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Exploring Perfectionism and Mental Health in Engineering Students: A Synthesis of Perfectionism Theories and Measurement Scales

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Abstract

This theory paper addresses the growing concern about mental health among engineering college students in the United States, a trend that has intensified over the past five years, particularly due to the effects of the COVID-19 pandemic. For example, during the 2022-2023 academic year, 65. 5% of the surveyed undergraduate students reported seeking counseling services for anxiety concerns. Such mental health concerns in addition to suicidal ideation, depression, and academic performance have become prominent. Within the engineering community, these concerns are even more pressing, as high levels of anxiety among engineering students are linked to poor academic results and, in extreme cases, suicidal behavior. As one of the trigger factors for stress and anxiety, perfectionism plays a prominent role in the lives of engineering students. Given the rigorous nature of engineering programs, it is crucial to understand the healthy (Adaptive) and unhealthy (Maladaptive) aspects of perfectionism to be able to understand the challenges of students and provide the necessary support.

This research holds importance as it sheds light on both the advantages and drawbacks of existing perfectionism scales. This contributes to a deeper comprehension of perfectionistic traits within engineering education and lays the groundwork for subsequent interventions. As a result of this synthesis, an ongoing research is in progress toward creating a perfectionism scale that captures Adaptive and Maladaptive Perfectionism tailored to students in Engineering.

1 Understanding Perfectionism: An Overview

The concept of perfectionism traces back to Alfred Adler's early research in the 1930s [1], where he identified it as a crucial factor in the development of personality . Adler introduced the concepts of 'striving for superiority' and the 'inferiority complex', explaining how difficulties in managing stress might lead to perfectionistic behavior [2]. Later, in the mid-20th century, Horney expanded on these ideas [3], viewing perfectionism as a reaction to feelings of inadequacy. Furthermore, she differentiates between the idealized self and the actual self, suggesting that when driven by self-loathing, perfectionism incurs a significant cost in the pursuit of ideal ambitions [4].

Although there is no universally accepted definition of perfectionism, the American Psychological Association (APA) characterizes it as *"a tendency to demand of others or oneself an extremely high*

or even flawless level of performance, exceeding what the situation requires" [5]. This discussion focuses on self-oriented demands, which lead to both Adaptive and Maladaptive behaviors, such as goal setting without compromising mental well-being.

Previous research identifies three prevalent characterizations of perfectionism [6]. These characterizations include 'Positive and Negative Perfectionism,' 'Adaptive vs. Maladaptive Perfectionism,' and 'Normal vs. Neurotic Perfectionism.' It is crucial to recognize that these terms are frequently used interchangeably. Positive perfectionism aligns with adaptive, normal, and healthy perfectionism, while negative perfectionism corresponds to maladaptive, neurotic, and unhealthy perfectionism [7], [8], [9]. In the following sections, we examine these descriptions in more depth. Positive perfectionism is driven by the desire to obtain positive results. In contrast, negative perfectionism focuses on the keen desire to avoid negative outcomes [10]. Normal perfectionism involves aspiring to achievable and realistic goals, fostering self-satisfaction and elevated self-esteem. Neurotic perfectionism, however, involves an obsession with excessively high standards driven by fear of failure and apprehension about others' disappointment. These characteristics of perfectionism reveal overlapping aspects, such as an aversion to negative outcomes, anxiety about mistakes, and fear of failure [6]. Adaptive perfectionism includes behaviors characterized by self-oriented perfectionism and high personal standards. In contrast, maladaptive perfectionism involves socially prescribed perfectionism and intense worry about errors. Maladaptive perfectionism can lead to procrastination, while adaptive perfectionism aids in the timely completion of tasks [11].

2 Characteristics of perfectionism

Perfectionism theories can be categorized into three key characteristics: unidimensional vs. multidimensional, adaptive vs. maladaptive, and global vs. domain specific [12]. Reviewing these dimensions is helpful to understand the need for designing an instrument that addresses and measures Adaptive and Maladaptive perfectionism tailored to engineering students.

2.1 Unidimensional vs. Multidimensional Perfectionism

In the context of perfectionism, a unidimensional approach considers it as a single concept involving irrational beliefs and strict self-imposed standards [13]. Conversely, multidimensional perfectionism includes both self-oriented and socially oriented dimensions. Significant contributors to this perspective include Frost et al. in 1990 [14] and Hewitt & Flett in 1991 [15], who created the Frost Multidimensional Scale (FMPS) and the Hewitt & Flett Multidimensional Scale (MPS), respectively. FMPS emphasizes factors such as personal standards and parental expectations, while MPS addresses self-oriented, other-oriented, and socially prescribed perfectionism. Current empirical studies support the multidimensional model as a more comprehensive approach to understanding perfectionism (e.g., [16], [17], [18]).

2.2 Adaptive vs. Maladaptive Perfectionism

Adaptive perfectionism is based on setting high but achievable standards that promote beneficial outcomes such as increased self-esteem, motivation, and confidence in decision making [19]. Maladaptive perfectionism, in contrast, involves setting high yet unattainable standards that result

in adverse consequences and impairs mental well-being such as anxiety, depression, and self-defeating behaviors.

2.3 Global vs. Domain-Specific Perfectionism

Global perfectionism refers to a universal inclination toward perfection in various domains of life, while domain-specific perfectionism is domain sensitive and focuses on areas such as hobbies, employment, or interpersonal relationships. Domain-specific frameworks provide a deeper outlook by acknowledging that perfectionistic tendencies can differ depending on the domain. For example, an individual might display high levels of perfectionism in their work but not in their hobbies.

Given these characterizations, this study proposes the necessity for a new scale that embeds these conceptualizations of Multidimensional, Adaptive vs. Maladaptive and Domain-specific to engineering.

3 Motivation: Why is a new scale to measure Perfectionism necessary?

Perfectionism has been studied in undergraduate students from Psychology [20], Math, Physics, Music, and Communications [21], as well as in graduate programs like Master of Business Administration (MBA) [22] and engineering [23] and [24] using non domain-specific perfectionism scales.

The necessity of operationalizing perfectionism using domain-specific scales, like those developed in sports [25], has been underscored by focusing on three distinct characteristics: domain-specificity, multidimensionality, and the distinction between adaptive and maladaptive perfectionism [12]. Within the domain of engineering, there exists a notable gap in comprehending how adaptive and maladaptive perfectionism influences undergraduate engineering students. This study's primary impetus is to concentrate on the operationalization of perfectionism traits specifically within the engineering discipline. Consequently, this study aims to synthesize current perfectionism scales, providing a new viewpoint for examining perfectionism in undergraduate engineering students. This study suggests the necessity of crafting a multidimensional scale specifically for undergraduate engineering students, focusing on the adaptive and maladaptive dimensions of perfectionism.

4 Review and Evaluation of Existing Perfectionism Instruments

Perfectionism initially was assessed from a single-dimensional perspective [13], followed by its evaluation through a multidimensional framework in various models [14]. The unidimensional view of perfectionism focuses on cognitive factors solely in the form of irrational beliefs [26]. This perspective has been used frequently in the literature on eating disorders to measure perfectionism through a six-item subscale of the Eating Disorder Inventory (EDI)[13].

One of the major advances in this field is the emergence of multidimensional views of perfectionism that encompasses personal and interpersonal aspects. These views are reflected in instruments

such as the Multidimensional Perfectionism Scale (MPS)[6], which has suggested the idea that perfectionism is complex and cannot be explained through unidimensional approaches alone. In next section, we look at four perfectionism instruments that were developed based on various subscales of perfectionism.

4.1 Existing Perfectionism Scales and Their Benefits and Weaknesses

4.1.1 Burns Perfectionism Scale (BPS) (1980)

Burns' Perfectionism Scale (BPS) is the first instrument developed on perfectionism. The BPS was developed based on the measurement of self-defeating attitudes that are associated with clinical depression and anxiety. According to Burns, perfectionism is a characteristic that a person possesses with extremely high standards. Furthermore, he adds that a perfectionist individual "strains compulsively and unremittingly toward impossible goals and measures his worth entirely in terms of productivity and accomplishment" [13] (p. 34). BPS has a 10-item unidimensional scale with items on a 5-point Likert scale. Hewitt and Dyck [27] reported preliminary evidence of the reliability of the internal consistency coefficient (Cronbach's alpha), around 0.70 (N=197 college students) [18] in measuring the constructs associated with perfectionism. For example, in the following item, participants were asked to state their agreement or disagreement with this statement: "If I don't set the highest standards for myself, I am likely to end up a second-rate person."
BPS was a pioneer of its time in measuring perfectionist tendencies in therapeutic settings, focusing on cognitive patterns. However, its unidimensional nature falls short in providing a holistic understanding of perfectionism across different life contexts.

4.1.2 Frost Multidimensional Perfectionism Scale (FMPS, 1990)

Before developing the Frost Multidimensional Perfectionism Scale, Frost and his colleagues highlighted the diverse and nonspecific definitions of perfectionism. Furthermore, they indicated some important features of perfectionism [14]. These features are as follows:

1. Excessively high personal standards (PS), e.g., "I have extremely high goals."
2. Excessive concerns over mistakes in performance (CM), e.g., "I should be upset if I make a mistake."
3. Doubting of the quality of one's performance and actions (DA), e.g., "Even when I do something very carefully, I often feel that it is not quite right."
4. The role of the expectations of parents (PE), e.g., "My parents wanted me to be the best at everything."
5. The role of criticism of parents (PC), e.g., "I never felt like I could meet my parents' expectations."
6. An exaggerated emphasis on precision, order, and organization. (O) e.g., "Neatness is very important for me"

Frost and his colleagues started the scale development with sixty-seven items on a 5-point Likert scale type derived from BPS and newly developed items. They selected the potential items based

on their conceptual fit with each of the six dimensions mentioned above. After revisions, the Organization scale (O) was dropped due to its weakest inter-correlation with the other subscales. Hence, the number of items in the instrument was reduced to thirty-five. This scale was developed and validated in female undergraduate college students (N=232) as the primary sample. The internal consistency coefficient (Cronbach's alpha) for the subscales ranged from 0.77 to 0.93 [8], showing strong reliability in measuring the constructs associated with perfectionism.

Frost Multidimensional Perfectionism Scale (FMPS) represents a comprehensive approach to measuring multiple dimensions of perfectionism, including personal standards, concerns about mistakes, and parental expectations. The robust psychometric properties of FMPS make it a reliable scale for research. FMPS has been widely used as a perfectionism scale with a citation count more than 7,200 times in the literature, according to the Google Scholar search. However, FMPS is limited by the lack of balanced emphasis on Adaptive and Maladaptive perfectionism. Furthermore, the length of the instrument can be a limitation (35 items) that can cause decreased participation, attention span, or response quality.

4.1.3 Hewitt & Flett Multidimensional Perfectionism Scale (MPS) (1991)

Hewitt & Flett named their multidimensional perfectionism scale as MPS the same as Frost's FMPS instrument. However, the dimensions of perfectionism that Hewitt and Flett suggested were distinctly different [6]. Based on their observations, the existing scales needed more interpersonal aspects. Thus, they identified three elements of the instrument: self-oriented perfectionism, socially prescribed perfectionism, and other-oriented perfectionism. They also note that the major distinction among the three dimensions of perfectionism is based on the source and direction of perfectionistic behavior. The final instrument has forty items, with fifteen items measuring each component using a 7-point Likert scale type. The instrument was developed and validated in college students (N = 156) [8]. 1. Self-oriented Perfectionism (SOP), e.g., "I must always be successful at school or work." 2. Socially prescribed Perfectionism (SPP), e.g., "The people around me expect me to succeed at everything I do." 3. Other-oriented Perfectionism (OOP), e.g., "I do not have very high standards for those around me." The internal consistency reliability for SOP, SPP and OOP is 0.86, 0.87, and 0.82, respectively [8].

Hewitt and Flett's Multidimensional Perfectionism Scale (MPS) represents a holistic instrument of perfectionism across three dimensions of self-oriented, other-oriented, and socially prescribed perfectionism. The instrument has been widely adopted in the literature and has been cited more than 5,000 times according to the Google Scholar search. Its strength lies in its ability to capture the nuanced ways that perfectionism can manifest, allowing for a deeper understanding of its impacts on psychological well-being. However, one limitation includes using narrow samples (such as psychology students from a single university in Canada), which may lead to biases. Moreover, despite having subscales that correlate with both Adaptive and Maladaptive perfectionism, the MPS was not originally designed to evaluate these two aspects [12].

4.1.4 Short Almost Perfect Scale (SAPS) (2014)

The Short Almost Perfect Scale (SAPS) is an advanced adaptation of the Almost Perfect Scale-Revised (APS-R) [28], itself evolved from the original Almost Perfect Scale (APS) [29]. Analysis of the initial APS identified four perfectionism-related factors: High Standards and Orderliness, Anxiety, Interpersonal Connections, and Procrastination [12]. As the scale was refined, the authors retained High Standards and Orderliness to emphasize beneficial aspects of perfectionism [28], adding new items to enhance the High Standards subscale. Additionally, they introduced the Discrepancy concept to evaluate negative perfectionism, highlighting the gap between personal expectations and actual performance, resulting in the Discrepancy subscale. APS-R emerged with three subscales: High Standards, Discrepancy and Order, comprising twenty-three items rated on a seven-point Likert scale from 1 (strongly disagree) to 7 (strongly agree).

To address APS-R's length, a further revision [30] reduced redundant items, yielding a concise 8-item instrument. Each component is assessed with four items, using the same 7-point Likert scale. The instrument was developed and validated with undergraduate students (N = 749) [31] to evaluate High Standards, e.g. "I have high expectations for myself " and Discrepancy, e.g. "I am hardly ever satisfied with my performance." Due to its relatively recent introduction, SAPS has growing usage, with about three hundred citations in Google Scholar. Although it assesses both Adaptive and Maladaptive perfectionism, it is not domain-specific. A recent study applied APS-R to civil engineering students [24], revealing that 68.5% were maladaptive perfectionists. These findings highlight the need for an engineering-specific scale to address unique challenges in this field.

5 Synthesis

An evaluation of existing tools for assessing perfectionism reveals that each has significantly enhanced our understanding of perfectionism and its effects on well-being. Examining the characteristics of the existing scales (Table 1) indicates that, according to the operationalization of perfectionism [12], no scale encompasses all three features: multidimensional, engineering-specific, and distinguishing between Adaptive and Maladaptive perfectionism traits.

It is crucial to recognize that these scales inherently incorporate both adaptive and maladaptive dimensions. The meta-analysis study [32] views perfectionism in the workplace as comprising two dimensions: *'Excellence-seeking'* and *'Failure-avoiding'*. Excellence-seeking perfectionism involves pursuing high standards and diligently working to achieve them. The study further aligns this dimension with Organization (FMPS), Self-oriented perfectionism (MPS), Other-oriented perfectionism (MPS) and High Standards (SAPS). In contrast, failure-avoiding perfectionism is associated with the fear of making mistakes, often leading to self-criticism. It is conceptually linked to Concerns over mistakes (FMPS), Doubting of actions (FMPS), Parental Expectations (FMPS), Parental Criticism (FMPS), Socially prescribed perfectionism (MPS), and Discrepancy (SAPS). By applying the Excellence-seeking and Failure-avoiding framework to engineering, we observe that perfectionism can be characterized by persistence and self-efficacy [33], as well as its influence on performance [34]. Engineering students, compared to other fields, exhibit greater perfectionistic concerns about their performance [35]. These concerns correspond to the Excellence-seeking and

Table 1: Summary of Existing Perfectionism Scales, Their Strengths, and Limitations

Scale	Year	Key Features	Strengths	Limitations	Characteristics
Burns Perfectionism Scale (BPS)	1980	10-item unidimensional scale on a 5-point Likert scale	Pioneer in measuring perfectionism in therapy; highlights cognitive patterns	Lacks multidimensional perspective; limited contextual applicability	Unidimensional, Not Domain-specific, Maladaptive focus
Frost Multidimensional Perfectionism Scale (FMPS)	1990	35-item scale measuring personal standards, concerns over mistakes, parental expectations	Comprehensive multidimensional approach; widely cited with strong psychometric properties	Weak correlation of Organization subscale with others; lengthy scale may affect response quality	Multidimensional, Not Domain-specific, more Maladaptive focus
Hewitt & Flett Multidimensional Perfectionism Scale (MPS)	1991	45-item scale measuring self-oriented, socially prescribed, and other-oriented perfectionism	Captures interpersonal aspects of perfectionism; well-cited	Developed on narrow samples; lacks distinction between adaptive and maladaptive perfectionism	Multidimensional, not domain-specific, does not distinguish between Adaptive vs. Maladaptive
Short Almost Perfect Scale (SAPS)	2014	8-item scale measuring high standards and discrepancy	Brief and easy to administer; captures both adaptive and maladaptive perfectionism	Limited usage in literature	Multidimensional, Not Domain-specific, captures Adaptive & Maladaptive aspects

Failure-avoidance model of perfectionism previously mentioned [32]. From the FMPS viewpoint, Personal Standards (PS) align with the high standards engineering students set for themselves to achieve accurate designs or solve intricate problems. Concerns over mistakes (CM) also manifest prominently in engineering education, where students undergo various iterations of problem solving and learn from errors. Doubting of actions (DA) is another prevalent feeling among engineering students regarding the sufficiency of their projects and their level of satisfaction. The next section will explore the limitations of current scales within the engineering domain.

6 Limitations of Current Perfectionism Scales for Engineering Students

Existing perfectionism scales, which are commonly employed to assess perfectionism, often focus on broad populations, and their dimensions are extensively used (such as [10], [14], [36]). First, none of the existing scales directly focuses on measuring perfectionism among undergraduate engineering students. Secondly, currently, there is no currently existing scale capable of measuring the dimensionality of perfectionism categorized as Adaptive and Maladaptive perfectionism. Given the high-demand nature of engineering courses, engineering students face unique pressures such as high academic standards [37], problem solving [33] and decision-making efficacy [24]. Moreover,

in terms of psychometric validation, although a study has examined perfectionism in STEM students [34], there remains a gap in verifying the validity and reliability of existing scales specifically for undergraduate engineering students. From a mental health perspective, current scales do not fully capture the link between Adaptive and Maladaptive perfectionism among engineering students. The absence of such assessments can hinder the well-being of engineering students. Consequently, creating or modifying perfectionism scales to address the unique experiences and challenges faced by engineering students is essential.

7 Summary, conclusion, and implications: Bridging the Gap in Perfectionism Measurement for Engineering Education

In summary, perfectionism represents a psychological concept characterized by the setting and striving for high personal performance benchmarks coupled with rigorous self-assessment [38]. Moreover, perfectionism can be classified under unidimensional or multidimensional characteristics, with the latter providing a more thorough insight. Furthermore, perfectionism may either be adaptive or maladaptive, impacting both motivation and psychological well-being in diverse manners. An additional significant differentiation lies between global and domain-specific perfectionism, which assesses whether perfectionist tendencies are pervasive or confined to particular life domains. In this paper, several existing perfectionism scales, such as FMPS and MPS, were synthesized and evaluated. From a theoretical viewpoint on perfectionism discussed in this paper, these scales have contributed valuable insights; however, they do not fully differentiate between adaptive and maladaptive aspects and may not capture domain-specific nuances, highlighting the need for a more refined assessment tool in engineering majors.

To conclude, it is important to acknowledge that engineering disciplines are known for their demanding nature, leading engineering students to experience higher levels of anxiety and stress due to perfectionistic traits compared to peers in other fields [39]. Recognizing the importance of consistent academic performance alongside good mental health is crucial. Although existing scales measure perfectionistic tendencies, there is no tool specifically designed for engineering students to distinguish between Adaptive and Maladaptive perfectionism. This study lays the foundation for a dissertation aimed at creating an engineering-focused scale that incorporates both adaptive and maladaptive dimensions, catering to the unique academic and mental health needs of engineering students.The implications of this scale include identifying students' adaptive and maladaptive perfectionistic tendencies and supporting their mental health through advisor guidance and academic counseling. Additionally, it could inform interventions, such as perfectionism diaries [40], to assist students struggling with maladaptive perfectionism. The long-term goal is to increase awareness of adaptive and maladaptive perfectionism, which could help reduce the risk of mental health crises, including suicide, among engineering students.

References

[1] A. Adler, *Social Interest: A Challenge to Mankind*. London: Faber and Faber Ltd., 1938, originally published in German as Der Sinn des Lebens (1933). Reprinted in 1964 by Capricorn Books, New York.

[2] T. J. Sweeney and T. J. Sweeney, *Adlerian counseling and psychotherapy: a practitioner's approach*, 5th ed. New York: Routledge, 2009, oCLC: ocn229019541.

[3] K. Horney, *Neurosis and Human Growth: The struggle toward self-realization*. New York: W. W. Norton, 1950.

[4] A. Mahasneh, A. Alwan, and T. Alrawwad, "The Level of Multidimensional Perfectionism and Motivational Orientation among Undergraduate Students," *Psychology in Russia: State of the Art*, vol. 12, pp. 94–114, Jun. 2019.

[5] American Psychological Association (APA), "Perfectionism." [Online]. Available: https://dictionary.apa.org/perfectionism

[6] G. L. Flett and P. L. Hewitt, "Perfectionism and maladjustment: An overview of theoretical, definitional, and treatment issues." in *Perfectionism: Theory, research, and treatment.*, 2004.

[7] P. L. Hewitt and G. L. Flett, "Perfectionism in the Self and Social Contexts: Conceptualization, Assessment, and Association With Psychopathology," *Journal of Personality and Social Psychology*, 1991.

[8] M. W. Enns and B. J. Cox, "The nature and assessment of perfectionism: A critical analysis." in *Perfectionism: Theory, research, and treatment.*, G. Flett and P. L. Hewitt, Eds. Washington: American Psychological Association, 2002, pp. 33–62.

[9] M. Moroz and D. M. Dunkley, "Self-critical perfectionism, experiential avoidance, and depressive and anxious symptoms over two years: A three-wave longitudinal study," *Behaviour Research and Therapy*, 2019.

[10] L. A. Terry-Short, R. G. Owens, P. D. Slade, and M. E. Dewey, "Positive and negative perfectionism," *Personality and Individual Differences*, vol. 18, no. 5, pp. 663–668, May 1995. [Online]. Available: https://www.sciencedirect.com/science/article/pii/019188699400192U

[11] M. W. Enns, B. J. Cox, J. Sareen, and P. Freeman, "Adaptive and maladaptive perfectionism in medical students: a longitudinal investigation," *Medical Education*, vol. 35, no. 11, pp. 1034–1042, 2001, _eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.1365-2923.2001.01044.x. [Online]. Available: https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1365-2923.2001.01044.x

[12] M. Gattoni, "Assessing Sport Perfectionism: The Development and Validation of the Sport Adaptive and Maladaptive Perfectionism Scale," Psy.D., University of La Verne, United States – California, 2018, iSBN: 9780438418646. [Online]. Available: https://www.proquest.com/docview/2116960859/abstract/2AC7FFF78BF0411APQ/1

[13] D. D. Burns, "The Perfectionist's Script For Self-Defeat," *Psychology Today*, 1980.

[14] R. O. Frost, P. Marten, C. Lahart, and R. Rosenblate, "The dimensions of perfectionism," *Cognitive Therapy and Research*, 1990.

[15] P. L. Hewitt and G. L. Flett, "The Multidimensional Perfectionism Scale: Reliability, Validity, and Psychometric Properties in Psychiatric Samples," 1991.

[16] B. J. Cox, M. W. Enns, and I. P. Clara, "The multidimensional structure of perfectionism in clinically distressed and college student samples," *Psychological Assessment*, vol. 14, no. 3, pp. 365–373, Sep. 2002, publisher: American Psychological Association. [Online]. Available: http://https://search.ebscohost.com/login.aspx?direct=truedb=pdhAN=2002-17916-014

[17] A. P. Hill, S. H. Mallinson-Howard, and G. E. Jowett, "Multidimensional perfectionism in sport: A meta-analytical review." *Sport, Exercise, and Performance Psychology*, vol. 7, no. 3, pp. 235–270, Aug. 2018. [Online]. Available: https://doi.apa.org/doi/10.1037/spy0000125

[18] M. M. Smith and D. H. Saklofske, "The Structure of Multidimensional Perfectionism: Support for a Bifactor Model With a Dominant General Factor," *Journal of Personality Assessment*, vol. 99, no. 3, pp. 297–303, May 2017, publisher: Routledge _eprint: https://doi.org/10.1080/00223891.2016.1208209. [Online]. Available: https://doi.org/10.1080/00223891.2016.1208209

[19] D. E. Hamachek, "Psychodynamics of normal and neurotic perfectionism," *Psychology: A Journal of Human Behavior*, vol. 15, no. 1, pp. 27–33, 1978, place: US Publisher: Inst for Leadership and Organization Effectiveness.

[20] E. Hamblin, "Stress in College Students: Associations with Anxiety and Perfectionism," Ph.D. dissertation, Sally McDonnell Barksdale Honors College, 2018.

[21] D. Per Villiers, "Perfectionism And Social Anxiety Among College Students (Doctoral dissertation, Northeastern University)." Ph.D. dissertation, Northeastern University, 2009.

[22] M. E. Cowie, L. J. Nealis, S. B. Sherry, P. L. Hewitt, and G. L. Flett, "Perfectionism and academic difficulties in graduate students: Testing incremental prediction and gender moderation," *Personality and Individual Differences*, vol. 123, pp. 223–228, Mar. 2018. [Online]. Available: https://linkinghub.elsevier.com/retrieve/pii/S0191886917306840

[23] N. Al Kakoun, "Priming and Mining the Civil Engineering Mindset: How Personal Values and Perfectionism Shape Societal Engagement and Consideration in Design," PhD, Swansea University, Swansea, 2023. [Online]. Available: https://cronfa.swan.ac.uk/Record/cronfa64671/

[24] N. Al Kakoun, F. Boy, and P. Xavier, "Don't let perfect be the enemy of good: how perfectionism influences human-centred designing engagement and communal design production in civil engineering," *Research in Engineering Design*, vol. 35, no. 2, pp. 171–189, Apr. 2024. [Online]. Available: https://link.springer.com/10.1007/s00163-023-00428-0

[25] J. K. Gotwals and J. G. H. Dunn, "A Multi-Method Multi-Analytic Approach to Establishing Internal Construct Validity Evidence: The Sport Multidimensional Perfectionism Scale 2," *Measurement in Physical Education and Exercise Science*, vol. 13, no. 2, pp. 71–92, Apr. 2009, publisher: Routledge _eprint: https://doi.org/10.1080/10913670902812663. [Online]. Available: https://doi.org/10.1080/10913670902812663

[26] S. J. Bork and J. L. Mondisa, "Engineering graduate students' mental health: A scoping literature review," *Journal of Engineering Education*, Jul. 2022, publisher: John Wiley and Sons Inc.

[27] P. L. Hewitt and D. G. Dyck, "Perfectionism, stress, and vulnerability to depression," *Cognitive Therapy and Research*, vol. 10, no. 1, pp. 137–142, 1986, place: Germany Publisher: Springer.

[28] R. B. Slaney, K. G. Rice, M. Mobley, J. Trippi, and J. S. Ashby, "The Revised Almost Perfect Scale," *Measurement and Evaluation in Counseling and Development*, vol. 34, no. 3, pp. 130–145, Oct. 2001. [Online]. Available: https://www.tandfonline.com/doi/full/10.1080/07481756.2002.12069030

[29] D. P. Johnson and R. B. Slaney, "Perfectionism: Scale development and a study of perfectionistic clients in counseling," *Journal of College Student Development*, vol. 37, no. 1, pp. 29–41, 1996, place: US Publisher: ACPA Executive Office.

[30] K. G. Rice and C. M. E. Richardson, "Classification challenges in perfectionism." *Journal of Counseling Psychology*, vol. 61, no. 4, pp. 641–648, Oct. 2014. [Online]. Available: http://doi.apa.org/getdoi.cfm?doi=10.1037/cou0000040

[31] K. G. Rice, C. M. E. Richardson, and S. Tueller, "The Short Form of the Revised Almost Perfect Scale," *Journal of Personality Assessment*, vol. 96, no. 3, pp. 368–379, May 2014. [Online]. Available: http://www.tandfonline.com/doi/abs/10.1080/00223891.2013.838172

[32] D. Harari, L. B. Steed, B. W. Swider, and A. P. Breidenthal, "Is Perfect Good? A Meta-Analysis of Perfectionism in the Workplace," 2018.

[33] N. A. Mamaril, E. L. Usher, C. R. Li, D. R. Economy, and M. S. Kennedy, "Measuring Undergraduate Students' Engineering Self-Efficacy: A Validation Study," *Journal of Engineering Education*, vol. 105, no. 2, pp. 366–395, 2016, _eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/jee.20121. [Online]. Available: https://onlinelibrary.wiley.com/doi/abs/10.1002/jee.20121

[34] K. G. Rice, F. G. Lopez, and C. M. Richardson, "Perfectionism and performance among STEM students," *Journal of Vocational Behavior*, vol. 82, no. 2, pp. 124–134, 2013. [Online]. Available: https://linkinghub.elsevier.com/retrieve/pii/S0001879112001571

[35] E. Jonietz, L, "Malleable mental health factors in undergraduate engineering students," dissertation, University of Texas at Austin, 2022.

[36] K. G. Rice and K. J. Preusser, "The Adaptive/Maladaptive Perfectionism Scale," 2002, iSSN: 0748-1756.

[37] P. T. Louis and N. Kumar, "Does birth order and academic proficiency influence perfectionistic self-presentation among undergraduate engineering students? A descriptive analysis," *Indian Journal of Psychological Medicine*, vol. 38, no. 5, pp. 424–430, 2016.

[38] Y. Xie, Y. Kong, J. Yang, and F. Chen, "Perfectionism, worry, rumination, and distress: A meta-analysis of the evidence for the perfectionism cognition theory," *Personality and Individual Differences*, vol. 139, pp. 301–312, Mar. 2019. [Online]. Available: https://linkinghub.elsevier.com/retrieve/pii/S019188691830624X

[39] K. G. Rice, M. E. Ray, D. E. Davis, C. DeBlaere, and J. S. Ashby, "Perfectionism and longitudinal patterns of stress for STEM majors: Implications for academic performance," *Journal of Counseling Psychology*, vol. 62, no. 4, pp. 718–731, 2015.

[40] A. Martin and R. P. Swinson, *When perfect isn't good enough; strategies for coping with perfectionism*. Oakland, CA: New Harbinger Publications, 2009.

8 Appendix

8.1 Burns Perfectionism Scale

Number	Scale Item
1	If I don't set the highest standards for myself, I am likely to end up a second-rate person.
2	People will probably think less of me if I make a mistake.
3	If I cannot do something really well, there is little point in doing it at all.
4	I should be upset if I make a mistake.
5	If I try hard enough, I should be able to excel at anything I attempt.
6	It is shameful for me to display weaknesses or foolish behavior.
7	I shouldn't have to repeat the same mistake many times.
8	An average performance is bound to be unsatisfying to me.
9	Failing at something important means I'm less of a person.
10	If I scold myself for failing to live up to my expectations, it will help me to do better in the future.

Scoring and Interpretation:
Items are measured on a 5-point Likert scale that ranges from "I agree very much (+2)" to "I disagree very much (-2)". Scores are calculated by summation. A score of +20 denotes extreme perfectionism, while -20 indicates strong non-perfectionistic tendencies.

8.2 The Short Form of the Revised Almost Perfect Scale (SAPS)

Number	Scale Item
1	I have high expectations for myself.
2	Doing my best never seems to be enough.
3	I set very high standards for myself.
4	I often feel disappointed after completing a task because I know I could have done better.
5	I have a strong need to strive for excellence.
6	My performance rarely measures up to my standards.
7	I expect the best from myself.
8	I am hardly ever satisfied with my performance.

Scoring and Interpretation:
Items are rated on a 7-point Likert scale, with 1 as strong disagreement and 7 as strong agreement. Scores for each Standards and Discrepancy subscale are totaled, where higher scores indicate a stronger inclination towards that perfectionism type.

8.3 Frost Multidimensional Perfectionism Scale (FMPS)

Number	Scale Item
1	My parents set very high standards for me.
2	Organization is very important to me.
3	As a child, I was punished for doing things less than perfectly.
4	If I do not set the highest standards for myself, I am likely to end up a second-rate person.
5	My parents never tried to understand my mistakes.
6	It is important to me that I be thoroughly competent in what I do.
7	I am a neat person.
8	I try to be an organized person.
9	If I fail at work/school, I am a failure as a person.
10	I should be upset if I make a mistake.
11	My parents wanted me to be the best at everything.
12	I set higher goals than most people.
13	If someone does a task at work/school better than I do, then I feel as if I failed the whole task.
14	If I fail partly, it is as bad as being a complete failure.
15	Only outstanding performance is good enough in my family.
16	I am very good at focusing my efforts on attaining a goal.
17	Even when I do something very carefully, I often feel that it is not quite right.
18	I hate being less than the best at things.
19	I have extremely high goals.
20	My parents expect excellence from me.
21	People will probably think less of me if I make a mistake.
22	I never feel that I can meet my parents' expectations.
23	If I do not do as well as other people, it means I am an inferior being.
24	Other people seem to accept lower standards from themselves than I do.
25	If I do not do well all the time, people will not respect me.
26	My parents have always had higher expectations for my future than I have.
27	I try to be a neat person.
28	I usually have doubts about the simple everyday things that I do.
29	Neatness is very important to me.
30	I expect higher performance in my daily tasks than most people.
31	I am an organized person.
32	I tend to get behind in my work because I repeat things over and over.
33	It takes me a long time to do something "right".
34	The fewer mistakes I make, the more people will like me.
35	I never feel that I can meet my parents' standards.

Scoring and Interpretation:
Items are measured on a 5-point Likert scale that ranges from "Strongly agree" to "Strongly disagree". Scores are determined by addition, with higher values reflecting greater perfectionistic

tendencies.

8.4 Hewitt & Flett Multidimensional Perfectionism Scale (MPS)

Number	Scale Item
1	When I am working on something, I cannot relax until it is perfect.
2	I am not likely to criticize someone for giving up too easily.
3	It is not important that the people I am close to are successful.
4	I seldom criticize my friends for accepting second best.
5	I find it difficult to meet others' expectations of me.
6	One of my goals is to be perfect in everything I do.
7	Everything that others do must be of top-notch quality.
8	I never aim for perfection in my work.
9	Those around me readily accept that I can make mistakes too.
10	It doesn't matter when someone close to me does not do their absolute best.
11	The better I do, the better I am expected to do.
12	I seldom feel the need to be perfect.
13	Anything I do that is less than excellent will be seen as poor work by those around me.
14	I strive to be as perfect as I can be.
15	It is very important that I am perfect in everything I attempt.
16	I have high expectations for the people who are important to me.
17	I strive to be the best at everything I do.
18	The people around me expect me to succeed at everything I do.
19	I do not have very high expectations for those around me.
20	I demand nothing less than perfection from myself.
21	Others will like me even if I don't excel at everything.
22	I can't be bothered with people who won't strive to better themselves.
23	It makes me uneasy to see an error in my work.
24	I do not expect a lot from my friends.
25	Success means that I work even harder to please others.
26	If I ask someone to do something, I expect it to be done flawlessly.
27	I cannot stand to see people close to me make mistakes.
28	I am perfectionistic in setting my goals.
29	The people who matter to me should never let me down.
30	Others think I am okay, even when I do not succeed.
31	I feel that people are too demanding of me.
32	I must work to my full potential at all times.
33	Although they may not show it, other people get very upset with me when I slip up.
34	I do not have to be the best at whatever I am doing.
35	My family expects me to be perfect.
36	I do not have very high goals for myself.
37	My parents rarely expected me to excel in all aspects of my life.
38	I respect people who are average.

Number	Scale Item
39	I often compare myself to others.
40	I struggle to accept mistakes in my work.
41	I feel disappointed if I am not the best.
42	Others' expectations drive me to succeed.
43	I find it hard to relax when something isn't perfect.
44	Mistakes make me question my abilities.
45	I often revisit tasks to ensure they're flawless.

Scoring and Interpretation:
The Multidimensional Perfectionism Scale (MPS) is a 45-item assessment that includes three subscales of self-oriented perfectionism, other-oriented perfectionism, and socially prescribed perfectionism. Scores are obtained by summation, with higher scores indicating a greater inclination towards the respective perfectionism subscale.