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How perfect is (too) perfect? Illuminating why the perfectionism-performance-relationship is (non-)linear

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ABSTRACT

Psychological science remains unclear about how individuals' trait perfectionism impacts their performance—is more perfectionism linearly better or does *too* perfect backfire? The present study investigates a potentially non-linear relationship and its underlying mediators. Based on the two-dimensional model of perfectionism that distinguishes perfectionistic *concerns* (PC) versus *strivings* (PS), we investigate the (non-)linear relationships of perfectionism and performance in the letter detection task. Additionally, we experimentally examined whether time pressure would moderate these findings. Our study results ($N = 229$) establish *non-linearity*: a quadratic function in the form of an inverted U-shape best explains the relationship between perfectionistic concerns and performance. Contrary to our hypothesis, perfectionistic strivings predicted task performance linearly but *negatively*. Upon further examination, we also found empirical support for a combinatory effect of both dimensions: Only individuals high in PC showed the negative effect of PS on task performance. Although performance differed in the timed versus untimed task, time pressure did not moderate the (non-)linear relationships of PS or PC on performance. Multiple mediation analyses revealed that perceived distress, rumination, and effort mediated the quadratic relationships of perfectionistic concerns. Overall, our results question the strict disentanglement of perfectionistic dimensions and emphasise the usefulness of a more holistic approach.

1. Introduction

Perfectionism is a trait that influences individuals' evaluation of their own performance (Frost et al., 1990). Caring increasingly more about performance would, at first blush, imply that perfectionism is positively related to better performance. But is more perfectionism *really* linearly better or does too much perfectionism backfire at some point?

Prior studies differentiate perfectionistic strivings (PS) and perfectionistic concerns (PC; Stoeber & Gaudreau, 2017). While PS captures "those aspects associated with self-oriented striving for perfection and setting exceedingly high personal standards of performance" (p. 294), PC captures "those aspects of perfectionism associated with concerns over making mistakes, fear of negative social evaluation, feelings of a discrepancy between one's expectation and performance, and negative reactions to imperfection" (Stoeber, 2012, p. 294). We thus argue that PS could represent a more adaptive form of perfectionism with a positive effect on performance, while PC could be more maladaptive and negatively affect performance (Hewitt & Flett, 1990). Prior research builds on linear assumptions, however, and has yet to conclusively test the relationship between trait perfectionism and task performance (e.g., Harari et al., 2018).

We expand the scope of analysis to non-linear relationships and investigate whether (and at which point) the two dimensions help versus hinder performance. We also contrast different psychological mechanisms that may (jointly) mediate these (non)linear perfectionism-performance links.

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1.1. Perfectionism-performance relationship

Differentiating PS and PC has proven fruitful as the dimensions often exert distinct effects on performance despite overlap and correlations of up to $r = 0.70$ (Stoeber & Gaudreau, 2017). PS positively predicts performance in various domains such as academic performance, music competitions, sports performance, or cognitive laboratory tasks (Stoeber, 2012). It relates to positive outcomes such as a higher sense of well-being, conscientiousness, and self-efficacy (Smith et al., 2019; Stoeber et al., 2008). However, other studies show the opposite, in that PS relates to lower well-being (Stoeber & Otto, 2006), neuroticism (Enns et al., 2001) and negative affect (Bieling et al., 2004).

In contrast, PC has no (or even a slightly negative) effect on performance (Stoeber, 2012). PC predominantly relates to maladaptive outcomes, such as anxiety, neuroticism, depression, or burnout (Harari et al., 2018; Hill et al., 2010). Nevertheless, a correlational meta-analysis found non-significant effects close to zero for the relationship between PS and job performance ($r = 0.05$) and PC and job performance ($r = -0.03$) and also a null finding with task performance when the dimensions could not be disentangled (Harari et al., 2018).

Thus, the literature reports inconclusive, heterogeneous perfectionism-performance relationships, also pointing at approaches beyond linearity (Nordin-Bates & Kuylser, 2021). For instance, a recent study showed that athletes' PS might be related to performance quadratically rather than linearly: performance improved with low-to-moderate levels but suffered at high levels of PS (Nordin-Bates et al., 2024). In line with this notion of non-linearity, we aim to transcend linear modelling techniques and to expand prior results by testing the (non-)linear perfectionism-performance relationships in a controlled, validated visual search task that has been applied in previous research (Slade et al., 1991; Stoeber et al., 2010; Tallis et al., 1991).

1.2. Towards a (non-)linear relationship

In support of the divergent nature of both perfectionism dimensions, we argue that both show unique patterns with performance (Fig. 1). In particular, we argue that PS and PC parallel the approach versus avoidance motivational orientations (Elliot, 2006). Approach motivation indicates a propensity towards desirable, positive outcomes (e.g., demonstrating competence), whereas avoidance motivation directs someone away from a negative outcome (e.g., evading incompetence). While both dimensions revolve around achieving high goals, they differ in *how* the goal is pursued. Behaviour driven by PS pursues positive consequences (success), while PC directs behaviours to avoid negative consequences (failure). This reasoning is also mirrored in 'excellence-seeking' versus 'failure-avoiding' perfectionism (see Harari et al., 2018).

Indeed, PS shows positive relationships with hope for success and approaching goal orientations (Stoeber et al., 2018), is related to more positive attitudes, and less fear of failure. As PS increases, performance becomes more intrinsically motivated (Stoeber et al., 2009), and attention is directed towards the task rather than its consequences.

In contrast, PC coincides with more fear of failure and avoidant goal styles (Madigan et al., 2017; Slade & Owens, 1998). If PC guides behaviour based on the motive to present oneself and protect against negative display, evaluation concerns and maladaptive foci become more prominent. This should harm performance beyond a certain threshold of excessive PC. These negative consequences might only unfold at higher levels, while lower levels can still be performance-enhancing. In all, we predicted:

H1. : The relationship between PS and performance is positive and linear—the higher an individual scores on PS, the better their task performance.

H2. : The relationship between PC and performance is quadratic—lower PC scores are positively associated with performance but too much PC results in a negative relationship.

We further advocate that examining the dimensions in isolation is not sufficient. Both dimensions simultaneously and synergetically affect individuals' performance. Thus, while separating the analysis for individuals who are strictly "strivings" or "concerns" may be plausible,

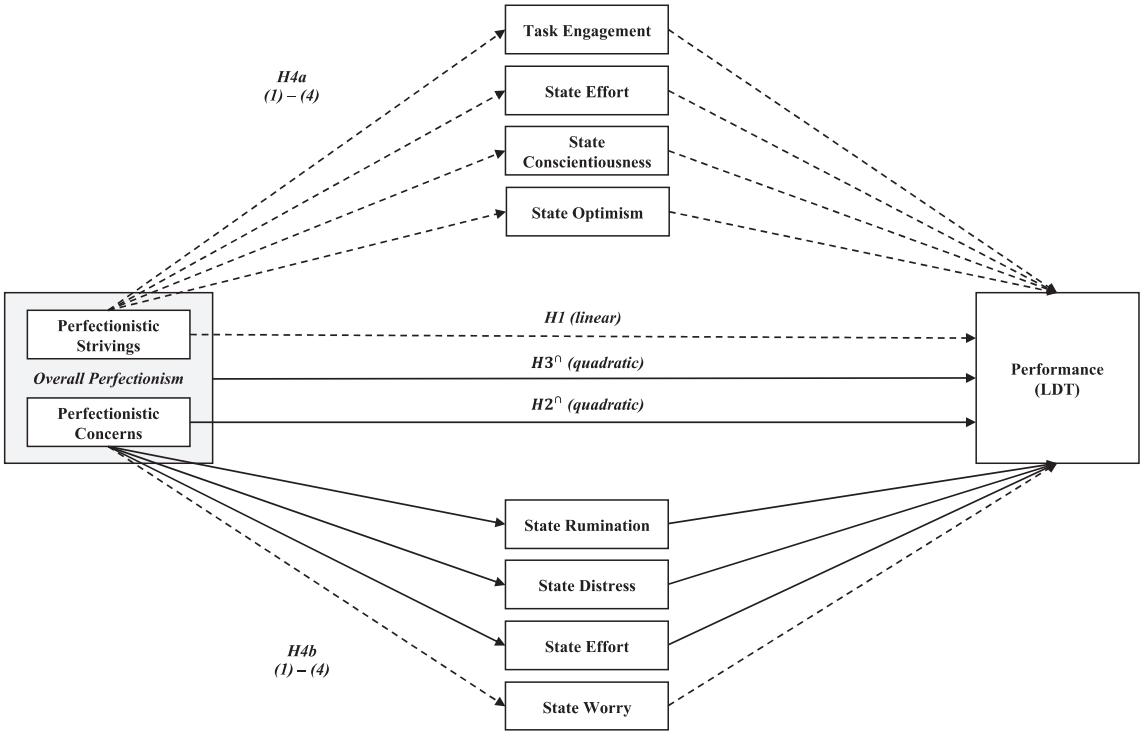

Fig. 1. Model overview.
Note. ∩ = predicted non-linear relationship.

explaining the behaviour of individuals who score high (or low) on both dimensions may require a more holistic perspective that stresses PS and PC combinations. Recent measurement studies (Howell et al., 2020; Smith & Saklofske, 2017) also acknowledge the usefulness of a general factor of perfectionism in addition to the separate subdimensions.

We predicted overall trait perfectionism (combined PS and PC) to show a novel result pattern rather than reflecting a purely additive effect. As PS and PC share the underlying inclination of setting high (excessive) performance standards (Stoeber, 2012), overall higher perfectionism should coincide with better performance. However, this beneficial performance effect is limited to a certain level and will eventually become "too much of a good thing" (Grant & Schwartz, 2011). Given the adage that 'bad is stronger than good' (Baumeister et al., 2001), being too concerned with potential mistakes while striving for excellence (i.e., high levels of PC *and* PS), may impair performance and backfire: In all, when combining PS and PC, high(er) PC scores may obscure the performance advantage of high(er) PS scores. Hence:

H3. : The relationship of overall perfectionism and task performance is non-linear.

1.3. Explanatory psychological mechanisms

We also sought to illuminate *why* PS and PC exert the hypothesised effects. To do so, we assessed several competing psychological variables that, according to the perfectionism literature, could plausibly account for performance differences. Although we acknowledge the presence of other important variables (e.g., motivation or emotional exhaustion; Harari et al., 2018), testing an exhaustive list would not have been feasible and beyond the scope of our study.

In line with the approach-avoidance framework mentioned above, we argue that during task execution, different emotional and cognitive states impact performance (Slade & Owens, 1998). Given PS's more adaptive nature of perfectionism, we selected variables that reflect these positive aspects—e.g., individuals with higher PS investing more effort and time on tasks (e.g., Stoeber et al., 2010). Additionally, PS relates to engagement, a state characterised by heightened energy while working and higher dedication to a task (Harari et al., 2018; Schaufeli & Bakker, 2004). A more careful and intensive task focus due to PS, is further reflected in its relationship to the personality construct of conscientiousness (Smith et al., 2019). Finally, individuals higher in PS more optimistically approach challenges as they believe that ambitious objectives are attainable through active pursuit (Black & Reynolds, 2013). We thus hypothesised:

H4a. : The positive relationship between PS and performance is mediated by state effort, state task engagement, state conscientiousness, and state optimism. We predict that PS increases the mediators, which in turn lead to a linear increase in performance.

Contrarily, PC reflects the more maladaptive form of perfectionism and is characterised by inclinations to avoid negative events, including concerns over mistakes and fear of negative evaluation (Stoeber, 2012). We predicted that individuals with high(er) PC would experience more intrusive, distracting thoughts and emotions during task performance, which, in turn, would explain deteriorating performance. Prior work corroborates this and links PC with increased rumination (Olson & Kwon, 2008), distress (Einstein et al., 2000), and worry (Stoeber & Joormann, 2001). While higher PC relates to greater effort towards producing flawless work (e.g., longer working hours; Harari et al., 2018; Slade & Owens, 1998), effort may not compensate for the excessive levels of PC, as rumination, distress, and worry impair performance. Thus:

H4b. : The (non-linear) relationship between PC and performance is mediated by state rumination, state distress, state worry, and state effort, so that PC increases the mediators which in turn lead to a linear decrease in performance.

2. Methods

We pre-registered the study (see Open Science Framework; OSF) and uploaded experimental materials, an exhaustive list of all survey items, and our collected data.[2]

2.1. Participants

A sample-size analysis for linear regressions with 1-β = 95 % power, α = 0.05, two predictors, and an assumed conventionally small-to-medium effect $f^2 = 0.085$ (Cohen, 1992) suggested a minimal sample of $N = 185$ participants. Anticipating dropout and potentially smaller effects, we recruited a total of $N = 235$ participants through Prolific and university-internal channels ($M_{age} = 24.85$, $SD = 8.72$, range = 18–62; 174 [74 %] female, 59 [25 %] male, 2 [0.85 %] non-binary). All participated in a raffle (50€).

2.2. Procedure

Participants first completed online questionnaires via the Gorilla Platform (Anwyl-Irvine et al., 2021) to assess demographics (e.g., age, sex, occupation) and control variables. They then performed a Letter Detection Task (LDT) with two randomised within-subjects conditions—timed and untimed. In the timed condition, participants were given four seconds per matrix to respond; the untimed condition offered participants unlimited time per matrix. Both conditions showed participants 160 slides in randomised order, each with a random arrangement of letters (A-Z) and numbers (0–9) in a 5 × 5 matrix. Unbeknownst to participants, half of the slides ($n = 80$) included the letter "E", the other half did not.

Participants were instructed to press the keyboard key "E" when they detected an "E" on the slide (E present) and "I" when they did not (E absent; Fig. 2). Following the task, participants completed the perfectionism measures as well as mediating variables.

2.3. Measures

We measured variables on 7-point Likert scales (*1 = strongly disagree*, *7 = strongly agree*), if not stated otherwise. The Cronbach's α indices in brackets below represent the original internal consistencies, whereas all α's from this study are listed in Table 1.

2.3.1. Trait perfectionism – PS and PC

Following Stoeber and Gaudreau (2017), we preregistered a combination of different scales to assess PS and PC. For PS, we combined the *'pure personal standards'* of the Frost Multidimensional Perfectionism Scale (FMPS; Frost et al., 1990; e.g., *"I set higher goals than most people"*) and four items of the subscale *'high standards'* of the revised Almost Perfect Scale (APS-R; Slaney et al., 2001; e.g., "I have high expectations for myself"; i.e., those with factor loadings >0.70). We omitted one item from the FMPS subscale due to high content overlap with the APS-R scale. For PC, we used the subscale '*concern over mistakes*' of the FMPS (Frost et al., 1990; $\alpha = 0.880$) and slightly adapted the items to meet the study's context (i.e., "tasks" instead of "work/school"; e.g., "*If I fail at tasks, I am a failure as a person*"). Ten (nine) items assessed PS (PC); overall perfectionism scores consisted of all 19 items.

2.3.2. LDT performance

To measure LDT performance (Stoeber et al., 2010), we used the total number of correct responses and transformed absolute values into percentage scores (0 %–100 %).

[2] Order and wording of hypotheses were adapted for clarity based on the reviewers' feedback. For more information, refer to the OSF preregistration.

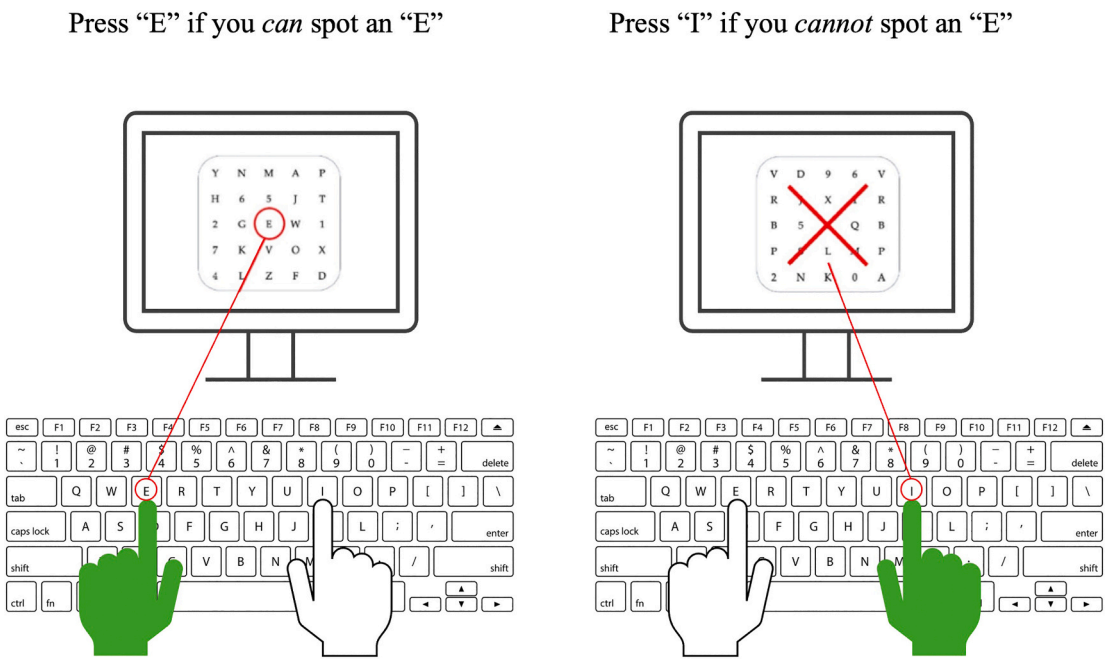

Fig. 2. Example of letter detection task to indicate the presence or the absence of the letter 'E'.
Note. Instruction Image used in Gorilla.

2.3.3. Mediators

We opted for state measures for all mediators as they offer a direct assessment of variables pertinent to the task, are attuned to fluctuations in psychological state, and thus yield insights into the perfectionism-performance relationship.

State Conscientiousness. To measure state conscientiousness, we followed the operationalisation by Schutte et al. (2003) to measure Big-5 states by adopting four bipolar items of the Big-5 markers (Goldberg, 1992). Instead of asking respondents to describe their general character (i.e., traits), we asked participants to describe their state perception *during* LDT (see Fleeson, 2004). Bipolar adjectives each represented opposing extremes. For example, "*careless–thorough*", or "*negligent–conscientious*". Schutte et al. (2003) proved sufficient reliability in their original study ($\alpha = 0.79$).

State Effort. We measured state effort using the Rating Scale Mental Effort (Zijlstra & van Doorn, 1985)—a reliable, valid, sensitive, and versatile one-dimensional rating scale. We asked participants to indicate how much effort they invested during task completion by sliding a fader from 0 ("low") to 150 ("very high").

State Optimism. We assessed state optimism using the State Optimism Measure (Millstein et al., 2019) and adapted the items to match the context (e.g., "*While I was working on the letter detection task, I felt optimistic about this challenge*"). The scale was developed to capture fluctuations of optimism over time and has been shown to have high reliability ($\alpha = 0.92$) and validity.

State Task Engagement / Distress / Worry. We assessed state task engagement, distress, and worry using 22 items of the Short Stress State Questionnaire Post (SSSQ-Post; Helton & Näswall, 2015). Exemplary items are "*I was motivated to do the task* (engagement), "*I felt irritated*" (distress), and "*I felt self-conscious*" (worry). The scale has a three-dimensional factor structure and showed sufficient reliability with αs ranging from 0.84 to 0.89 in the validation study.

State Rumination. We assessed state rumination with the Brief State Rumination Inventory (Marchetti et al., 2018; e.g., "During the task, it was hard for me to shut off negative thoughts about myself"; $\alpha = 0.89$). The validation study showed robust psychometric properties including construct validity with traditional trait rumination measures.

2.3.4. Control variables

Trait conscientiousness and trait emotional stability. We used the Ten-Item-Personality-Inventory (Gosling et al., 2003) to measure trait conscientiousness (e.g., "*I see myself as dependable, self-disciplined*") and trait emotional stability (e.g., "*I see myself as calm, emotionally stable*"). Both scales showed adequate test-retest reliability ($r > 0.7$) over six weeks in the original study.

2.4. Data analysis

All analyses were conducted in SPSS28. Before the main analyses, we ran an exploratory factor analysis with a Maximum Likelihood extraction method and an oblique rotation (Oblimin with Kaiser Normalization) to see whether our perfectionism items loaded on the intended dimensions (see Appendix Table 2). We excluded outliers based on the preregistered criterion of ±2.5 *SD* from the condition mean of our dependent variable performance (Leys et al., 2013). To test H1, we linearly regressed performance on PS. To test H2 and H3, we ran a curve estimation to assess the linear and quadratic relationships of PC and overall perfectionism with performance. For H4, we tested the mediations using MEDCURVE macro (Hayes & Preacher, 2010).

3. Results

Despite finding differences between the two preregistered LDT versions, we only report the results of the untimed condition below due to space constraints and because we did not observe any significant (non-) linear perfectionism effects in the timed condition. We refer interested readers to the SOM 2 for details on the timed condition.

Our exploratory factor analysis showed that all perfectionisms items loaded on their respective factor ($\lambda s = 0.456–0.845$; see Appendix, Table 2). Six outliers were excluded in the following analyses. No control variable influenced the variables of interest.

3.1. Relationship of perfectionism-performance

For the untimed LDT, PS explained significant variance in task performance F_{PS} (1, 228) = 4.96, $B_{PS} = -0.438$, $p = .027$, $R^2 = 0.021$.

Table 1
Internal consistency, mean, standard deviations and intercorrelations.

Variable	α	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Perfectionistic Strivings	0.91	5.15	0.96	–													
2. Perfectionistic Concerns	0.89	3.16	1.21	0.32**	–												
3. Overall Perfectionism	0.90	4.21	0.88	0.79**	0.84**	–											
4. Trait Emotional Stability	0.78	4.47	1.42	−0.08	−0.46**	−0.34**	–										
5. Trait Conscientiousness	0.75	5.28	1.28	0.38**	−0.08	0.17**	0.22**	–									
6. State Conscientiousness	0.83	5.57	0.97	0.08	−0.10	−0.02	0.17*	0.26**	–								
7. State Optimism	0.85	5.18	1.02	0.07	−0.12	−0.04	0.18**	0.07	0.37**	–							
8. State Rumination	0.82	3.30	1.19	0.25**	0.44**	0.43**	−0.30**	0.05	−0.05	−0.22**	–						
9. State Engagement	0.75	5.59	0.75	0.08	−0.03	0.03	0.18**	0.24**	0.39**	0.57**	−0.06	–					
10. State Distress	0.85	2.68	1.05	0.09	0.30**	0.25**	−0.34**	−0.11	−0.36**	−0.49**	0.43**	−0.40**	–				
11. State Worry	0.75	4.61	1.19	−0.14*	−0.36**	−0.32**	0.24**	0.09	0.14*	0.16*	−0.60**	0.04	−0.50**	–			
12. State Effort	–	92.62	19.26	0.02	0.14*	0.10	−0.09	−0.01	0.34**	0.29**	0.07	0.36**	−0.13*	0.04	–		
13. Performance Timed	–	9.98	6.07	−0.07	0.04	−0.02	−0.02	−0.03	0.02	0.10	−0.13	0.16*	−0.10	0.03	0.03	–	
14. Performance Untimed	–	96.37	2.87	−0.15*	−0.18**	−0.20**	0.01	−0.05	0.12	0.17**	−0.23**	0.21**	−0.29**	0.14*	0.15*	0.31**	–

Note. $N = 229$, * = $p < .05$, ** = $p < .01$, α = Cronbach's Alpha, *M* = Mean, *SD* = Standard Deviation.

However, contrary to our predictions (H1), the regression coefficient was *negative*, indicating that scoring higher on PS coincided with a linear *decrease* in task performance.

In line with H2 and H3, the results supported the predicted non-linearity of both PC and overall perfectionism. Fig. 3 illustrates this significant quadratic function for PC and untimed LDT performance, F_{PC} (2, 228) = 6.61, $p = .02$, $R^2 = 0.055$. The quadratic, non-linear regression coefficient ($B = -0.240$, $p = .024$) was significant, the linear coefficient was not ($B = 1.225$, $p = .104$).

The relationship between overall perfectionism and LDT performance also followed a quadratic trend, $F(2,228) = 8.73$, $p < .001$, $R^2 = 0.072$ (Fig. 4). Both the linear ($B = 3.556$, $p = .025$) and the non-linear ($B = -0.50$, $p = .007$) regression coefficients were significant.

3.2. Mediation analyses

For the untimed LDT, results indicated that the mediators could not explain the linear, negative relationship between PS and performance (all coefficients' *p*-values > .1); H4a was not supported. The mediation analyses for PC on task performance yielded partial support for H4b: State distress ($\theta = -0.19$, $CI_{95\%}$ [−0.3449, −0.0845]) state rumination ($\theta = -0.20$, $CI_{95\%}$ [−0.406, −0.065]) and state effort ($\theta = -0.05$, $CI_{95\%}$ [0.0014, 0.1466]) significantly mediated the quadratic relationship of PC on untimed LDT performance (see Fig. 5). A follow-up Sobel test indicated full mediation for rumination ($t = -2.562$, $p = .010$) and for distress ($t = -3.025$, $p = .002$) and a partial mediation for state effort ($t = 1.625$, $p = .10$).[3]

3.3. Exploratory analyses

Considering the unexpected negative effect of PS on performance, and the non-linear relationship of overall perfectionism, we explored an interplay of both dimensions. Although not preregistered, this analysis may reveal valuable insights for future studies and shed further light on our results.

The underlying assumption for overall perfectionism rested on the notion that "bad can be stronger than good" (Baumeister et al., 2001). Phrased differently, the effect of overall perfectionism may not be equally (nor additively) driven by both PS and PC. Hence, we tested whether PC interacted with PS to predict performance. Indeed, a moderation analysis of PC on the effect of PS on performance (PROCESS, model 1, Hayes, 2017) was significant ($b = -0.482$, $p = .047$). As Fig. 6 indicates, individuals' PS did not predict performance when PC was low (i.e., −1 *SD*; $b = 0.048$, $p = .851$) or average ($b = -0.2133$, $p = .298$). However, under high levels of PC (+1 *SD*), PS significantly predicted performance negatively ($b = -0.731$, $p = .017$).

4. Discussion

The present work expands the literature on trait perfectionism by exploring the two dimensions of PS and PC in more detail, including analysing multiple mediators, and establishing novel non-linear, quadratic relationships.

First, contrary to our expectations and previous findings (Stoeber & Otto, 2006), PS (similar to PC) was negatively linked to performance. The present findings thus do not replicate the positive PS effect in similar LDT studies (Stoeber et al., 2010). In line with recent studies, however, our results challenge the general idea of a purely "healthy" or "positive"

[3] During the review process, we diverged from the initially preregistered parallel mediation analysis. We utilized the statistical tool MEDCURVE by Hayes and Preacher (2010), which enables the testing of mediation of a quadratic relationship more accurately. Comprehensive details about the original preregistered analyses are available in the supplementary material (SOM 3) on OSF.

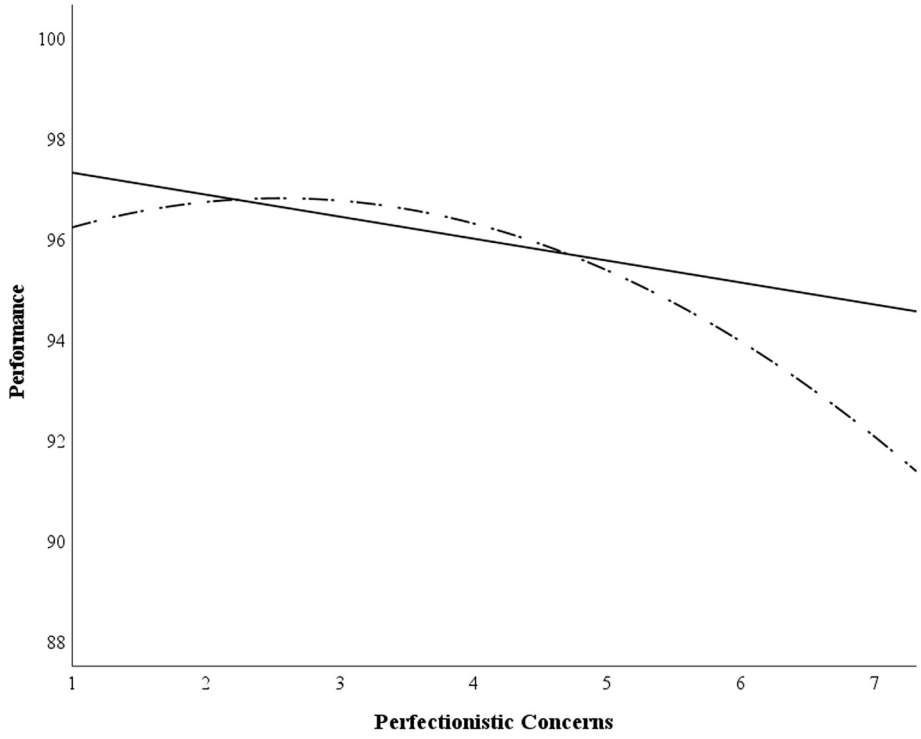

Fig. 3. Quadratic, inverted-U relationship of perfectionistic concerns and untimed performance.
Note. The explained variance by the linear model: $R^2 = 0.034$ (solid line). The explained variance by the quadratic model: $R^2 = 0.055$ (dotted line).

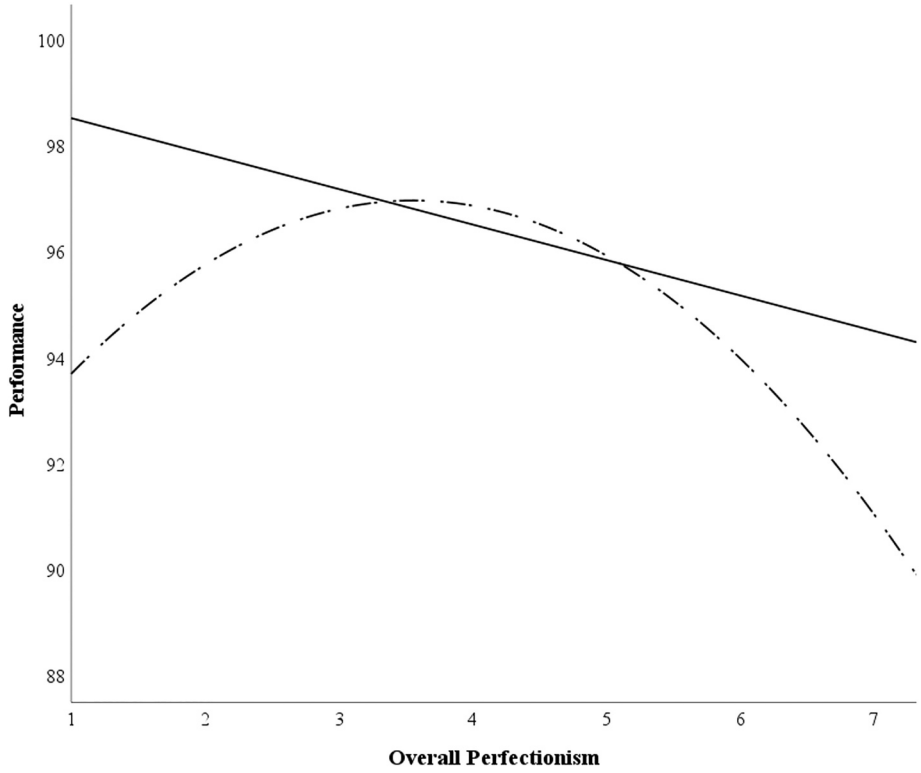

Fig. 4. Quadratic, inverted-U relationship of overall perfectionism and untimed performance.
Note. The explained variance by the linear model: $R^2 = 0.042$ (solid line). The explained variance by the quadratic model: $R^2 = 0.072$ (dotted line).

perfectionism: PS can also transgress beyond a point of diminishing returns (Nordin-Bates et al., 2024) and show adverse outcomes such as higher perceived stress and impaired well-being (e.g., Hill et al., 2010). Thereby, we echo recent literature that warns against symbolic or conceptual confusion of PS with related constructs such as excellencism (Gaudreau, 2019) or overly simplistic, straightforward conclusions

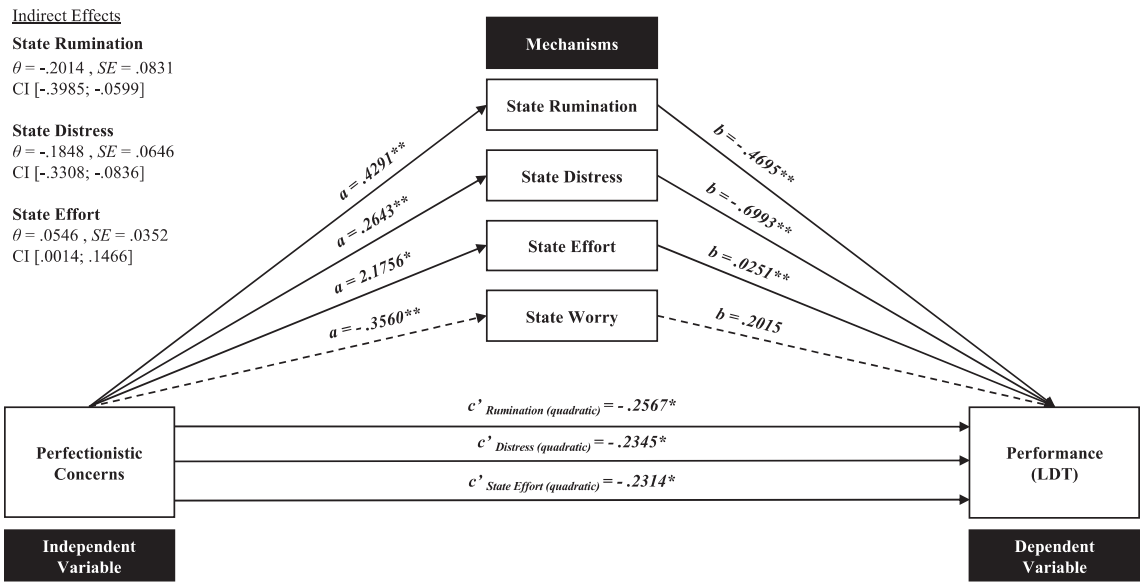

Fig. 5. Mediation analysis for the quadratic effect of PC on untimed performance.
Note. $N = 229$, $^{\circ} = p < .10$, $* = p < .05$, $** = p < .01$, θ = Theta.

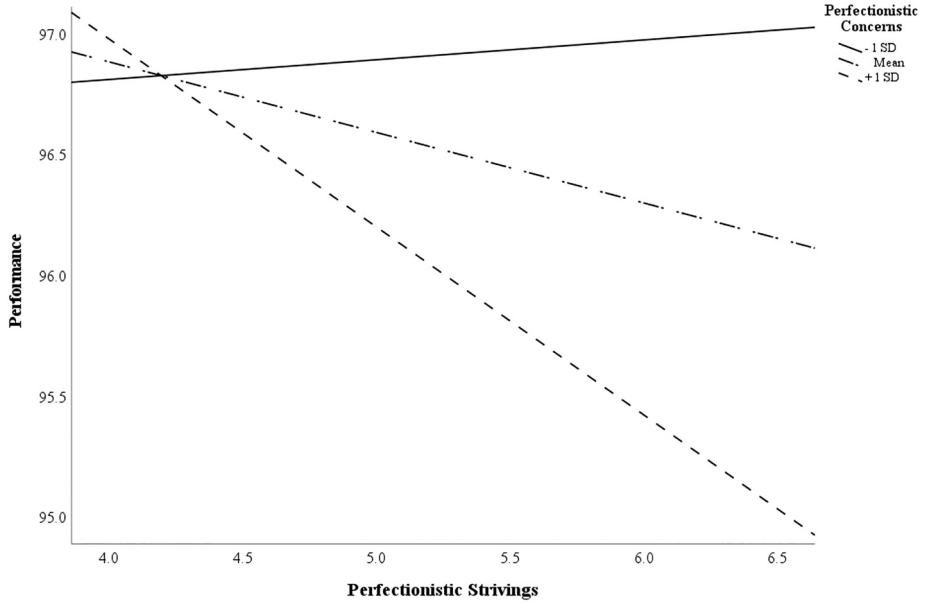

Fig. 6. Exploratory moderation of different levels of PC on the relationship between PS and untimed performance.
Note. At low (-1SD) and average (Mean) levels of PC, the impact of PS on performance was negligible. At high levels of PC (+1SD), however, a pronounced negative impact of PS on task performance emerged.

about the effect of perfectionism (Harari et al., 2018).

Second, the quadratic relationship indicates that PC is not – per se – detrimental to performance, as has been often reported (e.g., (Ocampo et al., 2020). Instead, the absolute degree of PC shapes how well individuals perform. These findings highlight the importance of non-linear effects and help to explain the previously reported weak (or null) findings regarding PC and performance (Harari et al., 2018).

Third, we found that low-to-moderate scores of overall perfectionism coincided with increasingly better performance up to an inflection point, after which higher trait scores coincided with deteriorating performance—an inverted-U shaped effect emerged (Grant & Schwartz, 2011; Loschelder et al., 2016). Our results also corroborate recent studies (Howell et al., 2020; Smith & Saklofske, 2017), that demonstrate that a general factor adds additional explained variance when testing a bi-factorial structure, compared to less parsimonious models that consider PS and PC separately (see SOM 4). Further, our exploratory analyses highlight that the (negative) impact of PS on performance depends on PC; it emerged only for comparably high(er) levels of PC. Both dimensions are not entirely independent but interact. This is consistent with recently discussed models such as the 'tripartite model of perfectionism' (Smith et al., 2015) or the '2x2 model of perfectionism' (Gaudreau, 2019); both argue the effect of PS depend on levels of PC.

Fourth, our mediation analyses underline the maladaptivity of PC and reveal that elevated levels of state distress and state rumination predict the drop in task performance. Participants with (excessively) high PC and the urge to avoid a negative event (failure) seem to become overwhelmed by distracting thoughts and stressful emotions, which in turn hampers performance. State effort emerged as a positive mediator

for PC, but not PS (cf. Stoeber et al., 2010), yet this positive effect was insufficient to facilitate performance as distracting thoughts seem to overshadow individuals' ability to perform well, resulting in the non-linear inverted-U.

PS showed no association with the hypothesised mediators (Table 1). Given its unexpected negative link to performance, it is less surprising that motivational forces (e.g., task engagement) that suggest positive effects remained unrelated. Perhaps the vigilant nature of the task was insufficient to trigger strivings for performance.

Overall, our results highlight the risk of overly simplistic and linear conclusions regarding perfectionism. Excessive levels – particularly PC – can eventually become detrimental to performance (and arguably well-being). Thus, it is a balancing act to avoid negative cognitive-affective states while reaping the benefits of improved performance at an optimal degree of perfectionism.

4.1. Limitations and future research

As with any research, the present is not without limitations that suggest avenues for future research. For instance, our study is limited in its generalizability. The LDT paradigm has been previously applied in perfectionism research (Slade et al., 1991; Stoeber et al., 2010; Tallis et al., 1991), requires no particular, pre-existing skills, and thus allows for controlled performance comparisons; yet its results do not inevitably transfer to more ecological tasks (e.g., taking an exam or writing a research article).

In addition, our time pressure manipulation seemed suboptimal: follow-up studies could realize time limits based on entire LDT blocks (e.g., 5 min per 80 slides) rather than per slide (e.g. 4 s) to evoke general time pressure on participants' self-regulation (e.g., pace), rather than risking incorrect individual responses. Future research may also examine moderation effects of time pressure in a between-subject design to prevent potential carry-over effects from one LDT version to the other.

The literature could also benefit from longitudinal designs that help to further explore the interaction of PS and PC over time and to validate mediation effects. Moreover, our results corroborate recent studies that point towards a potential backfiring effect of PS (Nordin-Bates et al., 2024). Future research would thus benefit from including explanatory mechanisms beyond a purely positive connotation of PS. In support of this, we found a small-to-moderate correlation between PS and state rumination. This future research may further expand our understanding of when and how the motivation to be (too) perfect impacts individuals' performance (non-)linearly.

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CRediT authorship contribution statement

Tilman Nols: Writing – review & editing, Writing – original draft, Formal analysis, Data curation, Conceptualization. **Sophia A. Kohlenberg:** Writing – review & editing, Writing – original draft, Formal analysis, Data curation, Conceptualization. **Sebastian B. Klein:** Writing – review & editing, Writing – original draft, Investigation, Data curation, Conceptualization. **Lea Boecker:** Writing – review & editing, Supervision, Project administration, Conceptualization. **Ashtyn E. Cross:** Writing – review & editing, Writing – original draft, Investigation, Data curation, Conceptualization. **David D. Loschelder:** Writing – review & editing, Supervision, Methodology, Investigation, Funding acquisition, Conceptualization.

Declaration of competing interest

None.

Data availability

The data are freely available. We provide access to our data on the corresponding OSF page.

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Appendix A. Supplementary data

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References

Anwyl-Irvine, A., Dalmaijer, E. S., Hodges, N., & Evershed, J. K. (2021). Realistic precision and accuracy of online experiment platforms, web browsers, and devices. *Behavior Research Methods, 53*(4), 1407–1425. https://doi.org/10.3758/s13428-020-01501-5

Baumeister, R. F., Bratslavsky, E., Finkenauer, C., & Vohs, K. D. (2001). Bad is stronger than good. *Review of General Psychology, 5*(4), 323–370. https://doi.org/10.1037/1089-2680.5.4.323

Bieling, P. J., Israeli, A. L., & Antony, M. M. (2004). Is perfectionism good, bad, or both? Examining models of the perfectionism construct. *Personality and Individual Differences, 36*(6), 1373–1385. https://doi.org/10.1016/S0191-8869(03)00235-6

Black, J., & Reynolds, W. M. (2013). Examining the relationship of perfectionism, depression, and optimism: Testing for mediation and moderation. *Personality and Individual Differences, 54*(3), 426–431. https://doi.org/10.1016/j.paid.2012.10.012

Cohen, J. (1992). Statistical power analysis. *Current Directions in Psychological Science, 1*(3), 98–101. https://doi.org/10.1111/1467-8721.ep10768783

Einstein, D. A., Lovibond, P. F., & Gaston, J. E. (2000). Relationship between perfectionism and emotional symptoms in an adolescent sample. *Australian Journal of Psychology, 52*(2), 89–93. https://doi.org/10.1080/00049530008255373

Elliot, A. J. (2006). The hierarchical model of approach-avoidance motivation. *Motivation and Emotion, 30*, 111–116. https://doi.org/10.1007/s11031-006-9028-7

Enns, M. W., Cox, B. J., Sareen, J., & Freeman, P. (2001). Adaptive and maladaptive perfectionism in medical students: A longitudinal investigation. *Medical Education, 35*(11), 1034–1042. https://doi.org/10.1046/j.1365-2923.2001.01044.x

Fleeson, W. (2004). Moving personality beyond the person-situation debate: The challenge and the opportunity of within-person variability. *Current Directions in Psychological Science, 13*(2), 83–87.

Frost, R. O., Marten, P., Lahart, C., & Rosenblate, R. (1990). The dimensions of perfectionism. *Cognitive Therapy and Research, 14*, 449–468. https://doi.org/10.1007/BF01172967

Gaudreau, P. (2019). On the distinction between personal standards perfectionism and excellencism: A theory elaboration and research agenda. *Perspectives on Psychological Science, 14*(2), 197–215. https://doi.org/10.1177/1745691618797940

Goldberg, L. R. (1992). The development of markers for the big-five factor structure. *Psychological Assessment, 4*(1), 26. https://doi.org/10.1037/1040-3590.4.1.26

Gosling, S. D., Rentfrow, P. J., & Swann, W. B., Jr. (2003). A very brief measure of the Big-Five personality domains. *Journal of Research in Personality, 37*(6), 504–528. https://doi.org/10.1016/S0092-6566(03)00046-1

Grant, A. M., & Schwartz, B. (2011). Too much of a good thing: The challenge and opportunity of the inverted U. *Perspectives on Psychological Science, 6*(1), 61–76. https://doi.org/10.1177/174569161039352

Harari, D., Swider, B. W., Steed, L. B., & Breidenthal, A. P. (2018). Is perfect good? A meta-analysis of perfectionism in the workplace. *Journal of Applied Psychology, 103*(10), 1121. https://doi.org/10.1037/apl0000324

Hayes, A. F. (2017). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. Guilford publications.

Hayes, A. F., & Preacher, K. J. (2010). Quantifying and testing indirect effects in simple mediation models when the constituent paths are nonlinear. *Multivariate Behavioral Research, 45*(4), 627–660. https://doi.org/10.1080/00273171.2010.498290

Helton, W. S., & Näswall, K. (2015). Short stress state questionnaire. *European Journal of Psychological Assessment*. https://doi.org/10.1027/1015-5759/a000200

Hewitt, P. L., & Flett, G. L. (1990). Perfectionism and depression: A multidimensional analysis. *Journal of Social Behavior and Personality, 5*(5), 423. https://doi.org/10.1037/0000289-011

Hill, R. W., Huelsman, T. J., & Araujo, G. (2010). Perfectionistic concerns suppress associations between perfectionistic strivings and positive life outcomes. *Personality and Individual Differences, 48*(5), 584–589. https://doi.org/10.1016/j.paid.2009.12.011

Howell, J., Anderson, R., Egan, S., & McEvoy, P. (2020). One factor? Two factor? Bi-factor? A psychometric evaluation of the Frost Multidimensional Scale and the Clinical Perfectionism Questionnaire. *Cognitive Behaviour Therapy, 49*(6), 518–530. https://doi.org/10.1080/16506073.2020.1790645

Leys, C., Ley, C., Klein, O., Bernard, P., & Licata, L. (2013). Detecting outliers: Do not use standard deviation around the mean, use absolute deviation around the median.

Journal of Experimental Social Psychology, 49(4), 764–766. https://doi.org/10.1016/j.jesp.2013.03.013

Loschelder, D. D., Friese, M., Schaerer, M., & Galinsky, A. D. (2016). The too-much-precision effect: When and why precise anchors backfire with experts. *Psychological Science, 27*(12), 1573–1587. https://doi.org/10.1177/0956797616666074

Madigan, D. J., Stoeber, J., & Passfield, L. (2017). Perfectionism and achievement goals revisited: The 3× 2 achievement goal framework. *Psychology of Sport and Exercise, 28*, 120–124. https://doi.org/10.1016/j.psychsport.2016.10.008

Marchetti, I., Mor, N., Chiorri, C., & Koster, E. H. W. (2018). The brief state rumination inventory (BSRI): Validation and psychometric evaluation. *Cognitive Therapy and Research, 42*, 447–460. https://doi.org/10.1007/s10608-018-9901-1

Millstein, R. A., Chung, W.-J., Hoeppner, B. B., Boehm, J. K., Legler, S. R., Mastromauro, C. A., & Huffman, J. C. (2019). Development of the state optimism measure. *General Hospital Psychiatry, 58*, 83–93. https://doi.org/10.1016/j.genhosppsych.2019.04.002

Nordin-Bates, S. M., & Kuylser, S. (2021). High striving, high costs? A qualitative examination of perfectionism in high-level dance. *Journal of Dance Education, 21*(4), 212–223. https://doi.org/10.1080/15290824.2019.1709194

Nordin-Bates, S. M., Madigan, D. J., Hill, A. P., & Olsson, L. F. (2024). Perfectionism and performance in sport: Exploring nonlinear relationships with track and field athletes. *Psychology of Sport and Exercise, 70*, Article 102552. https://doi.org/10.1016/j.psychsport.2023.102552

Ocampo, A. C., Wang, L., Kiazad, K., Restubog, S. L., & Ashkanasy, N. M. (2020). The relentless pursuit of perfectionism: A review of perfectionism in the workplace and an agenda for future research. *Journal of Organizational Behavior, 41*(2), 144–168. https://doi.org/10.1002/job.2400

Olson, M. L., & Kwon, P. (2008). Brooding perfectionism: Refining the roles of rumination and perfectionism in the etiology of depression. *Cognitive Therapy and Research, 32*, 788–802. https://doi.org/10.1007/s10608-007-9173-7

Schaufeli, W. B., & Bakker, A. B. (2004). Job demands, job resources, and their relationship with burnout and engagement: A multi-sample study. *Journal of Organizational Behavior: The International Journal of Industrial, Occupational and Organizational Psychology and Behavior, 25*(3), 293–315. https://doi.org/10.1002/job.248

Schutte, N. S., Malouff, J. M., Segrera, E., Wolf, A., & Rodgers, L. (2003). States reflecting the Big Five dimensions. *Personality and Individual Differences, 34*(4), 591–603. https://doi.org/10.1016/S0191-8869(02)00031-4

Slade, P. D., Newton, T., Butler, N. M., & Murphy, P. (1991). An experimental analysis of perfectionism and dissatisfaction. *British Journal of Clinical Psychology, 30*(2), 169–176. https://doi.org/10.1111/j.2044-8260.1991.tb00932.x

Slade, P. D., & Owens, R. G. (1998). A dual process model of perfectionism based on reinforcement theory. *Behavior Modification, 22*(3), 372–390. https://doi.org/10.1177/014544559802230

Slaney, R. B., Rice, K. G., Mobley, M., Trippi, J., & Ashby, J. S. (2001). The revised almost perfect scale. *Measurement and Evaluation in Counseling and Development, 34*(3), 130–145. https://doi.org/10.1080/07481756.2002.12069030

Smith, M. M., & Saklofske, D. H. (2017). The structure of multidimensional perfectionism: Support for a bifactor model with a dominant general factor. *Journal of Personality Assessment, 99*(3), 297–303. https://doi.org/10.1080/00223891.2016.1208209

Smith, M. M., Saklofske, D. H., Yan, G., & Sherry, S. B. (2015). Perfectionistic strivings and perfectionistic concerns interact to predict negative emotionality: Support for the tripartite model of perfectionism in Canadian and Chinese university students. *Personality and Individual Differences, 81*, 141–147. https://doi.org/10.1016/j.paid.2014.09.006

Smith, M. M., Sherry, S. B., Vidovic, V., Saklofske, D. H., Stoeber, J., & Benoit, A. (2019). Perfectionism and the five-factor model of personality: A meta-analytic review. *Personality and Social Psychology Review, 23*(4), 367–390. https://doi.org/10.1177/1088868318814973

Stoeber, J. (2012). Perfectionism and performance. *The Oxford Handbook of Sport and Performance Psychology, 294–306*. https://doi.org/10.1093/oxfordhb/9780199731763.013.0015

Stoeber, J., Chesterman, D., & Tarn, T.-A. (2010). Perfectionism and task performance: Time on task mediates the perfectionistic strivings–performance relationship. *Personality and Individual Differences, 48*(4), 458–462. https://doi.org/10.1016/j.paid.2009.11.021

Stoeber, J., Damian, L. E., & Madigan, D. J. (2018). Perfectionism: A motivational perspective. In *The psychology of perfectionism: Theory, research, applications* (pp. 19–43). Routledge/Taylor & Francis Group.

Stoeber, J., Feast, A. R., & Hayward, J. A. (2009). Self-oriented and socially prescribed perfectionism: Differential relationships with intrinsic and extrinsic motivation and test anxiety. *Personality and Individual Differences, 47*(5), 423–428. https://doi.org/10.1016/j.paid.2009.04.014

Stoeber, J., & Gaudreau, P. (2017). The advantages of partialling perfectionistic strivings and perfectionistic concerns: Critical issues and recommendations. *Personality and Individual Differences, 104*, 379–386. https://doi.org/10.1016/j.paid.2016.08.039

Stoeber, J., Hutchfield, J., & Wood, K. V. (2008). Perfectionism, self-efficacy, and aspiration level: Differential effects of perfectionistic striving and self-criticism after success and failure. *Personality and Individual Differences, 45*(4), 323–327. https://doi.org/10.1016/j.paid.2008.04.021

Stoeber, J., & Joormann, J. (2001). Worry, procrastination, and perfectionism: Differentiating amount of worry, pathological worry, anxiety, and depression. *Cognitive Therapy and Research, 25*, 49–60. https://doi.org/10.1023/A:1026474715384

Stoeber, J., & Otto, K. (2006). Positive conceptions of perfectionism: Approaches, evidence, challenges. *Personality and Social Psychology Review, 10*(4), 295–319. https://doi.org/10.1207/s15327957pspr1004_2

Tallis, F., Eysenck, M., & Mathews, A. (1991). Elevated evidence requirements and worry. *Personality and Individual Differences, 12*(1), 21–27. https://doi.org/10.1016/0191-8869(91)90128-X

Zijlstra, F. R. H., & van Doorn, L. (1985). *The construction of a scale to measure perceived effort*. University of Technology.