%	–	0.852	.40	62%	–
GPA	3.24	0.53	3.10	0.49	1.709	.19	3.16	0.52
DASS-21 Depression	6.92	9.10	12.04	11.24	5.732	**.01***	13.44	17.02
DASS-21 Anxiety	6.12	8.92	9.62	8.48	3.323	.07	7.42	8.68
DASS-21 Stress	10.48	10.32	16.18	11.10	5.307	**.02***	12.58	10.88
STAI—State Anxiety	32.24	10.21	35.39	11.66	1.889	.17	33.64	10.67
Estimated IQ	105.98	10.15	110.67	9.45	5.116	**.02***	107.65	10.11
Positive Perfectionism	80.14	9.06	78.22	10.11	2.876	.09	77.78	10.47
Negative Perfectionism	50.76	6.48	70.74	7.67	181.383	<**.01****	59.44	12.63

Note. LNP = low negative perfectionism; HNP = high negative perfectionism; GPA = grade point average; DASS-21 = Depression Anxiety Stress Scale–21; STAI = State Trait Anxiety Inventory; Sig = significance; Using Fisher's exact test for binary variables; IQ estimation derived from Oklahoma Premorbid Intelligence Estimate (OPIE-IV) equations.
* $p < .05$.
** $p < .01$.

participant met criteria for posttraumatic stress disorder (PTSD; 1.0%).

Materials

Clinical Measures

Mini-International Neuropsychiatric Interview 7.0 (MINI)
The MINI (Sheehan et al., 1998) is a valid, reliable, and widely used semistructured diagnostic screening interview. The MINI 7.0 covers primary DSM-5 disorders and previous versions of the MINI demonstrate good psychometric properties (Sheehan et al., 1998).

Depression, Anxiety, Stress Scale–21 (DASS-21)
The DASS-21 (Lovibond & Lovibond, 1995) is a self-report questionnaire that measures severity of depression, anxiety, and stress symptoms. Each item is scored from 0 (*did not apply to me at all over the last week*) to 3 (*applied to me very much or most of the time over the past week*). The DASS-21 demonstrates good–excellent reliability and validity in nonclinical samples (Sinclair et al., 2012) and clinical samples (Clara, Cox, & Enns, 2001). In the current study, good to excellent reliability was found for the DASS-21 (α = .91, .83, and .88 for depression, anxiety, and stress, respectively).

State Trait Anxiety Inventory—State Short Form (STAI-State)
The STAI-State (Marteau & Bekker, 1992) is a six-item self-report questionnaire adapted from the State Trait Anxiety Inventory. The STAI-State short form demonstrated good internal consistency (α = .82; Marteau & Bekker, 1992). This scale demonstrated good reliability in the present study (α = .80).

Positive and Negative Perfectionism Scale (PANPS)
The PANPS (Terry-Short, Owens, Slade, & Dewey, 1995) is a 40-item questionnaire comprising two subscales. Twenty items are summed to form the Positive Perfectionism subscale score, and 20 items are summed to form the Negative Perfectionism subscale score. The items are rated on a Likert scale from 1 (*strongly disagree*) to 5 (*strongly agree*). The Positive and Negative Perfectionism subscales demonstrate good–excellent internal consistency in student samples (α = .86–.90; Egan, Piek, Dyck, & Kane, 2011). The PANPS was selected for this study due to its psychometric properties and the ability to generate and compare two different conceptualizations of perfectionism—namely, negative versus positive perfectionism, and adaptive, maladaptive, and mixed perfectionism. In the present study, both scales were found to have good internal consistency (α = .88 for positive and negative perfectionism).

Neuropsychological measures

Executive Functions
The Trail Making Test (TMT; Delis, Kaplan, & Kramer, 2001) is a test of graphomotor speed and set shifting that includes part A (TMA) and part B (TMB). The TMB measures set shifting and requires participants to draw a line switching between

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numbered circles and letters. The TMB total time in seconds was used as the outcome measure. The Wisconsin Card Sorting Test (WCST; Loong, 1990) is a measure of executive functions assessing concept formation, set shifting, and the ability to utilize environmental feedback for cognitive sets. A computerized version of the WCST was administered. Outcomes of interest were percent preservative errors and the number of categories completed. The Tower of London (TOL; Shallice, 1982) assesses planning ability and problem-solving skills. A computerized version of the TOL (Sanzen Neuropsychological Assessment Tests, Colorado Springs, Colorado) was administered. The TOL task requires participants to move beads from a standard initial position to match the "goal" arrangement while following specific rules. The outcome measure of interest for this task was total excess moves beyond the minimum required to complete the model correctly.

The Digit Span (DS) task is a subtest of the Wechsler Adult Intelligence Scale–IV (WAIS-IV; Wechsler, 2008), assessing working memory maintenance and manipulation. This test requires participants to repeat a series of digits and has three conditions: forward, backward, and sequencing. The outcome measures for this task were total DS forward, total DS backward, and total DS sequencing scores. The Symbol Span Test (Wechsler, 2009) is a subtest of the Wechsler Memory Scale–IV (WMS-IV), assessing visual working memory. Participants are briefly shown a series of abstract symbols on a page and then asked to select the symbols they saw in the same order they were previously presented. Verbal Fluency (VF; Delis et al., 2001) measures phonemic fluency and category/sematic fluency. The outcome measures used were the total number of words for letter fluency and category fluency. The Conners' Continuous Performance Test 3rd Edition (CPT-III; Conners, 2014) is a computerized continuous performance test that assesses response inhibition, attention, and processing speed. The outcome measure of interest in the context of executive function was commission errors as an indicator of response inhibition.

Memory

The California Verbal Learning Test–II (CVLT; Delis et al., 2000) is an auditory list-learning task that requires participants to recall a series of words from a list. Total numbers of words recalled correctly in the short- and long-delay trials, and the cumulative number of words on Trials 1–5 were used as outcoms measures in the present study. The Rey–Osterrieth Complex Figure Test (RCFT; Osterrieth, 1944) is a nonverbal memory test that includes a copy, immediate, and delayed trials. In this study, the immediate and delayed trials were used as measures of nonverbal memory, using the Meyers and Meyers (1996) scoring system.

The TMA (Delis et al., 2001) is a common measure of graphomotor *processing speed*. The TMA requires participants to draw a line connecting between numbered circles as fast as possible. The total time in seconds for the TMA was used as the outcome measure. The CPT-III mean "go" reaction time was used as an additional outcome measure for processing speed, and the test's reaction time standard deviation and omission errors were used as outcome measures for attention. *Visuospatial function* was assessed by the RCFT copy trial. Estimated IQ (ESIQ) was estimated using the Oklahoma Premorbid Intelligence Estimate (OPIE-IV) algorithm for WAIS-IV (Holdnack, Schoenberg, & Lange, 2013). The OPIE-IV algorithm is a psychometrically valid, empirically derived formulae that includes the WAIS-IV Vocabulary and Matrix Reasoning subtest scores as well as demographic variables. *Self-report GPA* was used as a secondary estimation of global performance.

Procedure

Research assistants underwent a rigorous 3-month training schedule conducted by AA. Training included hands-on instructional training, multiple mock administrations of the MINI and the neuropsychological battery, and examination of video recordings, as well as one-on-one in-person evaluations by AA. Experimenters were graduate and undergraduate research assistants. A dedicated data manager carefully reviewed all outcome measures for all participants prior to data entry. This process was employed under direct supervision of AA. All participants were requested to avoid taking any stimulant medications, or sedatives (e.g., benzodiazepines), or to engage in heavy drinking 24 hours prior to the time of assessment. Participants were seen individually in a quiet lab room and completed the MINI clinical interview first, followed by the neuropsychological assessments and the self-report questionnaires, which were counterbalanced. Each session took approximately 3.5 hours, including a 10-minute break. All computerized tests and questionnaires were taken on identical laptops designated for the study. In addition, online questionnaires were administered via the Qualtrics secured online platform. Upon completion of the in-person session, 109 consecutive participants were contacted with a request to complete three additional surveys. Ninety-eight participants who

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completed the online phase comprised the final sample. Each participant completed the PANPS and the DASS-21. All participants signed an informed consent and were compensated $40 for participating in the initial in-person session, and $10 for the online phase. This study was approved by the Institutional Review Board in accordance with the declaration of Helsinki.

ANALYTIC PLAN

All analyses were conducted using IBM SPSS version 24 (2016). The data were initially screened for outliers or missing data. To assess the differences between high and low levels of negative perfectionism, two subsamples were created using a median split, which has been previously employed as a reliable mean to distinguish between high and low perfectionism using several different perfectionism measures, including the Dysfunctional Attitudes Scale (Zuroff et al., 2000) and the Almost-Perfect Scale Revised (Periasamy & Ashby, 2002). Analysis of variance was used to compare the HNP (n = 42) and LNP (n = 49) groups on continuous clinical and demographic variables, and Pearson's chi-squared test was used for nominal variables. MANCOVA was utilized to assess group differences on neuropsychological tests using raw scores.

In addition, to examine the more recent multidimensional conceptualization of perfectionism, we employed the 2 × 2 model of dispositional perfectionism utilizing both positive and negative perfectionism to create three perfectionism subgroups. While originally a cutoff of ±1 *SD* from the mean was used to create the subgroups (see Gaudreau & Thompson, 2010), we opted to utilize a more conservative approach and utilize the median value. This approach facilitates increased power due to increased sample size, and thus allows for the inclusion of important covariates. In terms of severity, this approach also results in more ecologically valid samples, as opposed to smaller ones with more extreme mean values. The perfectionism subgroups were defined by the following: Participants who scored above the median for positive perfectionism and below the median for negative perfectionism were classified as adaptive (n = 24). Participants who scored below the median for positive perfectionism and above the median for negative perfectionism were classified as maladaptive (n = 23). Participants who scored above the median for both positive and negative perfectionism were classified as mixed (n = 24). Of note, in this study, the mean PANPS scores for negative perfectionism in the HNP sample (M = 70.74, SD = 7.67), as well as in the maladaptive perfectionism subsample (M = 68.76, SD = 6.76), were equivalent to those found in clinical samples with anxiety disorders and depression (e.g., M = 62.57, SD = 16.63; Egan et al., 2011).

A MANCOVA with planned contrasts was used for the three-group analysis. Finally, to assess overall associations between perfectionism indices and cognitive function, Pearson's correlations were computed. Given the high number of comparisons and the risk of family-wise inflation of Type I error, a correction for multiple comparisons was employed across comparisons, utilizing the Holm–

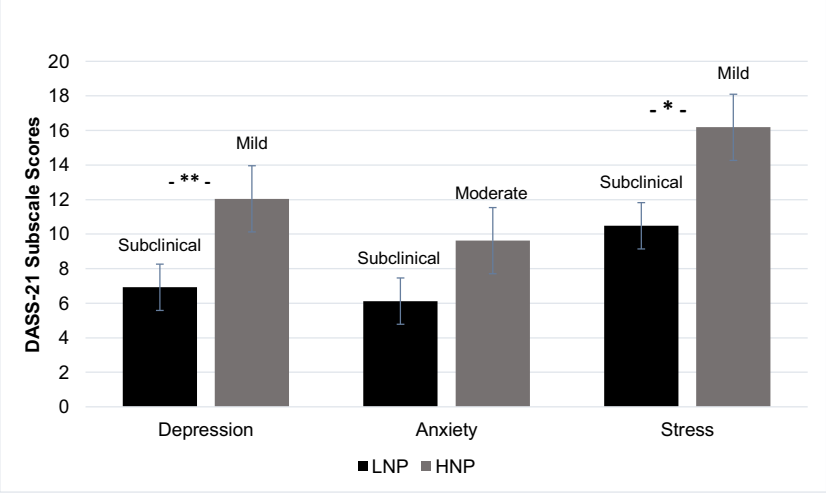

FIGURE 1 Comparative analyses of symptoms of depression, anxiety, and stress (DASS-21) between the high (HNP) and low (LNP) negative perfectionism subgroups. Degree of symptom severity categories as defined by the DASS-21; *p<.05, **p<.01. Error bars represent standard error.

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Bonferroni correction method (Holm, 1979). In addition, all analyses with neuropsychological outcomes were conducted with raw test scores. However, to facilitate interpretation of the test scores, results are presented in standardized *Z* scores produced via test norms (see Tables 3 and 4).

Results

Characteristics of the HNP Versus LNP Samples

No significant differences were found between the HNP and LNP groups on demographic variables apart from IQ. Although both groups had normative IQ, the HNP group was found to have significantly higher IQ, compared to the LNP group (*m*Diff = 4.69 IQ points), entailing less than one third of an *SD* difference. In terms of clinical status, Pearson's X^2 revealed that the HNP group had higher prevalence of individuals meeting criteria for at least one DSM disorder (p = .014; see supplemental materials), and univariate analyses revealed that the HNP group exhibited significantly higher scores on the DASS-21 Depression (p = .019), and Stress (p = .024) scales (see Table 1 and Figure 1). These variables, as well as the presence of a current DSM disorder (see Table 2), were controlled for in subsequent analyses of neuropsychological outcome measures. Notably, although no significant differences were observed on the DASS-21 Anxiety subscale (p = 0.072), this outcome measure was nevertheless controlled for given the effect size found (d = 0.40).

Cognitive Function in HNP Versus LNP

A MANCOVA was conducted to compare the HNP and LNP groups on neuropsychological outcome measures while controlling for depression, stress, anxiety, estimated IQ, and psychopathology (see Table 3). Univariate analyses of neuropsychological outcome measures revealed that the HNP group scored significantly lower than the LNP group only on the DS backward (p = .019) and phonemic fluency (p = .027). However, these comparisons did not survive correction for multiple comparisons and were determined not significant. Effect sizes across tests were small (d = 0.00–0.46) and 86% of the neuropsychological effect sizes favored the HNP group. However, scaled scores produced using test norms revealed that both groups performed in the normative range (see Table 1). Notably, no group difference was found on GPA.

Characteristics of the Adaptive, Maladaptive, and Mixed Perfectionism Subgroups

Based on the median split, three groups were created (adaptive, maladaptive, and mixed perfectionism), to reflect the perfectionistic profiles posited by Gaudreau and Thompson (2010). No significant differences were found between the groups on demographic variables and comorbidity status. The groups differed significantly on DASS-21 Depression (p < .001), DASS-21 Anxiety (p = .039), and DASS-21 Stress (p = .005; see Figure 2). Planned contrasts revealed that the maladaptive group had significantly higher scores on all three DASS-21 subscales compared to the adaptive group (p < .001–0.034).

Cognitive Function in Adaptive, Maladaptive, and Mixed Perfectionism Subgroups

A MANCOVA was conducted to compare the three perfectionism subgroups on the neuropsychological outcome measures while controlling for depression,

Table 2
Prevalence of DSM Disorders in High and Low Negative Perfectionism and Perfectionism Subtypes

Disorder	LNP (n = 52) % (n)	HNP (n = 46) % (n)	X^2/t	Sig	Adaptive (n = 24) % (n)	Maladaptive (n = 22) % (n)	Mixed (n = 24) % (n)	X^2/F	Sig
Major depressive disorder	–	8.7 (4)	4.17	.03	–	13.6 (3)	4.2 (1)	4.12	.12
Social anxiety disorder	1.9 (1)	4.3 (2)	0.48	.48	–	9.1 (2)	–	4.49	.10
Generalized anxiety disorder	1.9 (1)	10.9 (5)	3.40	.06	–	9.1 (2)	12.5 (3)	3.01	.22
Posttraumatic stress disorder	1.9 (1)	–	0.89	.34	–	4.5 (1)	8.3 (2)	2.04	.36
Obsessive-compulsive disorder	–	4.3 (2)	2.04	.12	–	4.5 (1)	4.2 (1)	1.08	.58
Bulimia nervosa	–	6.5 (3)	3.50	.06	12.5 (3)	9.4 (2)	4.2 (1)	1.07	.58
Attention-deficit/hyperactivity disorder	7.7 (4)	6.5 (3)	0.05	.82	–	4.5 (1)	8.3 (2)	0.47	.79
Substance abuse disorder	7.7 (4)	6.5 (3)	0.05	.82	4.2 (1)	4.5 (2)	8.3 (2)	0.47	.79
No disorder	88.5 (46)	67.4 (31)	6.44	.01	79.2 (19)	68.2 (15)	66.7 (16)	1.08	.58
Any disorder	11.5 (6)	32.6 (15)	6.44	.01	20.8 (5)	31.8 (7)	33.3 (8)	1.08	.58
Average number of disorders	0.25	0.58	1.91	.06	0.20	0.72	0.45	1.91	.15

Note. LNP = low negative perfectionism; HNP = high negative perfectionism; Sig = significance.

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Table 3
Neuropsychological Test Performance Across Low and High Negative Perfectionism Groups[a]

	LNP (n = 47)		HNP (n = 43)		F(1, 83)	Sig	Cohen's d*
	Mean	*SD*	Mean	*SD*			
Set shifting							
Trail making B	0.37	1.02	0.21	1.03	0.016	.91	−.09
WCST perseverative errors	0.38	1.27	0.83	1.21	0.404	.52	−.22
WCST categories completed[b]	5.45	1.58	5.72	0.95	0.140	.70	−.20
Planning							
TOL excess moves	0.95	3.63	1.50	2.93	0.071	.79	−.16
Working memory							
Digit Span forward total	−0.03	1.00	−0.03	1.06	0.059	.80	.00
Digit Span backward total	0.18	0.98	−0.07	0.76	5.687	.01*	.27
Digit Span sequencing total	0.02	1.00	0.37	1.13	0.912	.34	−.30
Digit Span total	0.05	0.86	0.01	1.00	0.375	.54	−.04
Symbol Span total	0.18	1.00	0.25	0.91	0.286	.59	−.06
Fluency							
Verbal fluency letter total	0.70	0.95	0.25	1.02	5.103	.02*	.40
Verbal fluency category total	0.53	0.84	0.61	1.14	0.036	.84	−.12
Response inhibition							
CPT commission errors	0.01	1.17	0.04	0.81	0.012	.91	−.02
Verbal memory							
CVLT short delay recall	−0.21	1.18	−0.18	0.95	0.016	.89	−.02
CVLT sum of trials 1–5	0.00	1.01	0.09	0.98	0.145	.70	−.07
CVLT long delay recall	−0.44	1.33	−0.24	0.90	0.014	.90	−.11
Nonverbal memory							
RCFT immediate	−0.28	1.29	−0.23	1.71	0.006	.94	−.07
RCFT delayed	−0.36	1.19	−0.46	1.71	0.005	.94	−.06
Processing speed							
Trail making A	−0.01	0.92	0.39	0.76	2.130	.14	−.46
CPT mean RT	0.19	1.08	0.18	0.87	0.656	.42	.02
Attention							
CPT omission errors	0.14	1.04	0.31	0.47	1.498	.22	−.22
CPT RT SD	0.17	1.12	0.44	0.87	0.039	.84	−.19
Visuospatial							
RCFT copy	0.03	0.93	0.18	0.64	0.627	.43	−.28

Note. LNP = low negative perfectionism; HNP = high negative perfectionism; Sig = significance; WCST = Wisconsin Card Sorting Test; TOL = Tower of London; CPT = Conners' Continuous Performance Test; CVLT = California Verbal Learning Test II; RCFT = Rey Complex Figure Test; RT = reaction time; *SD* = standard deviation. Negative effect sizes indicate performance favoring the HNP sample.

[a] Controlling for depression, anxiety, stress, IQ, and comorbidity. Analyses were conducted on raw scores, but *M* and *SD* are presented using *Z* scores extracted from norms.

[b] WCST categories completed raw score.

* *p* value did not survive correction for multiplicity.

anxiety, stress, and psychopathology (see Table 4). Planned contrasts revealed no significant differences between the groups on any of the neuropsychological outcome measures. Effect sizes across tests were small to medium (d = 0.00–0.63)—however, the direction of the effect varied. For example, 36% of the effect sizes indicated worse performance by the maladaptive group in comparison to the adaptive group, and 50% of the effect sizes indicated worse performance by the mixed group in comparison to the adaptive group. Notably, no group difference was found on GPA.

Correlations Between Cognitive Functions and Perfectionism Indices

To assess the relationship between cognitive functions and perfectionism, 22 zero-order correlations were computed using the entire sample (N = 98) separately for positive and negative perfectionism. Negative perfectionism was negatively correlated with DS backward scores (r = −.23, p = .02). Positive perfectionism was negatively correlated with CPT omission errors (r = −.21, p = .03), where higher ratings of positive perfectionism are associated with less omission errors. However,

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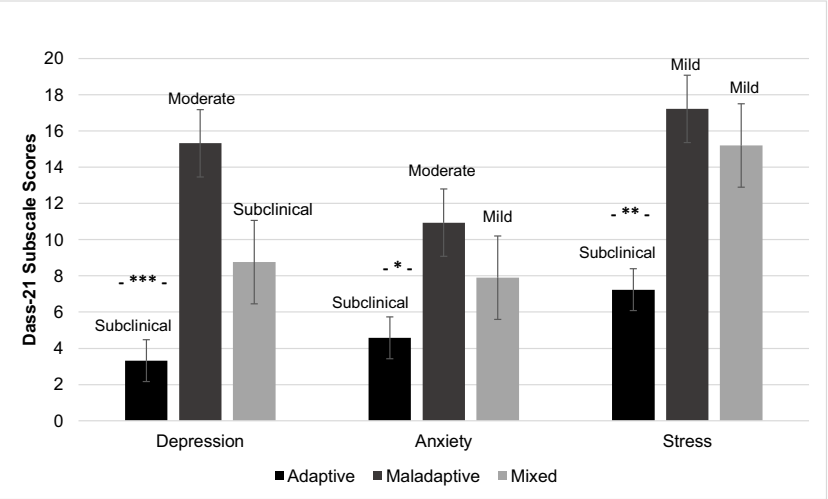

FIGURE 2 Comparative analyses of symptoms of depression, anxiety, and stress (DASS-21) for the adaptive, maladaptive, and mixed perfectionism subgroups. Note. Degree of symptom severity categories as defined by the DASS. *p<.05, **p<.01, ***p<.001. Error bars represent standard error.

these correlations did not survive correction for multiplicity.

Discussion

To our knowledge, this is the first study to assess the neuropsychological correlates of perfectionism while addressing related clinical factors, such as severity of psychopathological symptoms and clinical status. Contrary to our hypotheses, results of the comparison between HNP and LNP groups revealed intact cognitive functions, and no group differences on any neuropsychological outcome measure, as well as on GPA—a secondary performance-related outcome measure. However, the HNP group reported significantly elevated symptom severity (ranging from mild to moderate) of depression and stress and exhibited higher rates of DSM disorders. In contrast, the LNP group exhibited nonclinical levels of depression, stress, and anxiety. Thus, our results indicate that this substantial psychopathological burden does not seem to affect neuropsychological functions nor academic performance. This finding was supported by our study results, suggesting that the correlation found between the degree of negative perfectionism and cognitive functions in the entire sample ranged between 0 and 5% of explained variance.

In addition, similar results were found when three groups were created in accordance with contemporary models, suggesting an adaptive or positive type of perfectionism that may be conceptually and putatively associated with negative perfectionism (Hill et al., 2004; Slaney, Rice, Mobley, Trippi, & Ashby, 2001; Terry-Short et al., 1995). These groups—namely, maladaptive, adaptive, and mixed (high positive as well as high negative)—exhibited intact neuropsychological performance, and did not differ on task performance or GPA. Although no gradient in cognitive function was found, a gradient of symptom severity was found where the mixed and maladaptive groups indicated significant psychopathological burden, compared to the high adaptive perfectionism group that exhibited nonclinical levels of anxiety, depression, and stress. Thus, in both conceptualizations and perfectionism examined, cognitive functions were found to be intact. Although we found that maladaptive perfectionism was associated with substantial psychopathological burden, high adaptive perfectionism was not found to be related to clinical or burdensome levels of psychopathology.

Although research on the association between perfectionism and cognitive function in the general population is almost nonexistent, our results are generally in accordance with the only study assessing the association between neuropsychological test performance and perfectionism in a nonclinical sample (Desnoyers & Arpin-Cribbie, 2015). The authors of this study found weak correlations with only two outcome measures from two tasks administered (Desnoyers & Arpin-Cribbie, 2015). However, the authors highlighted a major limitation of their study, where insufficient variance and range of perfectionism scores in their study hinders generalizability from their results. Limited research examining cognitive function and perfectionism in clinical samples is characterized by inconsistent results. Moreover, extraction of cogent

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Table 4
Neuropsychological Test Scores Across Perfectionism Subtypes[a]

	Adaptive (n = 23)		Maladaptive (n = 21)		Mixed (n = 22)				Cohen's d*		
	Mean	*SD*	Mean	*SD*	Mean	*SD*	$F(2, 59)$	Sig	I vs. II	I vs. III	II vs. II
Set shifting											
Trail making B	−0.22	1.13	−0.16	1.08	−0.27	0.97	0.219	.80	.03	.10	.06
WCST perseverative errors	0.32	1.10	0.31	1.30	0.79	1.10	1.302	.36	.06	.40	.36
WCST categories completed[b]	5.43	1.72	5.43	1.32	6.00	0.00	1.204	.30	.00	−.46	−.61
Planning											
TOL excess moves	1.52	3.29	1.42	3.35	1.58	2.53	0.090	.91	.03	−.02	−.05
Working memory											
Digit Span forward total	−0.15	1.08	0.03	1.18	−0.09	0.95	0.256	.77	−.07	.00	.07
Digit Span backward total	0.20	1.13	−0.03	0.59	−0.11	0.91	0.438	.64	.15	.26	.16
Digit Span sequencing total	0.20	1.17	0.43	1.32	0.32	0.95	1.004	.37	−.17	−.10	.08
Digit Span total	0.13	0.96	0.19	1.00	0.02	1.03	0.391	.67	−.06	.10	.15
Symbol Span total	0.07	0.90	0.16	1.03	0.33	0.80	0.663	.51	−.09	−.32	−.21
Verbal fluency											
Letter total	0.87	0.95	0.33	1.14	0.19	0.91	2.385	.10	.41	.63	.13
Category total	0.68	0.88	0.65	1.25	0.58	1.04	0.113	.89	−.06	.05	.10
Response inhibition											
CPT commission errors	0.07	0.96	0.12	0.95	0.19	0.65	0.332	.71	.09	−.27	−.40
Verbal memory											
CVLT short delay	−0.21	1.12	0.11	0.85	−0.47	0.96	2.618	.08	−.32	.23	.58
CVLT trials 1–5	−0.07	1.13	0.24	0.97	−0.05	0.77	1.240	.29	−.22	.00	.27
CVLT long delay	−0.41	1.19	<0.001	1.06	−0.47	0.68	1.825	.17	−.35	−.03	.38
Nonverbal memory											
RCFT immediate	−0.36	1.44	−0.20	2.03	−0.26	1.37	0.115	.89	−.13	−.12	.02
RCFT delayed	−0.44	1.28	−0.43	2.07	−0.49	1.33	0.555	.57	−.20	−.23	.02
Processing speed											
Trail making A	0.10	0.91	0.38	0.69	0.40	0.85	0.674	.51	−.36	−.32	.01
CPT mean RT	0.34	0.76	0.24	0.84	0.12	0.91	1.206	.30	.16	.31	.15
Attention											
CPT omission errors	0.23	0.47	0.30	0.59	0.31	0.35	0.026	.97	−.02	−.14	−.10
CPT RT SD	0.34	0.78	0.38	0.87	0.49	0.89	0.097	.90	.03	.04	.00
Visuospatial											
RCFT copy	−0.10	1.10	0.09	0.78	0.27	0.47	2.345	.10	−.29	−.47	−.19

Note. Sig = significance; I = adaptive; II = maladaptive; III = mixed; In I vs. II, I vs. III = positive effect size reflects better performance by the adaptive group; II vs. III = positive ES indicate better performance by the maladaptive group; WCST = Wisconsin Card Sorting Test; TOL = Tower of London; CPT = Conners' Continuous Performance Test; CVLT = California Verbal Learning Test; RCFT = Rey Complex Figure Test; RT = reaction time; *SD* = standard deviation.

[a] Controlling for depression, anxiety, stress, and comorbidity. Analyses were conducted on raw scores, but *M* and *SD* are presented using *Z* scores extracted from norms.

[b] WCST categories completed raw score.

* *p* value did not survive correction for multiplicity.

inferences from the results of these studies regarding perfectionism is threatened by an alternative explanation pertaining to the role of nonperfectionism psychopathological mechanisms that may impact cognitive functions (e.g., Lindner, Fichter, & Quadflieg, 2014; Tchanturia et al., 2004; Vall & Wade, 2015). Lastly, the only study that utilized a comprehensive neuropsychological battery in the context of perfectionism examined this association in a mixed sample with neurological and psychiatric conditions (Slade et al., 2009), which is subject to the same limitations.

The present study found no association between different domains of perfectionism and cognitive function, and a clear association between types of perfectionism and psychopathological burden. The results reveal to a dissociation between clinically significant psychopathological burden and cognitive function, even in the context of perfectionism, a construct that inherently revolves around performance and evaluation of the self as a function of outcomes (Burns, 1980). One way to account for this association would be to consider that perfectionism is a facet of anxiety, and one that is

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associated with frequent negative and worrisome thoughts (Flett, Hewitt, Blankstein, & Gray, 1998). It has been suggested that increased worry and anxiety, as seen in GAD, may be associated with intact performance on cognitive tasks, when the task does not involve high cognitive load or specific threat-related stimuli (Eysenck, Derakshan, Santos, & Calvo, 2007). These predictions of Eysenck's processing efficiency theory and attention control theory were verified recently in a study that demonstrated intact performance in a sample of young adults with GAD (Leonard & Abramovitch, 2019).

In addition, our results may be in accordance with the results from a handful of Event-Related Potential (ERP) studies examining perfectionism and error-related activity during task performance in clinical and nonclinical samples. These studies—that originally expected to find the same association between error-related activity seen in OCD (Bucci et al., 2004)—identified an interesting phenomenon where in anticipation of negative feedback, high maladaptive perfectionism was found to be associated with a transient decrease in emotional arousal that was interpreted as a coping mechanism designed to facilitate avoidance from the emotional impact of negative feedback related to errors (Stahl et al., 2015). Although these findings require further replications, this phenomenon could partially account for our findings of intact performance across cognitive tasks in perfectionism. Speculatively, taken together with Eysenck et al. (2007) attention control theory, it is plausible that increased global arousal together with transient decreases in arousal, aimed at avoiding the emotional, and subsequently cognitive "cost" of awareness toward one's errors in real time, could account for our findings of intact cognitive function in high negative and maladaptive perfectionism samples. However, this small body of research into neurocognitive mechanisms associated with perfectionism requires further investigation, particularly in nonclinical samples.

Furthermore, it can be speculated that in a controlled lab setting where participants' focus is limited to a task, in conjunction with a high need to achieve, individuals with high levels of perfectionism may perform intact. Moreover, as opposed to numerous traits, symptoms, and disorders, perfectionism is inherently associated with motivation to perform, and motivation to perform better. This motivation may be present regardless of whether or not it is adaptive on a psychopathological level, and individuals with high perfectionism may be similar to people who are high achievers, in that they feel motivated to perform better. Thus, as opposed to other primary traits, intact performance in the context of a study or a clinical evaluation may be the rule in the context of perfectionism, which may obscure identification of this burdensome trait in college studies.

Importantly, the present study demonstrates how maladaptive perfectionism is positively associated with symptom severity and with higher rates of comorbidity. In contrast, our findings indicate that adaptive perfectionism is associated with less psychopathological burden. In fact, adaptive perfectionism seems to act as a mitigating factor—that is, according to our results, elevated negative perfectionism together with elevated adaptive perfectionism results in lower psychopathological burden compared to participants with HNP together with low adaptive perfectionism. Indeed, it has been shown that perfectionism is associated with two different drives for achieving success—namely, approach (e.g., striving for success) and avoidance (e.g., avoiding failure; Stoeber, Damian, & Madigan, 2018), which are associated with opposite outcomes in terms of satisfaction and psychological well-being (Elliot, Sheldon, & Church, 1997; Slade & Owens, 1998). It can be speculated that the difference between the groups in terms of symptom severity may be related to their goal orientation.

It has also been suggested, however, that contingent self-worth based on performance, a historical hallmark of perfectionism (Burns, 1980), is responsible for the relationship between perfectionism and psychopathology (Dibartolo, Frost, Peicha, Lasota, & Grills, 2004). Therefore, individuals who place a greater emphasis on their standards for performance as a proxy for their self-worth suffer more in terms of psychopathological burden compared to individuals with the more "adaptive" form of perfectionism where self-worth is not associated strongly with the outcome of their performance. Thus, there is a need to critically examine the bidimensional model in terms of the motivations and mechanisms underlying adaptive and maladaptive perfectionism, given that the former is associated with low psychopathological burden and has been termed "achievement striving" (Frost et al., 1993), which may not necessarily be a form of perfectionism (Flett & Hewitt, 2006). In fact, it may be the case that adaptive perfectionism is merely a construct assessing self-efficacy, where when combined with perfectionism may counterbalance some of the psychopathological burden inherent to negative perfectionism. In other words, it may be the case that perfectionism is inherently related to aversive or negative psychological experiences, and self-efficacy in the context of striving to perform better is associated with favorable ones, and these two constructs interact.

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Given the controversy concerning the conceptualization of perfectionism, there is a need for researchers to clearly define specifically what are the "adaptive" and "maladaptive" aspects of perfectionism. The present study found that in terms of performance there is no "cost" for endorsing high levels of negative perfectionism when utilizing two conceptualizations of perfectionism. However, there is a substantial toll on psychological well-being. Thus, maladaptive perfectionism pertains to the affective and psychopathological cost of perfectionism, and adaptive perfectionism, or positive perfectionism, appears not to be associated with either emotional or cognitive cost, challenging the notion that it is an aspect of perfectionism. In addition, the present study also found that there is no "gain" in terms of performance for individuals endorsing high levels of positive perfectionism. Future research should examine potential differences in the relationship between perfectionism and cognitive function utilizing other conceptualizations.

LIMITATIONS

This study has a number of strengths, including being the first study to utilize a comprehensive neuropsychological battery to examine the neuropsychology of perfectionism in a young functioning adult sample, employing a psychometrically valid correction for multiple comparisons and utilizing a large sample that facilitated covariate analyses. However, this study is not without limitations. First, the perfectionism measure was administered between 1 and 7 days after completion of the neuropsychological battery. Nevertheless, perfectionism has been demonstrated to be a stable trait up to 1 year (Cox & Enns, 2003; Rice & Aldea, 2006). Second, the sample comprised college students. It has been argued that universities are a setting in which perfectionism might be valued and encouraged by a performance-oriented climate (Verner-Fillion & Gaudreau, 2010), which may theoretically limit generalizability to other populations. However, it could be argued that assessment of perfectionism in this population provides a wealth of information due to the same reason. Indeed, college is a place where individuals "exercise" perfectionism frequently. This is supported by the high levels of negative perfectionism endorsed by our high negative and maladaptive perfectionism groups that was found to be equivalent to those seen in clinical samples of anxiety and depressive disorders (e.g., Egan et al., 2011). Last, as evidenced by our results, perfectionism in itself may entail a substantial psychopathological toll, particularly in college students. Thus, it can be argued that college students may be a very appropriate population, with clinical and cognitive variance allowing for high-resolution information to be extracted. Finally, in order to form subsamples of perfectionism, this study employed a median cutoff. This method—which has been employed in previous perfectionism studies (Periasamy & Ashby, 2002; Zuroff et al., 2000)—was chosen in order to allow for analyses of larger subsamples, increasing power and allowing for robust analyses of potential moderators/covariates. Notably, the subgroups created using this method resulted in perfectionism rates similar to those found in clinical samples. However, in order to assess the possibility that more extreme perfectionism scores may be associated with cognitive functions, we further employed a quartile cutoff and reanalyzed our data. These analyses resulted in similar null findings, and with similar effect sizes, which further solidifies the results of this study and its conclusions.

Conclusion

The present study reveals that elevated levels of maladaptive perfectionism, although associated with substantial psychopathological burden, is not associated with reduced performance across neuropsychological domains. These findings contrast with findings in most DSM disorders, but are in accord with the attention control theory of anxiety and with recent neuropsychological investigations into GAD. However, although maladaptive or adaptive perfectionism was not found to be associated with cognitive dysfunction, the former was found to be associated with substantial psychopathological burden, and the latter, as a mitigating factor for psychopathological symptoms. We thus speculate that adaptive perfectionism may be a form of self-efficacy. Given that no clear cognitive "cost" of perfectionism exists, but significant symptoms of anxiety, depression, and stress accompany high levels of negative perfectionism, the psychological burden of these functionally intact individuals may be overlooked, especially in academic settings. Future studies should investigate this phenomenon further and potentially examine ways to disseminate information about perfectionism in academic settings and explore low-intensity interventions that target this prevailing and burdensome trait, particularly given that effective evidence-based low-intensity interventions exist (Egan et al., 2014).

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Conflict of Interest Statement

The authors report no conflict of interests pertaining to this study.

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