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**INDIANAPOLIS**

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*College of Health Sciences*

AN ANALYSIS OF THE RELATIONSHIP BETWEEN PERFECTIONISM, STRESS  
PERCEPTION, AND STRESS MANAGEMENT AMONG DOCTOR OF PHYSICAL  
THERAPY STUDENTS

Submitted to the Faculty of the  
College of Health Sciences  
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In partial fulfillment of the requirements for the degree  
Doctor of Health Science  
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An Analysis of the Relationship Between Perfectionism, Stress Perception, and Stress  
Management among Doctor of Physical Therapy Students

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## Abstract

Perfectionism consists of high standards and hyper-critical self-evaluation. Doctor of Physical Therapy (DPT) students are required to meet highly competitive admissions processes and rigorous academic expectations. Unsurprisingly, DPT students experience increased stress levels during their academic tenure. There is a limited understanding of how successful these students are at managing the increased stress, especially among perfectionists. In this non-experimental, cross-sectional study, participants completed perfectionism, stress perception, and stress management validated measures. Results demonstrated that this sample was composed of 41.10% *Adaptive Perfectionists* and 25.15% *Maladaptive Perfectionists*. There was a moderate, direct association of perceived stress and the perfectionism discrepancy measure ( $r_s = .51, p < .01$ ). The perceived stress and perfectionism subtype logistic regression model was statistically-significant,  $\chi^2(1) = 18.73, p < .01$ . Additionally, there was a weak, indirect association between stress management and the perfectionism discrepancy measure ( $r_s = -.38, p < .01$ ). The stress management and perfectionism subtype logistic regression model was statistically-significant,  $\chi^2(1) = 14.40, p < .01$ . DPT students who are *Maladaptive Perfectionists* may be at greater risk for stress-related concerns. Baseline measures of perfectionism, stress perception, and stress management may inform curricular decisions regarding placement and sequencing of stress management interventions. Additionally, these measures may assist educators with identifying at-risk students and monitoring student response to stress management interventions. DPT students who are able to effectively manage stress may ultimately have greater well-being and lower rates of burnout.

*Keywords:* perfectionism, perceived stress, stress management, physical therapy student

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## Table of Contents

Abstract.....	2
Acknowledgements .....	3
Chapter 1: Introduction.....	10
Problem Statement.....	12
Purpose of the Study.....	12
Research Questions .....	12
Significance of the Study.....	13
Definition of Terms .....	14
Chapter 2: Literature Review .....	15
Physical Therapy Education .....	19
Perfectionism.....	20
Frameworks .....	21
Adaptive and Maladaptive Perfectionism .....	22
Self-Oriented, Other-Oriented, and Socially-Prescribed Perfectionism.....	23
Perfectionistic Strivings and Concerns.....	23
Framework summary .....	24
Outcome measures.....	25
Multidimensional perfectionism approaches.....	26
Bidimensional perfectionism approaches.....	28
Outcome measure summary .....	29

Theories and models.....	30
Perfectionism Acceptance Theory.....	30
Perfectionism Diathesis-Stress Model.....	30
Perfectionism and higher education .....	31
Perfectionism and health professions higher education .....	34
Stress.....	35
Perceived stress .....	35
Perceived stress and higher education.....	36
Perceived stress and health professions higher education.....	38
Perceived stress and medical students.....	39
Perceived stress and nursing students.....	41
Perceived stress and dental students.....	42
Perceived stress and physical therapy students .....	44
Perceived stress summary.....	46
Stress management .....	47
Stress management and higher education.....	48
Stress management and health professions higher education.....	49
Stress management and medical students.....	50
Stress management and nursing students .....	52
Stress management and dental students .....	53
Stress management and physical therapy students .....	54
Stress management summary .....	55
Summary.....	56

Chapter 3: Method.....	58
Study Design .....	58
Participants .....	59
Data.....	59
Operationalization of variables.....	59
Instruments .....	60
Almost Perfect Scale-Revised .....	61
Emotional Quotient Inventory 2.0 .....	62
Perceived Stress Scale .....	64
Procedures .....	64
Recruitment .....	65
Informed consent .....	65
Testing procedures.....	65
Data Management.....	66
Data Analysis.....	67
Chapter 4: Results.....	72
General Participant Characteristics .....	73
Gender description.....	73
Race/Ethnicity/Origin description .....	74
Participant Outcome Measures .....	75
Perfectionist type .....	75

Almost Perfect Scale Revised High Standards.....	75
Almost Perfect Scale Revised Discrepancy .....	76
Perceived Stress Scale .....	77
Emotional Quotient Inventory-Stress Management composite score .....	77
Effects of Student Characteristic on Perfectionism.....	78
Almost Perfect Scale Revised High Standards subscale score.....	78
Almost Perfect Scale Revised Discrepancy subscale score.....	80
Association in Perfectionism with Perceived Stress .....	81
Association in Perfectionism with Stress Management .....	82
Results for Binomial Logistic Regression Analysis .....	83
Ability of student characteristic to predict perfectionism subtype .....	83
Ability of perceived stress score to predict perfectionism subtype .....	84
Ability of stress management composite score to predict perfectionism subtype.....	84
Chapter 5: Discussion and Conclusion.....	85
Perfectionism.....	86
Perfectionism and student characteristics.....	87
Perceived Stress.....	88
Perceived stress and program year .....	88
Perceived stress and perfectionism.....	90
Stress Management.....	90
Stress management and perfectionism .....	91

Limitations.....	91
Implications for DPT Education and Future Research.....	92
Conclusion.....	94
References .....	95
Appendices .....	138
Appendix A: Conceptualization of Perfectionist Type Using the Almost Perfect Scale- Revised Subscales .....	138
Appendix B: Permission of Use for Almost Perfect Scale-Revised (APSR).....	139
Appendix C: Permission of Use for Perceived Stress Scale (PSS-10).....	140
Appendix D: Online Survey Consent Form .....	141

## List of Tables

Table 1: Perfectionism Frameworks, Dimensions, Terms, Types, and Tools.....	127
Table 2: Demographics by Gender and Year in Program .....	128
Table 3: Demographics by Race, Ethnicity, and Origin and Year in Program .....	129
Table 4: Perfectionism Classification by Year in Program .....	130
Table 5: Almost Perfect Scale-Revised Outcome Measure by Year in Program and Gender ....	131
Table 6: Perceived Stress Outcome Measure by Year in Program and Gender .....	133
Table 7: Emotional Quotient Intelligence 2.0 Stress Management Composite by Year in Program and Gender.....	134
Table 8: Logistic Regression Predicting Likelihood of Maladaptive Perfectionism based on Student Characteristic.....	135
Table 9: Logistic Regression Predicting Likelihood of Maladaptive Perfectionism based on Perceived Stress.....	136
Table 10: Logistic Regression Predicting Likelihood of Maladaptive Perfectionism based on Emotional Quotient Inventory 2.0 - Stress Management Composite.....	137

Analysis of the Relationship Between Perfectionism, Stress Perception, and Stress  
Management among Doctor of Physical Therapy Students

Graduate students matriculating in health professions programs experience elevated stress levels due to increased academic workload and performance expectations (Alzayyat & Al-Gamal, 2014; Dyrbye et al., 2006; Elani et al., 2014; Gibbons, Dempster, & Moutray, 2011; Hodselmans et al., 2018; Ruiz-Aranda, Extremera, & Pineda-Galán, 2014). There is a limited understanding of how successful these students are at coping with the increased stress burdens in general, and in particular, for those students who are *Perfectionists*.

This is concerning since ineffective stress management may exacerbate depressive symptoms (Pauley & Hesse, 2009) and poor health behaviors, including problematic alcohol consumption and insufficient sleep (Amaral et al., 2018; Park & Iacocca, 2014). These symptoms and behaviors may ultimately adversely impact academic performance (Palmer et al., 2013; van der Heijden et al., 2018). Therefore, it is important to study the relationship between perfectionism and stress among Doctor of Physical Therapy (DPT) students.

Perfectionism can be defined as a multifaceted personality characteristic comprised of extremely high internal expectations coupled with hyper-critical self-evaluations (Flett & Hewitt, 2002; Frost, Marten, Lahart, & Rosenblate, 1990; Stoeber, 2017c; Stoeber & Otto, 2006). Some groups have sub-divided perfectionism into Self-Oriented, Other-Oriented, and Socially-Prescribed Perfectionism (Hewitt & Flett, 1991; Stoeber & Childs, 2010). Others have viewed it in terms of being *Adaptive* or *Maladaptive* (M. Enns, Cox, Sareen, & Freeman, 2001; Rice & Slaney, 2002; Verner-Filion & Vallerand, 2016; Wagner & Causey-Upton, 2017). However, perfectionism also can be thought of bidimensionally as perfectionistic strivings and perfectionistic concerns (Stoeber & Gaudreau, 2017; Stoeber & Otto, 2006). Depending on the

interplay of these two dimensions, perfectionism may result in beneficial, benign, or unhealthy outcomes (Stoeber & Otto, 2006).

As previously mentioned, stress can negatively impact academic performance. Clarifying the relationship between stress and perfectionism may allow educators to craft curricula in a way that allows for better stress management, and in turn, improve student outcomes. The goal of this research was to analyze the adaptive and maladaptive factors of perfectionism that correlate with stress management. Investigating this connection is important because of the deleterious impact of stress on academic performance (Palmer et al., 2013; van der Heijden et al., 2018) and overall health (Dimsdale, 2008; Nabi et al., 2013; Schneiderman, Ironson, & Siegel, 2008). Over 20 years ago, Hewitt and Flett (1993) found that the combination of perfectionism and stress was predictive of depression. In a recent longitudinal study, Békés and colleagues (2015) assessed the moderating effect of perfectionism on the relationship between stress and depression. Among undergraduate students, *Maladaptive Perfectionists* reported higher stress indicators (Ashby, Noble, & Gnilka, 2012) and a stronger association between perceived stress and drinking as a coping mechanism (Rice & Van Arsdale, 2010) compared to *Adaptive Perfectionists*. Ashby and Gnilka (2017) again examined stress management strategies and found that different types of strategies could mediate the perceived stress in both *Adaptive* and *Maladaptive Perfectionists*.

Stress is one of the most common reasons to access counseling services by undergraduate students (Center for Collegiate Mental Health, 2017). Researchers reported higher rates of stress among health care professional students (Dutta, Pyles, & Meiderhoff, 2005), including medical students (Mosley et al., 1994), dental students (Alzahem, Van Der Molen, Alaujan, Schmidt, & Zamakhshary, 2011; Elani et al., 2014), nursing students (Alzayyat & Al-Gamal, 2014), graduate psychology students (El-Ghoroury, Galper, Sawaqdeh, & Bufka, 2012), occupational therapy students (Pfeifer, Kranz, & Scoggin, 2008), and physical therapy students (Frank & Cassady,

2005; Frazer & Echtermach, 1991; Hodselmans et al., 2018; Jacob et al., 2012; O'Meara, Kostas, Markland, & Previty, 1994). This is concerning because stress potentially has been associated with poorer coping mechanisms such as unhealthy eating, smoking, and drinking (Park & Iacocca, 2014). Additionally, perceived stress was associated with stress management strategies. Among health professions students, perceived stress was directly associated with maladaptive strategies and indirectly with adaptive strategies (A. Enns, Eldridge, Montgomery, & Gonzalez, 2018; Ruiz-Aranda, Extremera, & Pineda-Galán, 2014). When considered in its entirety, health professions students are particularly at risk for the negative impact of stress, which may increase their vulnerability to poorer academic performance and decreased overall health.

### **Problem Statement**

Researchers have explored perfectionism in a variety of other health professions' higher education programs (Comerchero & Fortugno, 2013; M. Enns et al., 2001; Henning, Ey, & Shaw, 1998; Wagner & Causey-Upton, 2017). This topic has yet to be explored among physical therapy students. Given the hyper-competitive admissions process and the rigor of DPT curriculum, it is anticipated that similar rates of perfectionism will be found among these students.

### **Purpose of the Study**

The purpose of this study was to examine perfectionism among entry-level DPT students and assess its relationship to perceived stress and stress management.

### **Research Questions**

The research questions addressed in this study were:

1. Was there a statistically significant difference in perfectionism level as measured on the subscale of High Standards score from the Almost Perfect Scale Revised

- (APSR) by student characteristic (year in program, gender description, and race/ethnicity/origin description) among DPT students at a public university in Texas?
- a. Was student characteristic predictive of perfectionism subtype (*Adaptive* or *Maladaptive*) among DPT students at a public university in Texas?
2. Were there statistically significant associations between perfectionism level as measured on the subscale of High Standards score from the APSR and perceived stress as measured by the 10 question, Perceived Stress Scale (PSS-10) among students enrolled in a DPT program at a public university in Texas?
    - a. Was perceived stress predictive of perfectionism subtype among DPT students at a public university in Texas?
  3. Were there statistically significant associations between perfectionism level as measured on the subscale of High Standards score from the APSR and stress management as measured by the Stress Management Composite score from the Emotional Quotient Inventory 2.0 (EQi) among students enrolled in a DPT program at a public university in Texas?
    - a. Was stress management predictive of perfectionism subtype among DPT students at a public university in Texas?

### **Significance of the Study**

A better understanding of perfectionism and its association with stress perception and management in this population may assist educators with identifying at-risk students more efficiently. This may also improve stress management through innovative curricular design (e.g., mindfulness, self-care and resiliency techniques; Kreitzer & Klatt, 2017). This may produce improved academic performance since perceived stress negatively impacts academic

performance (Palmer et al., 2013; van der Heijden et al., 2018). Furthermore, a better understanding may help minimize maladaptive coping strategies since perceived stress is directly associated with problematic alcohol consumption in *Maladaptive Perfectionists* (Rice & Van Arsdale, 2010). Additionally, this may directly address the burnout issues among health care providers by increasing the resiliency of new graduates in managing stress (Bodenheimer & Sinsky, 2014; Bowles, Adams, Batcheller, Zimmermann, & Pappas, 2018; Morrow, Call, Marcus, & Locke, 2018).

### **Definition of Terms**

The key terms used throughout this proposal were defined as follows:

- **Perfectionism:** Multifaceted personality characteristic that includes striving for flawlessness with an emphasis on excessively high standards as well as an element of hypercritical self-assessment (Flett & Hewitt, 2002; Stoeber, 2017c; Stoeber & Otto, 2006);
- ***Adaptive Perfectionism:*** A healthy and high functioning response to very high standards. Determined by scoring high on the APSR High Standards subscale (APSR-HS), but low on the APSR Discrepancy subscale (APSR-D; Rice & Ashby, 2007; Rice & Richardson, 2014). Appendix A conceptually describes this process;
- ***Maladaptive Perfectionism:*** Excessive, unhealthy response to self-imposed, excessively high standards. Determined by scoring high on the APSR-HS as well as the APSR-D (Rice & Ashby, 2007; Rice & Richardson, 2014). Appendix A conceptually describes this process;
- **Stress perception:** The relationship between appraised demands of a situation and the belief in one's capacity to cope with those demands. When the appraised

demands are viewed as being greater than capacity, then the situation may be viewed as a threat (Butler, 1993; Lazarus & Folkman, 1984; Phillips, 2013);

- Stress management: Strategies and other interventions aimed to enhance one's coping ability in order to decrease levels of distress (Esch & Stefano, 2010).

### **Literature Review**

Perfectionism can be defined as extremely high internal expectations coupled with hypercritical self-evaluations (Frost et al., 1990) or striving for flawlessness with unreasonably high standards (Flett & Hewitt, 2002; Stoeber & Otto, 2006). Many researchers consider perfectionism as comprised of different personality traits (Frost et al., 1990; Hewitt & Flett, 1991; Slaney, Rice, Mobley, Trippi, & Ashby, 2001; Stairs, G. Smith, Zapolski, Combs, & Settles, 2012). However, if traits are consistent patterns in behavior and thoughts are stable longitudinally and cross-situationally (Allport, 1966), and most *Perfectionists* are only *Perfectionists* in some, but not all domains, (Stoeber & Stoeber, 2009), then perfectionism may be better described as a personality disposition instead of a personality trait (Stoeber, 2017b).

Currently, perfectionism is often articulated as multifaceted and multidimensional. However, there is not 100% consensus as to the most appropriate way to define and assess the different constructs of perfectionism. Although most researchers agree on the vast majority of perfectionism constructs, vigorous disagreement continues on a select few (Stoeber, 2017a). Lack of consistency in the use and definition of terminology presents an ongoing challenge in perfectionism research.

Hewitt and Flett (1991) approached perfectionism multidimensionally, proposing three dimensions: Self-Oriented Perfectionism, Other-Oriented Perfectionism, and Socially-Prescribed Perfectionism. Frost et al. (1990) also viewed perfectionism multidimensionally, but as six dimensions, including High Personal Standards, Concerns Over Mistakes, Parental Expectations,

Parental Criticism, Doubts About Actions, and Organization. Conceptually, there is considerable overlap among these two most prominent perfectionism models (Frost, Heimberg, Holt, Mattia, & Neubauer, 1993). For example, High Personal Standards as characterized by Frost's model relates closely to the Self-Oriented Perfectionist dimension of Hewitt and Flett's model (Frost et al., 1993), and the Concerns Over Mistakes, Parental Expectations and Criticism dimensions of Frost's model are closely associated with Hewitt and Flett's Socially-Prescribed Perfectionist dimension (Frost et al., 1993).

Slaney et al. (2001) developed a similar multidimensional model consisting of three constructs: High Standards, Order, and Discrepancy. This model overlaps conceptually with the models proposed by Frost et al. (1990) and Hewitt and Flett (1991). For example, Slaney et al.'s (2001) Discrepancy dimension significantly associated with Hewitt and Flett's (1991) Socially-Prescribed Perfectionism, and with Frost et al.'s (1990) Concerns Over Mistakes and Doubts About Actions. Additionally, Slaney's (2001) High Standards dimension strongly associated with Hewitt and Flett's (1991) Self-Oriented Perfectionism and Frost et al.'s (1990) Personal Standards (Rice, Ashby, & Slaney, 2007). However, unlike previous models of perfectionism, Slaney and colleagues presented perfectionism as consisting of *Adaptive* or *Maladaptive* subtypes (Flett & Hewitt, 2015). In this model, an *Adaptive Perfectionist* has high standards but is able to tolerate mistakes; a *Maladaptive Perfectionist* has high standards accompanied by high levels of self-doubt, and in turn, low tolerance for mistakes (Rice, Ashby, & Slaney, 1998).

Three years after positing a multidimensional approach to perfectionism consisting of six dimensions, Frost et al., (1993) narrowed their approach to a bidimensional view of perfectionism consisting of Positive Achievement Strivings (also called Perfectionist Strivings) and Maladaptive Evaluative Concerns (also called Perfectionistic Concerns). The Positive Achievement Strivings construct in this new model included the original dimensions of Personal

Standards and Organization, and the Maladaptive Evaluative Concerns included the original dimensions of Concerns Over Mistakes, Doubts About Actions, Parental Expectations and Parental Concerns (Frost et al., 1993). Cox, Enns, and Clara (2002) found evidence that supported this bidimensional model. Subsequent research from the Frost team continued to measure most, if not all of the original dimensions, but reported results in the framework of their revised bidimensional model (DiBartolo, Li, & Frost, 2008; Kawamura & Frost, 2004; Kawamura, Hunt, Frost, & DiBartolo, 2001).

More recently, Stoeber and Otto (2006) also championed a bidimensional model similar to Frost et al. (1993). In this model, Perfectionistic Strivings would be analogous to High Personal Standards (Frost et al., 1990), Self-Oriented Perfectionist (Hewitt & Flett, 1991), Positive Achievement Strivings (Frost et al., 1993), and High Standards (Slaney et al., 2001). Perfectionism Concerns would be analogous to Concerns Over Mistakes (Frost et al., 1990), Socially-Prescribed Perfectionist (Hewitt & Flett, 1991), Maladaptive Evaluative Concerns (Frost et al., 1993), and Discrepancy (Slaney et al., 2001). Stoeber and Otto (2006) preferred this approach to studying perfectionism because the Perfectionistic Concerns dimension could potentially differentiate between the *Adaptive* and *Maladaptive Perfectionism* subtypes.

Despite a historical narrowing of theoretical models of perfectionism from multidimensional to bidimensional, there has been a recent resurgence in attempts to measure perfectionism in a complex, multidimensional way. Stairs et al. (2012) revisited and analyzed 15 perfectionism models, including the three previously mentioned models. They identified nine perfectionistic trait dimensions from the 15 models and then performed exploratory as well as confirmatory factor analyses. The resulting model consisted of nine dimensional constructs: High Standards, Order, Perfectionism Toward Others, Reactivity Towards Mistakes, Perceived Pressure From Others, Dissatisfaction, Details and Checking, Satisfaction, and Black and White

Thinking (Stairs et al., 2012). However, a search in ERIC, MEDLINE, PsychINFO, SPORTDiscus, and Web of Science produced only three published studies measuring perfectionism in this way (Forney, Schwendler, & Ward, 2019; Kim et al., 2016; Lapoint & Soysa, 2014). Therefore, it does not appear that other researchers have widely embraced this broadened, multidimensional concept.

Although there is overlap among the various theoretical approaches to perfectionism, both multidimensional and bidimensional, there is a striking lack of consensus on how best to define terms related to perfectionism. This inconsistency leads to difficulty evaluating the relative strengths and challenges of each model since they seem to measure different dimensions of perfectionism on face value, but inherently overlap in their underlying constructs.

In summary, the conceptualization and assessment of perfectionism continues to evolve. As previously mentioned, most perfectionists are not perfectionists across all contexts (Stoeber & Stoeber, 2009). For example, collegiate student-athletes indicated significantly different levels of perfectionism when asked to consider the contexts of athletics and academics (Dunn, Gotwals, & Dunn, 2005). Given the apparent context-dependent nature of perfectionism, some theoretical models may be problematic if their underlying constructs are conflated with contexts. An interesting, emerging trend in perfectionism research is the use of context-specific approaches, for example, those that assess perfectionism in romantic relationships (Matte & Lafontaine, 2012) or athletics (Gotwals & Dunn, 2009).

A multidimensional model consisting of nine constructs relating to perfectionism (Stairs et al., 2012) may be too broad to capture the potential context-dependent nature of perfectionism (Stoeber & Stoeber, 2009) in a health professions (e.g., medicine, nursing, dentistry, physical therapy) program setting. However, current, context-based approaches (Flett & Hewitt, 2015) may be too specific to capture perfectionism in a health professions program setting. Therefore, a

bidimensional model that accounts for interaction between the two dimensions may be the most appropriate (Gaudreau & Thompson, 2010; Rice & Ashby, 2007; Stoeber & Otto, 2006). Slaney et al.'s (2001) bidimensional model, for example, accounts for interaction between the High Standards and Discrepancy dimensions in order to consider an *Adaptive* and *Maladaptive* type of *Perfectionist* (Rice & Ashby, 2007). Appendix A conceptually describes this process. This well-known model has been validated and extensively used in studies of undergraduate students, specifically psychology students. Furthermore, researchers have explored perfectionism in a variety of other health professions programs (Comerchero & Fortugno, 2013; M. Enns et al., 2001; Henning et al., 1998; Wagner & Causey-Upton, 2017). However, there is a paucity of research involving the specific context of assessing *Adaptive* and *Maladaptive Perfectionism* types (Rice & Ashby, 2007) among health professions students specific to physical therapy education. Because of the hyper-competitive admissions process and the rigor of DPT programs, it is anticipated that similar rates of perfectionism will be found among these students.

### **Physical Therapy Education**

In response to a growing professional responsibility for patient management, physical therapy education has evolved into the DPT degree (Plack & Wong, 2002). This increasing responsibility of the physical therapist is associated with increased rigor post-graduation as well as the increased competitiveness of the admission process into DPT schools. For admission cycle 2017-2018, over 18,000 students submitted more than 112,000 applications for 10,400 possible seats (Physical Therapist Centralized Application Service [PTCAS], 2019). The mean GPA for successful applicants has increased from 3.45 to 3.57 over the past ten admissions cycles (2008-2018), with some programs approaching a perfect 4.0 standardized mean GPA (PTCAS, 2017). Inclusive of this same time period, a meta-analysis performed by Curran and Hill (2017) indicated an increase in perfectionism rates since 1989. As GPA trends higher towards a perfect

4.0 for successful DPT applicants, programs could begin to see an association with a level of perfectionism among physical therapy students.

### **Perfectionism**

Researchers have reported on perfectionism in the literature since the mid-twentieth century (R. Cole, 1946; Hollender, 1965). Prior to the 1990's, researchers examined perfectionism unidimensionally using the Burns Perfectionism Scale (Burns, 1980) or the perfectionism subscale from the Eating Disorder Inventory (Gardner, Olmstead, & Polivy, 1983). However, in the early 1990's and independent of one another, Frost et al. (1990) and Hewitt and Flett (1991) created two multidimensional perfectionism scales that are commonly used today (Stoeber, 2017a). As previously described, perfectionism has been viewed by some as a multidimensional construct (Hewitt & Flett, 1991), consisting of extremely high internal expectations coupled with hyper-critical self-evaluations (Frost et al., 1990).

The construct of perfectionism was initially viewed only as unhealthy and clinical in nature (Burns, 1980; Gardner et al., 1983; Hollender, 1965); more recently, researchers have conceptualized perfectionism as *Adaptive* or *Maladaptive* based on the interaction of the different perfectionistic constructs (Bieling, Israeli, & Antony, 2004; Rice & Ashby, 2007; Stairs et al., 2012; Stoeber & Otto, 2006). For example, two people could rate highly in the High Standards dimension from the model of Slaney et al. (2001). However, if one person also rates highly in the Discrepancy dimension, then this would be considered *Maladaptive* because the Discrepancy dimension indicates a perception of falling short of the high-performance expectations captured by the High Standards dimension. Rating low in the Discrepancy dimension along with rating highly in the High Standards dimension would indicate an *Adaptive* outcome because that person would not perceive themselves falling short of the high performance expectations (Rice & Ashby, 2007). Alternatively, other researchers view

perfectionism through the clinical, psychopathological lens and differentiate between striving for perfection and striving for excellence. Viewed through this lens, the *Adaptive* perfectionists are considered “striving for excellence” and not perfection. Therefore, by this definition, they are considered high-achievers rather than perfectionists (Flett & Hewitt, 2016; Gaudreau, 2019).

Although most research on perfectionism has been cross-sectional, perfectionism appeared to be relatively stable over time when viewed longitudinally. In research ranging from two months to two years, perfectionism demonstrated stability in adolescents (Damian, Stoeber, Negru-Subtirica, & Băban, 2017) and in undergraduate students (Azevedo et al., 2010; Moore et al., 2018; Rice & Dellwo, 2001).

**Frameworks.** Conceptually, a variety of different labels, sub-categories, and types have been used to further define the classification of perfectionism. Mentioned previously and demonstrated by the overlap among the multidimensional tools and conceptualization of perfectionism, there is a degree of similarities among these different frameworks. Because of the overlapping frameworks and diverse nomenclature research groups use to describe perfectionism, it can be confusing to compare the different approaches (Stoeber & Otto, 2006). However, in general terms, researchers tend to group *Adaptive Perfectionism*, Perfectionistic Strivings in the absence of Perfectionistic Concerns, and Self-Oriented Perfectionism in the absence of Socially-Prescribed Perfectionism. Additionally, and also in general terms, researchers tend to group *Maladaptive Perfectionism*, Perfectionistic Concerns, and Socially-Prescribed Perfectionism together (Stoeber & Otto, 2006). Refer to Table 1.

Other researchers have argued that the classification of perfectionism is difficult because of a potential contextual component (Rice & Richardson, 2014). Although perfectionism can impact any facet of life, for most perfectionists, their perfectionism is not cross-contextual (Stoeber & Stoeber, 2009). For example, perfectionism tends to be more prevalent in the

domains in which one most closely self-identifies such as occupation (Stoeber & Stoeber, 2009), academics (Dunn et al., 2005; McArdle, 2010; Stoeber & Stoeber, 2009), and athletics (Dunn et al., 2005; McArdle, 2010). Therefore, perfectionism seems more domain-specific rather than a personality trait that influenced all of life's domains.

***Adaptive and Maladaptive Perfectionism.*** *Adaptive Perfectionism* has been generally recognized as positive, healthy behaviors such as healthy eating and exercise habits as well as avoiding tobacco, illicit drugs, and problematic alcohol consumption. *Maladaptive Perfectionism* generally has been recognized as negative, unhealthy behaviors such as poor eating and exercise habits as well as tobacco, illicit drugs, and problematic alcohol consumption (Mackinnon, Ray, Firth, & O'Connor, 2019; Molnar, Sadava, Flett, & Colautti, 2012; Williams & Cropley, 2014). In this framework, each subtype of perfectionism—*Adaptive* or *Maladaptive*—is associated with certain manifestations. For example, *Maladaptive Perfectionists* tend to have higher rates of stress and anxiety when compared to those classified as *Adaptive Perfectionists* (Ashby & Gnilka, 2017; Békés et al., 2015; DiBartolo et al., 2008; Flett, Nepon, Hewitt, & Fitzgerald, 2016; Shafique, Gul, & Raseed, 2017; Zureck, Altstötter-Gleich, Wolf, & Brand, 2014). Building on the increased stress and anxiety in *Maladaptive Perfectionists*, when subjected to a short-term, stressful situation, *Maladaptive Perfectionists* had higher levels of both systolic and diastolic blood pressure compared to *Adaptive Perfectionists* (Albert, Rice, & Caffee, 2016). Additionally, among undergraduate students, *Maladaptive Perfectionism* appeared to directly associate with decreased motivation, and this decreased motivation with academic burnout when compared to *Adaptive Perfectionists* (E. Chang, Lee, Byeon, Seong, & Lee, 2016). Furthermore, *Maladaptive Perfectionists* experienced chronic insomnia more frequently than *Adaptive Perfectionists* (Vincent & Walker, 2000).

***Self-Oriented, Other-Oriented, and Socially-Prescribed Perfectionism.*** Flett, Hewitt, Blankstein, and O'Brien (1991) hypothesized three different constructs of perfectionism: Self-Oriented Perfectionist, self-imposed unrealistic expectations; Other-Oriented Perfectionist, imposing unrealistic expectations on others; and Socially-Prescribed Perfectionist, the perception of unrealistic expectations from others. Based on exploratory factor analysis, higher Self-Oriented Perfectionist with lower Socially-Prescribed Perfectionist aligned with *Adaptive Perfectionism*, whereas higher Self-Oriented Perfectionist with higher Socially-Prescribed Perfectionist aligned with *Maladaptive Perfectionism* (Frost et al., 1993; Verner-Filion & Gaudreau, 2010). Although Other-Oriented Perfectionist was part of this multidimensional model, it is not directed internally towards self like Self-Oriented Perfectionist and Socially-Prescribed Perfectionist, but rather externally towards others. Therefore, Other-Oriented Perfectionist is considered outside the context of *Adaptive* and *Maladaptive Perfectionism* (Stoeber, 2014).

***Perfectionistic Strivings and Concerns.*** An exploratory factor analysis (Frost et al., 1993) of the previously mentioned multidimensional frameworks from Hewitt and Flett (1991) consisting of three constructs and Frost et al. (1990) consisting of six constructs, produced a close association among Personal Standards and Organization from Frost's team and Self-Oriented Perfectionist as well as Other-Oriented Perfectionist from the Hewitt and Flett team. This was termed Perfectionistic Strivings (Frost et al., 1993). Additionally, the analysis (Frost et al., 1993) found a close association among Concern Over Mistakes, Doubts About Actions, as well as Parental Expectations and Concerns from Frost et al. (1990) with Socially-Prescribed Perfectionist from Hewitt and Flett (1991). This grouping was termed Perfectionistic Concerns (Frost et al., 1993). The concept of Perfectionistic Strivings, also called Personal Standards Perfectionism, is the self-direct pursuit of self-determined high standards, but often without high

self-criticism. The concept of Perfectionistic Concerns, also called Evaluative Concerns Perfectionism, is the drive to obtain unrealistically high standards based on the perception that these are valued by others resulting in harsh and excessive self-criticism that may lead to catastrophizing mistakes and doubting one's ability (Gaudreau, 2015; Stoeber & Otto, 2006). In this two-factor framework, Perfectionistic Strivings directly associated with positive affect and Perfectionistic Concerns directly associated with negative affect and depression (Frost et al., 1993). Additionally, Perfectionistic Strivings directly associated with positive school engagement (Damian et al., 2017). To place Perfectionistic Strivings and Perfectionistic Concerns in the context of *Adaptive* and *Maladaptive Perfectionism*, the interaction of Perfectionistic Strivings and Perfectionistic Concerns should be considered. An *Adaptive Perfectionist* would be high Perfectionistic Strivings and low Perfectionistic Concerns, whereas a *Maladaptive Perfectionist* would be high in both Perfectionistic Strivings and Perfectionistic Concerns (Gaudreau & Thompson, 2010; Stoeber & Otto, 2006).

For some researchers, the neutrality of the Perfectionistic Strivings and Concerns labels is viewed as beneficial because the terms may accommodate for the complex, context-dependent nature of perfectionism whereas the labels of *Adaptive* and *Maladaptive* may not since they could be interpreted as “good” or “healthy” and “bad” or “unhealthy” (Gaudreau, 2013; Stoeber, 2017a). However, the neutrality of Perfectionistic Strivings and Concerns also has limitations by not considering the interaction between these two dimensions and, therefore, not indicating the perfectionistic behavior as *Adaptive* or *Maladaptive* (Rice, Suh, & Davis, 2017).

**Framework summary.** Unfortunately, there is no perfect, universally agreed upon way to describe or measure perfectionism. As shown above, there is variance among the different terms describing perfectionists as well as perfectionism frameworks. There is also a significant overlap among some of the frameworks previously described. A unidimensional approach to measure

perfectionism, such as the Burns Perfectionism Scale (Burns, 1980), is insufficient to capture the complex, nuanced, and context-dependent nature of perfectionism (Flett & Hewitt, 2016). However, multidimensional approaches that try to capture up to nine dimensions (Stairs et al., 2012) may be measuring items beyond perfectionism constructs such as antecedents to perfectionism (Flett & Hewitt, 2015). Additionally, focusing on an internal, within-person approach may offer a clearer picture of perfectionism (Gaudreau, 2013). Finally, a multidimensional approach needs to account for interactions between the different constructs, such as seen with the APSR (Rice & Ashby, 2007). Current literature and perfectionism tool development is trending towards a bidimensional-interaction approach. The FMPS-Brief (Burgess, Frost, & DiBartolo, 2016) and Short Almost Perfect Scale (Rice, Richardson, & Tueller, 2014) are shorter versions of the FMPS and APSR, respectively. Validation of these tools is in the early stages, but they are not nearly as well validated as the FMPS and APSR.

Therefore, a within-person, bidimensional approach using a more established tool that takes into account the interaction between two dimensions (Rice & Ashby, 2007; Stoeber & Otto, 2006) may be the strongest approach. The two-factor frameworks presented above include Perfectionistic Strivings and Perfectionistic Concerns approach (Stoeber & Otto, 2006) and the *Adaptive* and *Maladaptive Perfectionistic* approach (Rice & Ashby, 2007). Because the nomenclature of Perfectionistic Strivings and Perfectionistic Concerns tends to be more abstract than *Adaptive* and *Maladaptive Perfectionistic* nomenclature, it was more effective to follow the *Adaptive* and *Maladaptive* framework. This was accomplished using interaction between the High Standards and Discrepancy subscales of the APSR (Rice & Ashby, 2007; Slaney et al., 2001).

**Outcome measures.** Although there are a variety of different bidimensional and multidimensional outcome measures available to assess perfectionism, the two oldest and most

common in the literature are the Frost Multidimensional Perfectionism Scale (FMPS; Frost et al., 1990) and the Hewitt-Flett Multidimensional Perfectionism Scale (HFMPMS; Hewitt & Flett, 1991). The APSR (Slaney et al., 2001) is also commonly found in the literature but not as frequently as the other two measures (Stoeber, 2017b). Additionally, all three of these measures are well validated on populations similar to the population this research studied (Frost et al., 1990; Hewitt, Flett, Turnbull-Donovan, & Mikail, 1991; Slaney et al., 2001). The following paragraphs will further describe these tools.

***Multidimensional perfectionism approaches.*** Concurrently and unbeknownst to each other, researchers Hewitt and Flett (1991) and Frost, Marten, Lahart, and Rosenblate (1990), created two widely known perfectionism measures. Using confirmatory factor analysis of the HFMPMS, Hewitt and Flett supported the three dimensions from this outcome measure (Hewitt & Flett, 1991). Frost and colleagues supported six dimensions of perfectionism in the FMPS using exploratory and confirmatory factor analysis (Frost et al., 1990). However, using Horn's parallel analysis and in an effort to decrease factorial instability, Stöber (1998) recommended reducing the FMPS to four dimensions by combining Concerns Over Mistakes and Doubts About Actions as well as combining Parental Expectations and Parental Criticism. Researchers reported good psychometric properties for both tools (Frost et al., 1990; Hewitt & Flett, 1991), and both tools have been used to assess health professions students (M. Enns et al., 2001; Henning et al., 1998). However, both surveys require a fee to administer. A further limiting factor regarding the FMPS is a lack of published norms (Flett & Hewitt, 2015).

A third tool frequently used to multidimensionally measure perfectionism is the APSR (Slaney et al., 2001). Slaney and colleagues supported three dimensions of perfectionism in the APSR using exploratory and confirmatory factor analysis (Slaney et al., 2001). The APSR consists of three subscales, High Standards, Order, and Discrepancy, and researchers have

reported sound psychometric properties for this tool (Rice et al., 2007; Slaney et al., 2001; Suddarth & Slaney, 2001). Although this tool has been used to assess students in higher education (Ashby et al., 2012; Rice et al., 2014; Rice & Slaney, 2002), it has been used less to measure samples of students in health professions programs (Wagner & Causey-Upton, 2017). However, unlike the FMPS and HFMPs, there is not a fee to administer the APSR when used for research purposes.

More recently, Stairs and colleagues developed a comprehensive, multidimensional tool to measure perfectionistic constructs named the Measures of Constructs Underlying Perfectionism (M-CUP; Stairs et al., 2012). As mentioned previously, this research group analyzed 15 perfectionism tools. This included the aforementioned FMPS, HFMPs, APSR, the Eating Disorder Inventory-2 Perfectionism Scale, and the Burns Perfectionism Scale. Stairs and colleagues supported nine dimensions in the M-CUP using exploratory and confirmatory factor analysis (Stairs et al., 2012). The M-CUP consists of nine subscales, High Standards, Order, Perfectionism Toward Others, Reactivity Towards Mistakes, Perceived Pressure From Others, Dissatisfaction, Details and Checking, Satisfaction, and Black and White Thinking (Stairs et al., 2012). Although Stairs et al. (2012) validated this tool using an undergraduate student sample, unfortunately, it appears this tool is not commonly used among perfectionism researchers. As of November 2019, there were only three published studies using the M-CUP beyond the original work from Stairs et al. (2012). None involved students from health professions programs. Two studies involved undergraduate student samples (Forney et al., 2019; Lapoint & Soysa, 2014), and the other involved a clinical population (Kim et al., 2016). The M-CUP consists of 61 questions and nine subscales and is the longest among the four previously mentioned tools (Stairs et al., 2012). For comparison, the FMPS consists of 35 questions and six subscales (Frost

et al., 1990); the HFMPs consists of 45 questions and three subscales (Hewitt & Flett, 1991); and the APSR consists of 23 questions and three subscales (Slaney et al., 2001).

Some authors argue that not all of the subscales on these multidimensional tools directly measure perfectionism (Stoeber, 2017b). For example, the subscales of Self-Oriented Perfectionism from the Hewitt-Flett MPS (HFMPs) and the Personal Standards from the Frost MPS (FMPS) may truly measure perfectionism. However, other dimensions such as Other-Oriented Perfectionism and Socially-Prescribed Perfectionism from the HFMPs may not directly measure perfectionism, but instead constructs related to perfectionism (Shafran, Cooper, & Fairburn, 2002). Additionally, measures such as Parental Criticism from the FMPS did not directly represent an actual trait of perfectionism, but rather factors that may contribute to developing perfectionism (Stairs et al., 2012). Furthermore, to categorize perfectionists as *Adaptive* or *Maladaptive*, the creators of the APSR opted to exclude the tool's subscale of Order and use only its two subscales of High Standards and Discrepancy (Rice & Ashby, 2007). By only including two of the three subscales, conceptually, this became a bidimensional view of perfectionism.

***Bidimensional perfectionism approaches.*** As previously explained, perfectionism research is moving from a multidimensional towards a bidimensional view of perfectionism. Further supportive of a bidimensional view was a comparison of the nine subscales from the closely related FMPS and the HFMPs measures conducted by Frost et al. (1993). This exploratory factor analysis of these two multidimensional tools consolidated the nine total subscales into two dimensions of perfectionism labeled Maladaptive Evaluation Concerns and Positive Strivings (Frost et al., 1993). Contemporary researchers also support and further refined this bidimensional model of perfectionism using the labels of Perfectionistic Strivings and Perfectionistic Concerns (Gaudreau & Thompson, 2010; Stoeber & Otto, 2006).

Additionally, the Rice research group explored a bidimensional approach to the multidimensional APSR by omitting the Order dimension and focusing only on the interaction of the High Standards and Discrepancy dimensions for classification of *Adaptive* and *Maladaptive Perfectionism* (Rice & Ashby, 2007; Rice et al., 2007). The APSR has evolved to a shorter version called the Short Almost Perfect Scale (SAPS) that omitted the order subscale questions in their entirety as well as other redundant items from the other subscales (Rice et al., 2014). Although researchers reported good psychometric properties among undergraduate students for the SAPS, they cautioned that these items were not administered in a stand-alone fashion. Rather, they were administered as part of the APSR. Additionally, they recommended administering the eight items from the SAPS with other items having a similar response set-up (Rice et al., 2014). Based on these recommendations, all of the APSR items were administered for this research project.

***Outcome measure summary.*** In summary, the above-mentioned perfectionism outcome measures FMPS (Frost et al., 1990), HFMPs (Hewitt & Flett, 1991; Hewitt et al., 1991), APSR (Ashby, Rice, & Martin, 2006; Rice & Aldea, 2006; Slaney et al., 2001), and M-CUP (Stairs et al., 2012) have all demonstrated good psychometric properties. As previously outlined, researchers have used the three dimension and 35-item FMPS and six dimension and 45-item HFMPs to measure perfectionism in higher education in general and in health professions programs (M. Enns et al., 2001; Henning et al., 1998). Researchers have also used the three dimension and 23-item APSR to measure perfectionism in higher education in general and in health professions programs (Ashby et al., 2012; Rice et al., 2014; Rice & Slaney, 2002; Wagner & Causey-Upton, 2017), just not as extensively as the FMPS and HFMPs (Stoeber, 2017a). Researchers seem to be reluctant to use the comprehensive M-CUP measure. This may be due to the nine dimensions and its 61-items. Since the APSR has good validity, a reasonable number of

items, and a bidimensional scoring approach allowing for the interaction of the two-dimension resulting in an *Adaptive* or *Maladaptive* classification, it was used in this research project.

**Theories and models.** Although there are several different theories and models related to perfectionism, there are two that warrant further discussion in order to better understand perfectionism, stress, and the physical therapy student. The Perfectionism Acceptance Theory (PAT) from Lundh (2004) may better explain *Adaptive* and *Maladaptive Perfectionism*. Additionally, the Perfectionism Diathesis-Stress Model (PDSM) may further explain the result of the interaction between perfectionism and stress (Goforth, Pham, & Carlson, 2011).

***Perfectionism Acceptance Theory.*** The PAT differentiates *Adaptive* and *Maladaptive Perfectionism* based on the acceptance of non-perfectionism. The *Adaptive* and *Maladaptive Perfectionist* both pursue perfection. However, the *Adaptive Perfectionist* accepts non-perfection, whereas the *Maladaptive Perfectionist* does not accept non-perfection. Therefore, the pursuit of perfection only becomes maladaptive when this pursuit of perfection transitions into a demand for perfection (Lundh, 2004). This theory appears conceptually consistent with the bidimensional approach from Rice and Ashby (2007) that used the Discrepancy dimension to differentiate between *Adaptive* and *Maladaptive Perfectionists*.

***Perfectionism Diathesis-Stress Model.*** The PDSM frames perfectionism as a predispositional vulnerability. If the interaction between the Discrepancy dimension of perfectionism and perceived stress exceeds the perceived capacity to meet the resulting demand, then there is increased risk for the development of a negative outcome such as symptoms of distress (E. C. Chang & Rand, 2000; Flett, Hewitt, Blankstein, & Mosher, 1995). For example, regression analysis performed by Flett, Hewitt, and Dyck (1989) suggested an interaction between perfectionism and stress that was predictive of anxiety. The same research group further supported this model when they suggested a possible interaction between perfectionism and

stress to produce increasing levels of depressive symptoms (Flett et al., 1995). Additionally supporting this model, M. Smith, Saklofske, Yan, and Sherry (2017) showed a weak and direct association between stress, anxiety, and perfectionism. Interestingly, in a study involving participants diagnosed with depression, both dimensions of perfectionism (High Standards and Discrepancy) longitudinally moderated the association between chronic stress and depressive symptoms (Békés et al., 2015).

Others have implicated the High Standards dimension as a vulnerability factor in the PDSM. Results from the work of Hewitt, Flett, and Ediger (1996) suggested High Standards as a vulnerability factor. Contrary to these findings and more consistent with the *Adaptive* and *Maladaptive* framework of perfectionism, first-year medical students who scored low on *Adaptive* dimensions and students who scored high on *Maladaptive* dimensions were vulnerable to negative effects of stress (M. Enns, Cox, & Clara, 2005). Although PDSM has been used to explain the interaction of perfectionism and stress, the role of the different dimensions of perfectionism in this model has been inconsistent in previous literature. The *Adaptive* and *Maladaptive* framework that accounts for the interaction between the two perfectionism dimensions (Rice & Ashby, 2007) may provide a better understanding of the relationship between perfectionism and stress in the PDSM. Furthermore, applying the Perfectionism Acceptance Theory and Perfectionism Diathesis-Stress Model may provide clarity of perfectionism's role in higher education.

**Perfectionism and higher education.** Using undergraduate student samples, researchers have conducted numerous studies on the association between perfectionism and stress, as described in the following paragraphs. Among perfectionists, *Adaptive Perfectionists* reported lower levels of perceived stress than *Maladaptive Perfectionists*. Additionally, *Adaptive Perfectionists* more often employed task-oriented coping (e.g., taking action to address the

situation) and less likely employed emotion-oriented coping (e.g., altering one's response to the situation) compared to *Maladaptive Perfectionists*. In contrast, *Maladaptive Perfectionists* more often employed emotion-oriented coping and less likely employed task-oriented coping compared to *Adaptive Perfectionists*. Therefore, the coping strategy favored by *Adaptive Perfectionists* potentially served as a buffer to stressor, resulting in lower perceived stress in *Adaptive Perfectionists* (Ashby & Gnilka, 2017).

Rice and Van Arsdale (2010) also examined perfectionism, stress, and coping in an undergraduate student sample. Supportive of the findings from Ashby and Gnilka (2017), *Maladaptive Perfectionists* had increased perceived stress, as well as the negative emotion-oriented coping strategy of drinking-to-cope, than *Adaptive Perfectionists* (Rice & Van Arsdale, 2010). Additionally, other researchers have further supported that *Maladaptive Perfectionists* had higher levels of stress compared to *Adaptive Perfectionists* (Bieling et al., 2004; Rice & Richardson, 2014). Offering even further support of the association between stress and perfectionism, *Maladaptive Perfectionists* showed not only higher levels of stress, but also prolonged reactivity to stress indicating rumination among *Maladaptive Perfectionists* (Flett et al., 2016). Building on the work of Flett et al. (2016) and also potentially impacting academic performance, *Maladaptive Perfectionists* showed a relationship between perceived stress and fear of negative evaluation among both undergraduate and graduate students (Shafique et al., 2017). Also related to academic performance, coping strategies used by perfectionists may impact testing anxiety. Supportive of Ashby and Gnilka (2017) as well as Rice and Van Arsdale (2010), *Maladaptive Perfectionists* favored avoidant emotion-oriented coping strategies more than *Adaptive Perfectionists* and experienced more testing anxiety than *Adaptive Perfectionists* (Vanstone & Hicks, 2019). Interestingly, in a sample of Canadian and Chinese students, Canadian students showed significantly more *Maladaptive Perfectionistic* tendencies in one

aspect (Concerns over Mistakes), but not in another (Socially-Prescribed Perfectionism; M. Smith et al., 2017). Additionally, in a sample of Russian undergraduate students, there was no significant difference in stress levels between *Adaptive* and *Maladaptive Perfectionists* (Wang, Permyakova, & Sheveleva, 2016) indicating a potential cultural component to perfectionism that is beginning to be explored among researchers (DiBartolo & Rendón, 2012).

Although the majority of adult, non-clinical perfectionism research has involved undergraduate students as described previously, pursuing perfectionism research among health professions programs should not be neglected. Researchers have already expressed concern that undergraduate student samples may have a higher proportion of perfectionists due to a selection-bias towards the individual with high standards (Rice & Richardson, 2014). For example, among a sample of undergraduate students, Grzegorek, Slaney, Franze, and Rice (2004) identified over 50% of this sample as perfectionists with 31% as *Adaptive Perfectionists* and 26% as *Maladaptive Perfectionists*. In comparison to a sample of pre-occupational therapy students, Wagner & Causey-Upton (2017) identified over 90% of this sample as perfectionists with 50% as *Adaptive Perfectionists* and 43% as *Maladaptive Perfectionists*. Unfortunately, non-clinical, general population sample norms were not found in the literature. If there is a concern of a higher proportion of perfectionists among undergraduate students due to high standards compared to the general population, then potentially a population of graduate students in health professions programs may have a more pronounced proportion of perfectionists than the undergraduate student population or a different distribution of *Adaptive* and *Maladaptive Perfectionists*. Although not reporting rates of perfectionism between undergraduate art students and medical students, there were higher rates of *Adaptive Perfectionists* among medical students and higher rates of *Maladaptive Perfectionists* among the undergraduate art students when comparing the two groups. (M. Enns et al., 2001). Seeliger and Harendza (2017) also reported lower rates of

*Maladaptive Perfectionism* among medical students compared to available normative data.

Similar to the results involving medical students, there were lower rates of *Maladaptive Perfectionists* from a sample of students in health professions programs representing medical, nursing, dental, and pharmacy programs compared to a previous sample of undergraduate students (Henning et al., 1998). Therefore, perfectionism exploration among DPT students, as proposed in this research project, is prudent.

**Perfectionism and health professions higher education.** As previously mentioned, despite a robust literature on the relationship between perfectionism and stress in undergraduate students, there is a dearth of research involving perfectionism and graduate students, and especially in health professions programs. In a longitudinal study involving medical students, *Maladaptive Perfectionism* strongly and directly associated with distress and predicted depressive symptoms (M. Enns et al., 2001). Supportive of these findings, one of the strongest predictors of distress in medical students was *Maladaptive Perfectionism* (Henning et al., 1998). This is concerning since Hu, Chibnall, and Slavin (2019) identified over 25% of first-year medical students as *Maladaptive Perfectionists*.

Moving beyond perfectionism and stress, researchers have explored the association between perfectionism and academic performance in health professions programs. Witcher et al. (2007) found that, among psychology graduate students, *Adaptive Perfectionism* positively predicted academic performance, whereas *Maladaptive Perfectionism* negatively predicted performance. Although graduate health professions students were only a small subset of the sample of graduate student participants, *Maladaptive Perfectionism* predicted academic stress with women being more susceptible than their male counterparts (Cowie, Nealis, Sherry, Hewitt, & Flett, 2018). From a sample of pre-occupational therapy students, a sample that may closely match the student profile of DPT students, researchers identified a vast majority of the students

as perfectionists, with half of the sample identified as *Adaptive Perfectionists*. Using qualitative, survey data, the majority of students reported that their perfectionism caused increased stress levels (Wagner & Causey-Upton, 2017).

In summary, a significant amount of perfectionism research has involved undergraduate students. There is a paucity of perfectionism research involving health professions programs, and none to date has involved DPT students. As outlined above, perfectionism, especially *Maladaptive Perfectionism*, is positively and strongly associated with stress in health professions students (Cowie et al., 2018; M. Enns et al., 2001; Henning et al., 1998; Wagner & Causey-Upton, 2017; Witcher et al., 2007). Therefore, research involving perfectionism, stress, and the DPT student addresses a significant gap in the literature.

### **Stress**

Stress can be described as a dynamic and potentially cumulative process involving perceived demands and self-perceived capacity to meet them. It can impact all aspects of human function, including physiological, cognitive, emotional, and behavioral. Because stress is a dynamic relationship between perceived demands and self-perceived capacity to meet those demands, it may be beneficial when perceived capacity is greater than or at least meets the perceived demands. However, it may also be detrimental when perceived capacity is no longer able to meet the perceived demands (Butler, 1993). Therefore, Seyle (1975) separated stress into two different concepts, *eustress* and *distress*. He viewed eustress as positive stress, with perceived lower stress levels being healthy, and distress as negative stress, with perceived higher stress levels being unhealthy.

**Perceived stress.** Perceived stress is the subjective appraisal of the relationship between environmental demands and available resources. Perceived stress can be an individual experience. Therefore, two individuals may experience similar events, but depending on other

variables such as support, personality, coping ability, they may appraise the situation differently based on these variables as well as the appraisal of their ability to meet the demand (Phillips, 2013).

*Perceived stress and higher education.* Stress was one of the most common reasons for undergraduate students to access college counseling services, with just over 45% of clinicians citing stress as an area of concern among students (Center for Collegiate Mental Health, 2017). Perceived stress seems to be increasing among undergraduate students, Xiao et al. (2017) reported an increase in distress over multiple cohorts of students from 2010-2015. Supportive of this, Beiter et al. (2015) reported a greater than two-fold increase in yearly counseling center visits among undergraduate students over a four-year period with the top stressors being academic success, pressure to succeed, post-graduate plans, and financial concerns. Among undergraduate students, almost 60% reported high levels of stress (Makrides, Veinot, Richard, McKee, & Gallivan, 1998). In a predominately undergraduate student sample comprised of American and international students, American students indicated greater stress levels than their international counterparts indicating a potential cultural component to perceived stress (Misra & Castillo, 2004). Furthermore, from the same sample, gender may play a role in perceived stress among undergraduate students since women reported more perceived stress than men. However, this result is inconsistent in the literature, as Talib and Zia-ur-Rehman (2012) found no gender difference among undergraduate students and perceived stress.

This increased, perceived stress, common in undergraduate students, also appears to negatively impact sleep quality (Amaral et al., 2018; Galambos, Vargas Lascano, Howard, & Maggs, 2013). In a sample of over 1,000 undergraduate students, perceived stress was the most significant risk factor for decreased sleep quality, with nearly two-thirds reporting stress had a negative impact on sleep (Lund, Reider, Whiting, & Prichard, 2010). Galambos et al. (2013)

longitudinally supported the cross-sectional findings of Lund and colleagues by reporting that perceived stress and sleep quality were weakly and indirectly associated with each other, meaning increased perceived stress resulted in decreased sleep quality in a sample of nearly 100 undergraduate students. Offering further support of the indirect association between perceived stress and sleep quality, Amaral et al. (2018) found a weak-to-moderate indirect association between stress and sleep quality in a sample greater than 500. The detrimental impact of perceived stress on sleep quality is concerning because, in a sample of nearly 1400, sleep quality was moderately, indirectly associated with academic performance. Additionally, in this same sample, perceived stress showed a weak, indirect association with academic performance (van der Heijden et al., 2018).

This is not surprising because there is a robust body of work demonstrating that stress and fatigue negatively impact cognitive performance (Beilock & DeCaro, 2007; Lepine, Lepine, & Jackson, 2004; Palmer et al., 2013; Van Der Linden & Eling, 2006). For example, stress can negatively impact working memory (Beilock & DeCaro, 2007) and focus (Liston, McEwen, & Casey, 2009). Similar to stress, fatigue can also negatively impact focus in addition to local processing efficiency (Van Der Linden & Eling, 2006). However, consistent with the concept that perceived stress is a subjective appraisal of the relationship between environmental demands and available resources (Phillips, 2013), stress can positively or negatively impact learning performance based on if the stress is appraised as a positive and challenging experience or a negative and hindering experience (Lepine et al., 2004). Furthermore, stress may improve or inhibit the different types of memory as stress seemed to inhibit working memory, supporting the work of Beilock and DeCaro (2007), but improve spatial memory (Luethi, Meier, & Sandi, 2009).

Beyond the deleterious effect of stress on sleep and academic performance and perhaps more importantly, chronic stress has been associated with a variety of health-related issues such as a higher risk of cardiovascular disease (Chida & Steptoe, 2010; Dimsdale, 2008; Nabi et al., 2013; Sheps et al., 2002; H. Song et al., 2019; Spruill, 2010) and obesity (Brunner, Chandola, & Marmot, 2007; Sinha & Jastreboff, 2013). Furthermore, on a cellular level, increasing perceived stress levels have been associated with increased cell aging among first-year medical residents (Ridout et al., 2019). Additionally, chronic stress has been associated with poor health behaviors such as problematic alcohol consumption (Park & Iacocca, 2014) and stress-eating (Adam & Epel, 2007; Sinha & Jastreboff, 2013). Taken together, these findings are concerning as undergraduate students transition into more rigorous health professions programs with increasing academic load requirements and performance expectations, potentially resulting in elevated stress levels experienced by the health professions students (Dutta et al., 2005). A better understanding of the role stress plays in health professions programs may help minimize the negative impact stress has on students, as outlined above.

***Perceived stress and health professions higher education.*** Among a variety of different health professions programs, students experience significant levels of stress when compared to individuals of similar age (Henning et al., 1998). Further corroborating this in a 2005 review, Dutta, Pyles, and Meiderhoff (2005) reported high rates of stress among students in the health profession programs of medicine, dentistry, nursing, and allied health with medical students being the most stressed. Ruiz-Aranda, Extremera, and Pineda-Galán (2014) offered similar results in a sample of health professions programs, including physical therapy, occupational therapy, and nursing. Additionally supportive of the impact that stress has in health professions programs, researchers found in a study comprised of psychology, nursing, and social work students, perceived stress had a moderate, direct relationship with maladaptive coping and a

weak, indirect relationship with adaptive coping (A. Enns et al., 2018). Similarly, the Ruiz-Aranda group reported weak-to-moderate, indirect associations between perceived stress and life satisfaction as well as perceived happiness (Ruiz-Aranda et al., 2014).

These stress-related issues among health professions students and health care providers have not gone unnoticed by professional organizations, health professions programs, and accrediting bodies (Anandarajah, Quill, & Privitera, 2018; Bodenheimer & Sinsky, 2014; Bowles et al., 2018; Kreitzer & Klatt, 2017; Morrow et al., 2018). There has been a call to mitigate stress and burnout issues among health care providers. Some health professions leaders have advocated to add care team well-being as a fourth aim to the “Triple Aim” health care approach which currently consists of patient experience, population health, and reducing costs (Bodenheimer & Sinsky, 2014; Bowles et al., 2018; Morrow et al., 2018). Additionally, there has been a call to assess and address health and wellness in first-year health professions students (Melnik et al., 2016). Although in the early stages, a small number of universities have begun to heed these calls by offering programming to health professions students as well as practicing health care professionals. These different stress management curricular initiatives include resiliency (Mejia-Downs, 2019), mindfulness, self-care, and work-life balance (Kreitzer & Klatt, 2017).

***Perceived stress and medical students.*** In multiple studies, researchers have identified stress-related issues among medical students (Dyrbye et al., 2006; Guthrie et al., 1998; Ishak et al., 2013; Stewart, Lam, Betson, Wong, & Wong, 1999). This is not a new concern in medical education, as evidenced by the *Medical Education* journal devoting an entire issue to the topic over 25 years ago (C. Cole, 1994). In the same year as the *Medical Education* issue on stress in medical education, Mosley et al. (1994) reported that among third-year medical students, greater than 50% reported high levels of stress. In a five-year longitudinal study, Guthrie et al. (1998)

further supported this concern by finding that the prevalence of students reporting high stress levels over the five years of attending medical school ranged from 50-60%.

In another prospective, longitudinal analysis of medical students, Stewart, Lam, Betson, Wong, & Wong (1999) analyzed stress and academic performance during the first two years in medical school and found that academic performance, both prior to admission and during medical school, was weakly and indirectly associated with perceived stress levels at the start of medical training and eight months into the program. Confirming the prevalence of stress, Dyrbye, Thomas, & Huntington (2006) again identified a high prevalence of stress among medical students, with nearly 50% of medical students experiencing concerning levels of stress. They furthered the discussion of stress in medical education by identifying that personal life stressors such as a recent major illness or death of a close family member contributed just as much, if not more than academic-related (e.g., testing and evaluation, course and workload issues) stressors. More recently, the prevalence of stress among medical students has remained the same with Almojali, Almalki, Alothman, Masuadi, & Alaqeel (2017) reporting prevalence levels greater than 50%. Additionally, from logistic regression analysis, high stress levels were a strong predictor of and contributor to poor sleep (Almojali et al., 2017).

Although identified as a concern over 25 years ago (C. Cole, 1994), the prevalence of stress among medical students has remained stubbornly constant around 50% (Almojali et al., 2017; Ishak et al., 2013; Mosley et al., 1994). Unfortunately, this issue does not appear to improve upon graduation and may increase post-graduation (Shanafelt et al., 2012; Shanafelt, Bradley, Wipf, & Back, 2002). Therefore, as previously mentioned, medical specialties, such as family and internal medicine, have championed initiatives that focus on the well-being of the health care professional (Anandarajah et al., 2018; Bodenheimer & Sinsky, 2014). One such initiative may be the incorporation of emotional intelligence training. Gupta, Singh, and Kumar

(2017) further supported the work of Birks et al. (2009) by observing a weak, indirect association between emotional intelligence and perceived stress.

***Perceived stress and nursing students.*** Similar to medical education, nursing educators and researchers have also identified stress-related issues among nursing students in multiple studies (Alzayyat & Al-Gamal, 2014; Gibbons et al., 2011; Prymachuk & Richards, 2007; Pulido-Martos, Augusto-Landa, & Lopez-Zafra, 2012). In addition to addressing personal stressors like Dyrbye, Thomas, & Huntington (2006) did with medical students, different groups of researchers have attempted to capture other causes of stress among nursing students (Alzayyat & Al-Gamal, 2014; Gibbons, Dempster, & Moutray, 2008; Prymachuk & Richards, 2007; Pulido-Martos et al., 2012). For example, results of a survey-based, self-report measure showed that academic sources (e.g., testing and evaluation, course and workload issues), clinic-related sources (e.g., fear of making mistakes, negative patient outcomes), and personal sources (e.g., money and budget issues, work-life balance) were common categories of stressors selected by nursing students (Prymachuk & Richards, 2007). The results of a systematic review of 23 articles by Pulido-Martos et al. (2012) also produced similar sources of stress as Prymachuk and Richards (2007).

Offering an additional perspective of the sources of stress among nursing students, Gibbons et al. (2008) further supported the themes of academic and clinical sources of stress by using a qualitative method of focus-groups. In another systematic review of 13 articles that focused specifically on the clinic-related stressors of nursing students, Alzayyat and Al-Gamal (2014) further contributed to this discourse by identifying that the highest sources of stress while on clinical rotations were continued academic demands, interpersonal relations in the clinical setting, as well as patient and caregiver management. In order to determine possible moderators and mediators to perceived stress, Gibbons, Dempster, and Moutray (2011) investigated the

predictors of stress and found that self-efficacy buffered the effects of stress. Additionally, avoidance-coping was the strongest predictor of less healthy well-being. Meanwhile, approach-coping was not a predictor of more healthy well-being. Therefore, strategies that promote improving self-efficacy and promote effective coping may prove beneficial to address the prevalence of stress among nursing students (Gibbons et al., 2011). This is important because, although a 34% prevalence of stress in nursing students (Prymachuk & Richards, 2007) is not as high as the 50% prevalence of stress in medical students (Dyrbye et al., 2006), it is still a concern in the nursing profession (Lim, Bogossian, & Ahern, 2010).

Similar to initiatives being championed among physician groups (Anandarajah et al., 2018; Bodenheimer & Sinsky, 2014), nursing leaders are championing initiatives that would focus on the well-being of the health care professional (Bowles et al., 2018). These initiatives may address some of the recommendations of self-efficacy and effective coping strategies promoted by Gibbons et al. (2011). One such initiative may be the incorporation of emotional intelligence training into nursing programs (Cleary, Visentin, West, Lopez, & Kornhaber, 2018; Judge, Opsahl, & Robinson, 2018). Through mapping of a nursing program curriculum, Por, Barriball, Fitzpatrick, and Roberts (2011) found evidence, albeit it limited, of emotional intelligence aspects. They also noted a weak-to-moderate indirect association between emotional intelligence and perceived stress among nursing students (Por et al., 2011). This was congruent with previous weak-to-moderate indirect associations between emotional intelligence and perceived stress in health professions programs in general (Birks et al., 2009; Faguy, 2012; Ruiz-Aranda et al., 2014) and among medical students (Gupta et al., 2017).

***Perceived stress and dental students.*** Very similar to the concerns of stress and the two previously mentioned health professions programs, various researchers have pursued this topic in studies involving dental students (Alzahem et al., 2011; Elani et al., 2014; Gorter et al., 2008;

Silverstein & Kritz-Silverstein, 2010). Dental students may experience more stress than medical students (Birks et al., 2009), however, this is inconsistent in the literature as other researchers found that stress among medical students was greater than dental students as well as nursing and allied health professions students (Dutta et al., 2005). Gorter et al. (2008) found the prevalence of stress among dental students greater than 30%. However, another research group reported prevalence levels of 70% in another sample of students (Abu-Ghazaleh, Rajab, & Sonbol, 2011). For comparison, reported stress prevalence among medical students is around 50% (Almojali et al., 2017; Guthrie et al., 1998; Mosley et al., 1994).

Echoing the sources of stress among nursing students (Pryjmachuk & Richards, 2007; Pulido-Martos et al., 2012), themes associated with academic, personal, and clinical sources of stress for dental students emerged (Alzahem et al., 2011; Elani et al., 2014). For example, in a systematic review of 49 articles, Alzahem et al. (2011) identified common themes of stress sources experienced by dental students relating to academic (e.g., testing and evaluation, course and workload issues), clinic (e.g., fear of making mistakes, negative patient outcomes), and personal (e.g., money and budget issues, work-life balance) issues. In a larger, slightly more recent systematic review of 124 articles, Elani et al. (2014) confirmed the previously identified common sources of stress and further differentiated these sources based on the dental student being preclinical (didactic only) or clinical. Between these two groups, academic sources of stress were still the predominant concern for both groups, and, as to be expected, the preclinical group did not report clinical sources of stress. However, personal sources of stress were significantly higher in the preclinical group (50%) when compared to the clinical group (11%; Elani et al., 2014). This clinical source of stress may help explain the increase in stress among first-year dental students, when there is little, if any patient care, to the final year, when it is almost exclusively patient care (Gorter et al., 2008). In a multi-site, longitudinal study, dental

students reported higher levels of stress in their final year (44%) compared to their first year (36%) as well as higher rates of emotional exhaustion in their final year (22%) compared to their first year (39%; Gorter et al., 2008).

Further supporting that dental school is a stressful time, another multi-site, albeit shorter, longitudinal study, Silverstein and Kritz-Silverstein (2010) found stress levels increased over the first year of dental school. This is concerning because students with higher levels of stress had poorer academic performance as there was a weak, indirect association between GPA and stress (Silverstein & Kritz-Silverstein, 2010). Additionally, these researchers continued to support the previously mentioned themes from Elani et al. (2014) of academic and personal sources of stress during the first year of dental school.

As with leaders in medicine (Anandarajah et al., 2018; Bodenheimer & Sinsky, 2014) and nursing (Bowles et al., 2018) education, the levels of stress experienced by dental students is concerning in this field as well (Alzahem, Van der Molen, & De Boer, 2015; Silverstein & Kritz-Silverstein, 2010). However, similar to medicine (C. Cole, 1994), this is not a recent phenomenon as researchers such as Tisdelle, Hansen, St. Lawrence, and Brown (1984) as well as Howard, Graham, and Wycoff (1986) investigated stress management strategies. More recent suggestions to address this issue have included proactive symptom recognition by faculty and staff, effective coping strategy education including the role of physical activity, and educating faculty to their role as potential sources of stress (Silverstein & Kritz-Silverstein, 2010).

***Perceived stress and physical therapy students.*** Stress prevalence is also an issue among students from physical therapy programs (Frank & Cassady, 2005; Frazer & Echternach, 1991; Hodselmans et al., 2018; Jacob et al., 2012; O'Meara et al., 1994). Moderate stress level prevalences of 57% (Hodselmans et al., 2018) and 82% (Frazer & Echternach, 1991) among physical therapy students are comparable to the 50-60% in medical students (Dyrbye et al., 2006;

Guthrie et al., 1998; Mosley et al., 1994), the 30-70% in dental students (Abu-Ghazaleh et al., 2011; Gorter et al., 2008), and the 30% in nursing students (Prymachuk & Richards, 2007). Currently, there is a paucity of research on effective stress management strategies among physical therapy students as well as identification of student characteristics, which may buffer the negative effects of stress. This is concerning since physical therapy students may be faced with a similar prevalence and source of stresses as medical (Dyrbye et al., 2006), nursing (Prymachuk & Richards, 2007; Pulido-Martos et al., 2012), and dental (Alzahem et al., 2011; Elani et al., 2014) students. These stressors include academic, personal, and clinical sources (Hodselmans et al., 2018; Tucker, Jones, Mandy, & Gupta, 2006) with academic sources ranked as the highest stressor (Jacob et al., 2012; Tucker et al., 2006).

Consistent with students from health professions programs of medicine (Dyrbye et al., 2006), nursing (Alzayyat & Al-Gamal, 2014), and dentistry (Elani et al., 2014), physical therapy students also considered academic-related sources (e.g., testing and evaluation, course and workload issues) as one of their most significant stressors (Tucker et al., 2006). Similar to the other health professions programs (C. Cole, 1994; Tisdelle et al., 1984) previously mentioned, this is also not a new concern among physical therapy educators and researchers (Frazer & Echternach, 1991; O'Meara et al., 1994). Over a quarter-century ago, in a multi-site study, Frazer and Echternach (1991) found academic stressors such as heavy workload as a frequent stressor among physical therapy students. When comparing perceived stress between first-year and second-year students, Frazer and Echternach (1991) found a decreased prevalence among the second-year students. However, this result may be inconsistent in the literature, as both O'Meara et al. (1994) and Frank and Cassady (2005) reported that perceived stress appeared to remain unchanged between first-year and second-year students. These results are different from the results of increasing perceived stress from first-year to second-year among dental students from

Silverstein & Kritz-Silverstein (2010). However, these comparisons should be viewed cautiously as Silverstein and Kritz-Silverstein (2010) longitudinally compared the same group at two different times. In contrast, Frazer and Echternach (1991), O'Meara et al. (1994), and Frank and Cassady (2005) compared two different groups cross-sectionally.

O'Meara et al. (1994) also observed higher stress levels in physical therapy students when compared to undergraduate students. Similarly, Frank and Cassady (2005) observed higher rates of stress in physical therapy students compared to individuals of similar age as well as finding that female physical therapy students reported higher stress levels than their male counterparts. Finally, similar to the work from Silverstein and Kritz-Silverstein (2010) in dental students, perceived stress levels also have a weak, indirect association between GPA and stress among physical therapy students (Frank & Cassady, 2005).

***Perceived stress summary.*** In summary, researchers and educators have been concerned about the perceived stress levels of health professions students and have called for stress management interventions for at least two decades (C. Cole, 1994; Frazer & Echternach, 1991; Tisdelle et al., 1984). In spite of this awareness, stress prevalence among these students has continued to remain high across all programs (Almojali et al., 2017; Alzayyat & Al-Gamal, 2014; Elani et al., 2014; Hodselmans et al., 2018). More recently, accrediting bodies at the professional level (Morrow et al., 2018) and health professions programs (M. Cox et al., 2017; Mejia-Downs, 2019; Melnyk et al., 2016) have recognized the importance of addressing this issue since these health professions programs are preparing these students for effective patient care. To accomplish this, a high level of academic rigor is to be expected (Dutta et al., 2005) and therefore, it was not surprising to find across all health professions programs that academic-related sources (e.g., testing and evaluation, course and workload issues) was the most significant stressor (Alzayyat & Al-Gamal, 2014; Dyrbye et al., 2006; Elani et al., 2014; Jacob et

al., 2012; Tucker et al., 2006). Current trends in health professions programs (Alzahem et al., 2015; Chambers, Phillips, Burr, & Xiao, 2016; Willgens et al., 2016) and at the professional level (Kreitzer & Klatt, 2017) indicate that stress management strategies are being implemented. Therefore, the next logical step is establishing evidenced-based, stress management strategies.

**Stress management.** Butler (1993) described stress as a dynamic and potentially cumulative process involving perceived demands and self-perceived capacity to meet those demands. If perceived capacity meets or exceeds perceived demands, then stress may be perceived as beneficial, or at least not detrimental. However, if perceived capacity fails to meet perceived demands, then stress may be perceived as detrimental (Butler, 1993). Because stress perception varies by individual, there may be significant variability between individuals in their response to the same, or a similar stressor (Leblanc, 2009).

Stress can positively impact learning if the task is perceived as appropriately challenging or negatively impact learning if the task is perceived as overwhelmingly challenging (Lepine et al., 2004). Because stress may be a catalyst to learning, as well as a barrier to learning (Joëls, Pu, Wiegert, Oitzl, & Krugers, 2006; Lepine et al., 2004; Schwabe, Wolf, & Oitzl, 2010), the goal of stress management is not to eliminate stress, but rather to improve one's perceived capacity to meet the perceived demands. Stress management interventions such as self-care (e.g., mindfulness-based interventions) (Kreitzer & Klatt, 2017; van der Riet, Levett-Jones, & Aquino-Russell, 2018) and emotional intelligence development (Birks et al., 2009; Faguy, 2012; Ruiz-Aranda et al., 2014) are potential strategies to accomplish this goal.

Mindfulness-based interventions (MBI) can include non-judgmentally and purposefully being in the moment that can be enhanced through different forms of meditation such as breathing, walking, and loving-kindness meditations as well as progressive relaxation techniques and different forms of movement-based meditations such as yoga, tai chi, and qi gong (Kabat-

Zinn, 2003). Varvogli and Darviri (2011) provided an evidence-based review for other stress management techniques such as progressive muscle relaxation, biofeedback, guided imagery, diaphragmatic breathing, transcendental meditation, cognitive behavioral therapy, and mindfulness-based stress reduction. They concluded that these evidenced-based techniques were safe, easy-to-learn, and effective in lowering stress. However, better-designed studies are needed to determine stronger efficacy of these techniques in disease management and prevention (Varvogli & Darviri, 2011).

***Stress management and higher education.*** In two relevant studies, 60% of undergraduate students reported high levels of stress (Makrides et al., 1998) and stress was one of the most common reasons for undergraduate students to access college counseling services, with just over 45% of clinicians citing stress as an area of concern among undergraduate students (Center for Collegiate Mental Health, 2017). Although not directly measuring stress, Mahmoud et al. (2015) found among undergraduate students using maladaptive coping (e.g., problematic drinking, avoidance, substance use) had a moderate-to-strong relationship with anxiety. MBIs may provide an alternative to maladaptive coping strategies.

Kabat-Zinn and colleagues developed a mindfulness-based stress reduction program, which is comprised of different mindfulness techniques, breathing exercises, body scanning, meditation, and hatha yoga. The standard program is 2.5 hour weekly sessions over eight weeks and one all-day retreat (“MBSR,” n.d.). This mindfulness-based stress reduction program is one of the most commonly researched stress management strategies among undergraduate students (Bamber & Kraenzle Schneider, 2016) as well as among students in health professions programs (McConville, McAleer, & Hahne, 2017).

Some universities are taking a more holistic approach to student stress management. For example, the SMART Lab at Ohio State University teaches stress management and resiliency

skills to undergraduate students (“SMART Lab,” n.d.). In addition to teaching these skills to students, their mission includes researching the efficacy of stress management and resiliency skills in students. Although the team has produced no journal publications as of yet, they do have a variety of active and pending research on this topic (“SMART Lab,” n.d.). Additionally, the Center for Spirituality and Healing (CSH) at the University of Minnesota offers undergraduate students and medical residents an eight-week online course focusing on resiliency and well-being (“Center for Spirituality and Healing,” n.d.; Kreitzer & Klatt, 2017). Similar to the SMART lab, CSH currently does not have any published research on this topic. However, they are collecting data as part of an NIH Y-U grant (“Center for Spirituality and Healing,” n.d.).

Bamber and Kraenzle Schneider (2016) conducted a systematic review of 57 articles involving MBI and stress among undergraduate students and concluded that MBI supported stress reduction. Self-reported perceived stress decreased in over 75% of the studies specific to MBI (Bamber & Kraenzle Schneider, 2016). Even with a shorter duration of four weeks, Greeson, Juberg, Maytan, James, and Rogers (2014) supported MBI as beneficial with the MBI group demonstrating a 13.8% decrease in stress compared to the control group demonstrating only a 2.4% decrease. MBI durations ranging from 4-8 weeks offered 10-30% reductions in stress among undergraduate students, with longer durations producing greater stress reduction (Galante et al., 2018; Greeson et al., 2014; Newsome, Waldo, & Gruszka, 2012). Researchers have found similar evidence in health professions programs (Chambers et al., 2016; De Vibe et al., 2013; Jain et al., 2007; McConville et al., 2017; van der Riet et al., 2018).

***Stress management and health professions higher education.*** Similar to undergraduate students and previously noted, students from a variety of different health professions programs are experiencing significant levels of stress (Dutta et al., 2005; Henning et al., 1998; Ruiz-Aranda et al., 2014). Because of these higher stress levels, researchers and educators are

considering “humanistic” skills (e.g., emotional intelligence and self-care) as a way to decrease stress levels among health professions students (Birks et al., 2009; Faguy, 2012; Ruiz-Aranda et al., 2014). For example, in a multi-center, multi-health professional survey of first-year dental, nursing, and medical students in the United Kingdom, there was a moderate, indirect association between emotional intelligence and perceived stress (Birks et al., 2009). Ruiz-Aranda, Extremera, and Pineda-Galán (2014) also found a weak, indirect association between perceived stress and emotional intelligence in a sample of female physical therapy, nursing, and occupational therapy students. Most recently, McConville, McAleer, and Hahne (2017) conducted a systematic review of 19 articles involving MBI and stress among health professions students. They concluded that MBI supported stress reduction at a small-to-moderate treatment effect favoring the MBI groups, similar to the results of this type of intervention in undergraduate students (McConville et al., 2017).

The culture of health professions programs often consists of an unhealthy work-life balance and is carried out in highly stressful academic and clinical environments. However, it may be moving towards a healthier approach (Kreitzer & Klatt, 2017), as evidenced by university programs encouraging self-care and mindfulness. Dobkin and Hutchinson (2013) reviewed 14 medical and dental schools offering some type of MBI, including class lectures, one-day workshops, and 8-10 week modules. They recommended inclusion in health professions program curriculum because MBI seems to positively influence stress in students regardless of variance in the type and duration of the instructional design (Dobkin & Hutchinson, 2013).

***Stress management and medical students.*** High stress levels among medical students have been concerning to medical educators for over a quarter-century (C. Cole, 1994). Researchers have reported high stress prevalence levels in the 50-60% range at various points in the matriculation process (Guthrie et al., 1998; Mosley et al., 1994). Dr. Ronald Epstein, an early

proponent of using MBI to address stress among physicians and medical students, published a seminal article on mindful practice describing five levels of mindfulness: Denial, Imitation, Curiosity, Insight, and Incorporation (Epstein, 1999). In that same year, Epstein also advocated for promoting student well-being in medical school curricula (Novack, Epstein, & Paulsen, 1999). Proponents of a “Quadruple Aim” health care approach advocate for increased efforts to improve provider well-being—particularly through efforts to mitigate stress and reduce burnout—in addition to the current, widely-accepted “Triple Aim” health care approach consisting of enhancing patient experiences, improving population health, and reducing costs (Bodenheimer & Sinsky, 2014; Bowles et al., 2018; Morrow et al., 2018).

Some medical schools have developed multi-intervention stress management programs to address stress among medical students (“Center for Mindfulness,” n.d.; “Mindful Practice,” n.d.; “Vanderbilt Medical School Wellness Program,” n.d.). For example, Mindful Practice at the University of Rochester Medical Center offers different workshops and courses that include different stress management elements (e.g., MBI, resiliency) (“Mindful Practice,” n.d.). In an eight-week intensive program for primary care physicians that included MBI, there was a weak, indirect association between mindfulness and burnout, suggesting that mindfulness may decrease perceived stress (Krasner et al., 2009). Another example is Mind-Body Medicine (MBM) at Georgetown University School of Medicine, which promotes self-care and stress management, among other things, into the medical school curriculum. In this eleven-week elective course, students learn different MBI, including relaxation and slow, deep breathing techniques, guided imagery, and different forms of meditation (“Mind-Body Medicine,” n.d.). Using qualitative content analysis of answers from 82 students from the MBM course, the themes of stress relief emerged (Saunders et al., 2007). De Vibe et al., (2013) added to the research on stress management by finding moderate effect size and a number needed to treat of four from a sample

of medical and psychology students completing a seven-week MBI. Other researchers have found similar results of moderate effect size for a seven-week MBI (Shapiro SL, Schwartz GE, & Bonner G., 1998) and large effect size for a four-week MBI (Jain et al., 2007). Further supportive of MBI as a stress management strategy, second-year medical students participated in a ten-week MBI and demonstrated a small effect size in reducing stress (Rosenzweig, Reibel, Greeson, Brainard, & Hojat, 2003). However, in a 12-article review, Daya and Hearn (2018) found mixed evidence, with only seven articles offering support of MBI in reducing stress among medical students. Given the variance in the MBI content and duration (4-11 weeks) (Jain et al., 2007; Krasner et al., 2009; Rosenzweig et al., 2003; Shapiro SL et al., 1998), it is not surprising that Daya and Hearn (2018) found mixed evidence regarding MBI as a stress management strategy.

***Stress management and nursing students.*** Similar to physician leaders (Anandarajah et al., 2018; Bodenheimer & Sinsky, 2014), there is a movement among nursing leaders to address the stress-related issues among students (Alzayyat & Al-Gamal, 2014; Gibbons et al., 2011; Prymachuk & Richards, 2007; Pulido-Martos et al., 2012) and improve self-care through strategies such as stress management (Bowles et al., 2018). MBI is a stress management strategy that has also garnered attention for reducing stress levels among nursing students (Jain et al., 2007; Y. Song & Lindquist, 2015; van der Riet et al., 2018). In a 16-article review, van der Riet et al. (2018) concluded that MBI positively impacted stress among nurses and nursing students. More specifically, nursing students participating in an eight-week MBI consisting of stress management techniques of progressive-relaxation, meditation, and self-reflection. Researchers reported a 27% decrease in perceived stress compared to no change in a control group (Kang, Choi, & Ryu, 2009). Song and Lindquist (2015) also observed greater decreased stress among nursing students compared to the control group in a similar eight-week MBI, though both groups

experienced large decreases in perceived stress levels of (79% and 54% respectively) independent of the intervention effect. In an eight-week online, asynchronous MBI, researchers observed moderate decreases in perceived stress for MBI consisting of online progressive relaxation and different meditations including breathing, walking, and yoga (Spadaro & Hunker, 2016). Although the data trended towards a direct association between MBI practice frequency and perceived stress reduction (Spadaro & Hunker, 2016), formal statistical analyses were not performed, highlighting the need for more robust studies on this topic. In research comparing two types of stress management interventions, MBI and biofeedback, Ratanasiripong, Park, Ratanasiripong, and Kathalae (2015) found that although both MBI and biofeedback decreased anxiety, only MBI significantly decreased perceived stress (13%). Similar to the research involving medical students, MBI appears to be a promising stress management strategy for nursing students.

***Stress management and dental students.*** Similar to other medical education programs (Novack et al., 1999; Saunders et al., 2007), dental school curriculum has incorporated stress management interventions (Brondani, Ramanula, & Pattanaporn, 2014) to address high levels of stress among dental students (Abu-Ghazaleh et al., 2011; Gorter et al., 2008). Although the research on stress management interventions in dental school environments is not as robust as it is in medical and nursing education, a few strategies have been studied (A. K. H. Pau & Croucher, 2003; A. Pau et al., 2007; Sugiura, Shinada, & Kawaguchi, 2005). In two separate studies, Pau and colleagues (2003) found a significant, weak, indirect association between emotional intelligence and perceived stress (A. K. H. Pau & Croucher, 2003; A. Pau et al., 2007). These results align with prior studies that found moderate (Birks et al., 2009) and weak (Ruiz-Aranda et al., 2014) indirect associations between emotional intelligence and perceived stress in other health professions students. Echoing the recommendation of incorporating MBI in medical

school curriculum (Dobkin & Hutchinson, 2013), Lovas, Lovas, and Lovas (2008) advocated for incorporating MBI into the dental school curriculum at Dalhousie University to address stress among students and potentially carry-over as a stress management strategy in future clinical practice.

*Stress management and physical therapy students.* In response to high levels of stress among physical therapy students (Dutta et al., 2005; Frank & Cassady, 2005; Ruiz-Aranda et al., 2014; Tucker et al., 2006), physical therapy educators are taking an evidence-based approach to incorporating stress management strategies into the curriculum (Willgens et al., 2016). There is, however, a dearth of research regarding stress management among physical therapy students and clinicians. In a preliminary randomized-control trial, there was a trend, but not a significant difference towards improved perceived stress in the intervention compared to the control group following a four-week resiliency program (Mejia-Downs, 2019). Based on participant interviews following a ten-week MBI program that included guided meditation and mindfulness, Willgens et al. (2016) summarized that participants were open to learning the MBI and found this stress management strategy beneficial. Furthermore, they recommended that MBI stress management techniques should be included in the physical therapy curricula. Providing further support for the benefit of MBI in physical therapy programs, Chambers et al. (2016) found significant improvements in blood pressure and perceived stress among students. By the end of the eight-week intervention, four of the 24 participants' blood pressure readings moved from prehypertensive into healthy normal range, and students reported 26% lower perceived stress (Chambers et al., 2016). Van Veld et al. (2018) used a mixed methods approach to champion the importance of coping skills development. Also using a mixed methods approach, but in nursing education, Reeve, Shumaker, Yearwood, Crowell, and Riley (2013) furthered the discussion of

copied methods as a viable stress methods strategy by concluding that active coping methods (e.g., social support) improved students ability to cope with stress.

Researchers have considered the role that different coping strategies (e.g., task-oriented, emotion-oriented) may play in stress management (Mahmoud et al., 2015; Reeve et al., 2013; Sheilds, 2001; Van Veld et al., 2018; Willgens & Hummel, 2016). However, this line of research is not yet well-formed and is just beginning to coalesce. Future research recommendations include prospective, longitudinal studies testing the efficacy of curriculum focused on developing adaptive coping skills in improving the stress management of physical therapy students (Barbosa et al., 2013; Van Veld et al., 2018; Willgens & Hummel, 2016).

***Stress management summary.*** In summary, in response to high stress levels among health professions students (Almojali et al., 2017; Birks et al., 2009; C. Cole, 1994; Dutta et al., 2005; Elani et al., 2014; Frank & Cassady, 2005; Frazer & Echternach, 1991; Gibbons et al., 2008; Jacob et al., 2012; Ruiz-Aranda et al., 2014; Tisdelle et al., 1984), researchers are exploring the effectiveness of different stress management strategies such as holistic, multifaceted programs (“Center for Mindfulness,” n.d.; “Mindful Practice,” n.d.; “SMART Lab,” n.d.; “Vanderbilt Medical School Wellness Program,” n.d.; Drolet & Rodgers, 2010), mindfulness-based interventions (Bamber & Kraenzle Schneider, 2016; De Vibe et al., 2013; Galante et al., 2018; Greeson et al., 2014; McConville et al., 2017; Warnecke, Quinn, Ogden, Towle, & Nelson, 2011), emotional intelligence development (Birks et al., 2009; Faguy, 2012; Ruiz-Aranda et al., 2014), effective coping strategies (Mahmoud et al., 2015; Reeve et al., 2013; Van Veld et al., 2018) and resiliency training (Mejia-Downs, 2019). MBIs such as mindfulness-based stress reduction (Bamber & Kraenzle Schneider, 2016; McConville et al., 2017; van der Riet et al., 2018), emotional intelligence development (Birks et al., 2009; Ruiz-Aranda et al., 2014), and effective coping strategies (Mahmoud et al., 2015; Reeve et al., 2013; Sheilds, 2001;

Van Veld et al., 2018) may be promising stress management strategies for both undergraduate and health professions students. To address the call for improved stress management among these current students and future health professionals (Anandarajah et al., 2018; M. Cox et al., 2017; Kreitzer & Klatt, 2017), health professions programs are adding elements of stress management into the curricula that range from lectures (Morrow et al., 2018) and modules of varying lengths (Krasner et al., 2009; “MBSR,” n.d.; “Mindful Practice,” n.d.) to full, elective courses (“Mind-Body Medicine,” n.d.; Saunders et al., 2007). More research is needed to fully understand the relative benefits of each of these different approaches as applied to health professions programs.

### **Summary**

Most researchers conceptualize perfectionism as a bidimensional construct consisting either of *Adaptive* and *Maladaptive Perfectionism* (Ashby & Gnilka, 2017; Ashby et al., 2012; Rice & Ashby, 2007) or of strivings and concerns (Frost et al., 1993; Gaudreau & Thompson, 2010; Stoeber & Otto, 2006). Through the lens of the Perfectionism Acceptance Theory, *Adaptive Perfectionism* is striving for excellence and accepting non-perfection, whereas *Maladaptive Perfectionism* is demanding perfection coupled with not accepting imperfection (Lundh, 2004). Unsurprisingly, demanding perfection and not accepting imperfection (Lundh, 2004) may result in high levels of stress (Ashby & Gnilka, 2017; Békés et al., 2015; Bieling et al., 2004; E. C. Chang & Rand, 2000; Flett et al., 2016; Molnar et al., 2012; Rice & Van Arsdale, 2010). High stress levels are detrimental for a variety of reasons, and sequelae can include a higher risk of cardiovascular disease (Chida & Steptoe, 2010; Dimsdale, 2008; Nabi et al., 2013; Sheps et al., 2002; H. Song et al., 2019; Spruill, 2010), obesity (Brunner et al., 2007; Sinha & Jastreboff, 2013), poor sleep quality (Almojali et al., 2017; Amaral et al., 2018; Galambos et al., 2013; Vincent & Walker, 2000), and an increased cellular aging rate (Ridout et al., 2019).

This is concerning to health professions educators and researchers, since stress levels among health professions students have remained stubbornly high for more than a quarter of a century (Almojali et al., 2017; Alzayyat & Al-Gamal, 2014; Chambers et al., 2016; C. Cole, 1994; Elani et al., 2014; Frazer & Echternach, 1991; Henning et al., 1998; Tisdelle et al., 1984). Additionally, health professional organizations and academic accrediting bodies are calling for increased focus on provider self-care to mitigate burnout issues among health care professionals (Anandarajah et al., 2018; Bodenheimer & Sinsky, 2014; Bowles et al., 2018; M. Cox et al., 2017; Kreitzer & Klatt, 2017). To address this concern, innovative educational design targeting stress management strategies such as MBIs (Bamber & Kraenzle Schneider, 2016; De Vibe et al., 2013; Galante et al., 2018; Greeson et al., 2014; McConville et al., 2017; Warnecke et al., 2011), emotional intelligence development (Birks et al., 2009; Faguy, 2012; Ruiz-Aranda et al., 2014), effective coping strategies (Mahmoud et al., 2015; Reeve et al., 2013; Van Veld et al., 2018), and resiliency training (Mejia-Downs, 2019) are being incorporated into the curricula of health professions programs (Daya & Hearn, 2018; Dobkin & Hutchinson, 2013; Galante et al., 2018; Krasner et al., 2009; Kreitzer & Klatt, 2017; Saunders et al., 2007).

Researchers have examined perfectionism (M. Enns et al., 2001; Henning et al., 1998; Hill & Curran, 2016; Lloyd, Schmidt, Khondoker, & Tchanturia, 2015; Seeliger & Harendza, 2017; M. Smith et al., 2016), stress (Beiter et al., 2015; A. Enns et al., 2018; Jacob et al., 2012; Robotham, 2008; Silverstein & Kritz-Silverstein, 2010), and stress management (Bamber & Kraenzle Schneider, 2016; Chambers et al., 2016; Daya & Hearn, 2018; De Vibe et al., 2013; Lovas et al., 2008; A. Pau et al., 2007; Shapiro SL et al., 1998; van der Riet et al., 2018; Van Veld et al., 2018) in different non-clinical adult populations including undergraduate students and, to some degree, in health professional programs. However, the body of available literature specific to graduate health professions programs remains limited. There are many remaining

gaps in the knowledge of how perfectionism, stress perception, and stress management interact in health professions students. Given that *Maladaptive Perfectionism* was one of the strongest predictors of distress among medical students (Henning et al., 1998), it is critical to examine the prevalence of perfectionism and its impact on other groups. As the entry-level degree for a physical therapist has become more rigorous over the past 30 years (Plack & Wong, 2002), so has the rigor of admittance to DPT programs (PTCAS, 2019). With an applicant pool approaching 20,000 and the number of seats in DPT programs just over 10,000 (PTCAS, 2019), some students may feel the need to strive for perfectionism in order to be considered for admittance. This may result in higher stress levels while matriculating through physical therapy school. This is concerning because if these students do not learn effective stress management strategies while in school, they may be more susceptible to burnout as practicing physical therapists. A better understanding of how perfectionism, stress perception, and stress management interact may assist educators with identifying students at risk for deleterious effects of stress. Additionally, this may support the development of curriculum to teach stress management skills. All of which may ultimately result in healthier, happier students.

## **Method**

### **Study Design**

Investigators conducted a non-experimental study using a single-site, cross-sectional design. Students currently enrolled at the University of North Texas Health Science Center (UNTHSC) in the DPT program in Fort Worth, TX, between the dates of January 1, 2019 and July 31, 2019 (Spring and/or Summer and/or Fall semester 2019 and Classes of 2019-2022) were eligible to be included in the study. The study consisted of an online survey and results from an emotional intelligence assessment administered as part of program requirements. The

Institutional Review Board at UNTHSC approved the study, and a reliance agreement from the University of Indianapolis was put in place prior to any data collection.

### **Participants**

Investigators recruited a convenience sample from the first, second, and third-year DPT students enrolled at UNTHSC. Inclusion criteria for study participation included full-time enrollment as a first-, second-, or third-year student in the DPT program at UNTHSC. Students enrolled part-time in the UNTHSC Physical Therapy program were excluded. Investigators calculated an *a priori* sample size using a G\*Power (Version 3.1.9.2; Faul, Erdfelder, Lang, & Buchner, 2007). The effect size was based on a previously reported effect size of .57 among undergraduate students (Rice & Ashby, 2007). Based on conducting an ANOVA test and the following input parameters: effect size of .50, an alpha of .05, and a power of .80, with two degrees of freedom, and three groups, a sample size of at least 42 was recruited.

### **Data**

During the Spring, Summer and/or Fall 2019 semester, investigators collected participant name, demographics (year in program, gender description, age, and race/ethnicity/origin description), perfectionism score, and perceived stress scores. As part of a campus-wide emotional intelligence initiative, students completed the Emotional Quotient Inventory 2.0 (EQi) during Spring, Summer, and/or Fall 2019 semester. This tool has a Stress Management composite that was utilized for this project. Investigators collected all survey data via a secure online data collection platform. All data was downloaded, cleaned, and imported into IBM SPSS Statistics for Macintosh, Version 21.0 (IBM Corp., Armonk, NY) for analysis.

**Operationalization of variables.** For this study, the Almost Perfect Scale-Revised (APSR) measured perfectionism; the 10-question Perceived Stress Scale (PSS-10) measured

perceived stress; and, the Stress Management composite score from the EQi measured stress management. These are all self-report tools.

The APSR measured perfectionism (Slaney et al., 2001). Investigators classified participants who score less than 42 on the APSR High Standards (APSR-HS) subscale as *Non-Perfectionists*. They also classified participants scoring at least 42 on the APSR-HS subscale and less than 42 on the APSR Discrepancy (APSR-D) subscale as *Adaptive Perfectionists*. Additionally, they classified participants scoring at least 42 on the APSR-HS subscale and at least 42 on the Discrepancy APSR-D subscale as *Maladaptive Perfectionists* (Rice & Ashby, 2007).

The EQi Stress Management (EQi-SM) composite score measured stress management (MHS, 2011b). The EQi contains five composite scores, 15 constructs, and 133 items scored on a five-point Likert scale. It is one of the more widely used self-report measures of emotional intelligence (Faguy, 2012). Investigators used the EQi-SM composite consisting of the Flexibility, Stress Tolerance, and Optimism constructs. This composite is scaled, such that a score of 100 or greater indicates a higher-use skill, and scoring less than 100 indicates a lower-use skill (MHS, 2011c). The updated EQi and the original version have sound reliability and validity (Bar-On, 2004; MHS, 2011b).

The PSS-10 measured perceived stress (Cohen & Williamson, 1988). The PSS-10 is used to measure the frequency of perceived stress over the past month. For the PSS-10, scores range 0 to 40 with higher scores indicating higher levels of perceived stress. Because the PSS-10 is not a diagnostic tool, there are no cut-off scores established (Cohen & Williamson, 1988).

### **Instruments**

The APSR, the EQi-SM, and the PSS-10 measured perfectionism, stress management, and perceived stress, respectively. The APSR is available for research use only. UNTHSC is

using the EQi as part of an emotional intelligence educational initiative. Investigators documented permission of use for both instruments. The PSS-10 is available at no charge for non-commercial research purposes. The investigators completed a formal request and documented permission of use (See Appendices B and C). Although none of the tools below have been validated specifically for DPT students, they have been validated on undergraduate populations.

**Almost Perfect Scale-Revised.** The APSR has 23 items, and this measure includes Discrepancy, High Standards, and Order subscales. The authors have granted permission of use for the APSR in research studies (See Appendix B). Psychometric properties have been established for the APSR among multiple undergraduate populations. Slaney et al. (2001) used samples from three different U.S. universities totaling over 800 students with the mean ages ranging from 19.23 and 21.00. In a different sample of nearly 200 U.S. students with a mean age of 20.30, Suddarth and Slaney (2001) also established psychometrics for the APSR. In a sample of almost 300 students with a mean age of 19.87, Grzegorek, Slaney, Franze, and Rice (2004) studied psychometric properties. Rice and Aldea (2006) used a sample of more than 100 students with a mean age of 19.42. Additionally, Ashby, Rice, and Martin (2006) established psychometric properties in a sample of over 200 U.S. undergraduate students with a mean age of 22.92. For comparison purposes for the outcome measures, the average age of the accepted DPT student was 22.96 (PTCAS, 2019). Although the APSR has not previously been validated using a sample of DPT students, the mean age of physical therapy students and the mean ages from the validation samples are comparable. In addition to comparable ages between the DPT students and the samples used in validation studies, this sample was also higher education students and, therefore, should have similar life demands and responsibilities as the samples used for tool validation.

Using Cronbach's alpha, multiple researchers have reported good to excellent internal consistency for the APSR subscales (Ashby & Rice, 2002; Grzegorek et al., 2004; Rice & Aldea, 2006; Slaney et al., 2001). For example, the subscales ranged from .85 to .92 (Slaney et al., 2001), .84 to .93 (Ashby & Rice, 2002), .82 to .92 (Grzegorek et al., 2004), and .89 to .96 (Rice & Aldea, 2006). Regarding concurrent validity, the APSR-HS subscale correlated with the Self-Oriented Perfectionism subscale (HMPS) at .64 and .55 (Slaney et al., 2001) as well as .66 (Suddarth & Slaney, 2001). Additionally, the APSR-HS subscale correlated with the Personal Standards subscale (FMPS) at .64 (Slaney et al., 2001) and .61 (Suddarth & Slaney, 2001). The APSR-D subscale correlated with the Concerns Over Mistakes subscale (FMPS) at .55 (Slaney et al., 2001), .67 (Suddarth & Slaney, 2001), and .76 (Ashby et al., 2006) as well as with the Doubts About Actions subscale (FMPS) at .62 (Slaney et al., 2001), .66 (Suddarth & Slaney, 2001), and .91 (Ashby et al., 2006). Additionally, the APSR-D subscale correlated with the Socially-Prescribed Perfectionism subscale (HMPS) at .64 (Suddarth & Slaney, 2001).

Test-retest reliability has been established for this measure among U.S. undergraduate students. Grzegorek, Slaney, Franze, and Rice (2004) found adequate subscale correlations over a three week period: .72 for APSR-HS, .92 for APSR-D, and .80 for Order. Additionally, Rice and Aldea (Rice & Aldea, 2006) produced test-retest reliability over an 8-10 week period in a sample of greater than 100 students of .76 to .87 for the APSR subscales.

**Emotional Quotient Inventory 2.0.** The authors and distributors of the EQi reported data collection on over 10,000 participants in 2009-2010 in order to establish validity and reliability. The authors reported sound reliability with high internal consistency and test-retest reliability (MHS, 2011b). The internal consistency (Cronbach alpha) for the total score was .97, the range for the five composite scores was .88 to .93, and all subscales were at least .77 (MHS, 2011b). Specifically, the EQi-SM internal consistency for the 18-29 year-old normative group

was .90 (overall internal consistency was .92). Furthermore, internal consistency of the EQi-SM subscales for the 18-29 year-old normative group was as follows: Flexibility .78 (overall internal consistency was .80), Stress Tolerance .86 (overall internal consistency was .87), and Optimism .88 (overall internal consistency was .89) (MHS, 2011a). Additionally, test-retest ranged .81 to .92 for the total score, composite test-retest scores ranged from .83 to .91, and subscale scores ranged from .70 to .89 (MHS, 2011b). Specifically, the EQi-SM test-retest was .90 for 2-4 weeks and .78 for 8 weeks. Furthermore, test-retest of the EQi-SM subscales was as follows: Flexibility .85 for 2-4 weeks and .70 for 8 weeks, Stress Tolerance .85 for 2-4 weeks and .75 for 8 weeks, and Optimism .88 for 2-4 weeks and .80 for 8 weeks (MHS, 2011a).

Additionally, the creators reported appropriate content validity, correlations, and expected differences among different groups (MHS, 2011c). Confirmatory Factor Analysis results for the EQi-SM were as follows: Goodness of Fit Index .94, Adjust Goodness of Fit Index .91, Normed Fit Index .94, Non-Normed Fit Index .93, Comparative Fit Index .95, and Root Mean Square Error of Approximation .08 (MHS, 2011a). Correlations between the EQi composites were appropriately sized, indicating the assessment of a common characteristic, but not so high as to indicate measurement redundancy. The correlations between the EQi-SM and the other composites of the EQi were as follows: Self-Perception .78, Self-Expression .67, Interpersonal .63, and Decision Making .73. As for the correlations of the EQi-SM Subscales (Flexibility, Stress Tolerance, Optimism), these ranged from .48 - .58 (MHS, 2011a).

For construct validity, specifically convergent validity, the EQi showed strong correlations with the original Emotional Quotient Inventory (Bar-On, 2004) total score (.90) and for the subscales of the EQi-SM (.67-.79; MHS, 2011a). In comparison with the Social Skills Inventory, which measures emotional and social communication skills (Riggio & Carney, 2003), the total score of the EQi showed a moderate correlation of .54 with the total score from the

Social Skills Inventory. Additionally, the EQi-SM showed a moderate correlation of .59 with the Total Control Scale and no correlation (-.03) with the Total Sensitivity Scale from the Social Skills Inventory (MHS, 2011a). In comparison with the Mayer-Salovey-Caruso Emotional Intelligence Test, which measures abilities relating to emotional intelligence (Mayer, Salovey, Caruso, & Sitarenios, 2003), the total score of the EQi showed only a weak correlation of .12 with the total score from the Mayer-Salovey-Caruso Emotional Intelligence Test. Additionally, the EQi-SM showed only a weak correlation of .14 with the Managing Emotions branch score from the Mayer-Salovey-Caruso Emotional Intelligence Test (MHS, 2011a).

In summary, the EQi has proven to be a valid and reliable measure of emotional intelligence, including the EQi-SM score (MHS, 2011b, 2011c, 2011a). The EQi-SM score demonstrated appropriate internal consistency for the 18-29 year-old normative group as well as appropriate test-retest reliability at both 2-4 weeks and eight-week timeframes (MHS, 2011a). Additionally, the validity of the EQi-SM reflected appropriate convergence with similar measures (MHS, 2011b).

**Perceived Stress Scale.** The PSS-10 was used for this study. The authors have granted permission of use for the PSS-10 in academic research studies (See Appendix C). Internal consistency reported using Cronbach's alpha was reported as good to excellent in three different samples from U.S. students with mean ages of 23.80, 20.23, and 22.44, respectively. The total scores were .89 (Roberti, Harrington, & Storch, 2006), .85 (Chao, 2012), and .92 (Deatherage, Servaty-Seib, & Aksoz, 2014). Roberti et al. (2006) also explored convergent validity between the PSS-10 and the State-Trait Anxiety Inventory-Trait Version (STAI-T) and reported that the PSS-10 correlated with STAI-T: Total score at .73, STAI-T: Anxiety subscale at .59, and STAI-T: Depression subscale at .72.

## **Procedures**

**Recruitment.** Participants were recruited from UNTHSC DPT cohorts from the classes of 2019-2022. Participants completed the surveys at their convenience using an internet-connected device. Using the online learning management system and university-issued email addresses, potential participants were provided information regarding the overview and purpose of the research as well as links to access the survey. Recruitment was timed with the administration of the EQi, which is part of a university-wide initiative and occurred during the Spring, Summer, and Fall 2019 semesters.

**Informed consent.** As part of the online platform housing the surveys, the potential participants were initially required to consent to participate via a consent form housed on a secure online data collection portal (e.g., Qualtrics, REDCap) (see Appendix D) prior to having access to the surveys. They had the option to agree to or decline participation in this study. Only after the potential participant indicated their consent/agreement by checking a box at the end of the survey, were they able to access the survey questions.

**Testing procedures.** All outcomes data and demographics were collected using online surveys distributed through a secure online data collection portal (e.g., Qualtrics, REDCap). The APSR and the PSS-10 surveys were counterbalanced; however, the order of items on each tool was not counterbalanced. The EQi, including the EQi-SM, was completed previously as part of the unrelated emotional intelligence initiative. Participants accessed the online surveys through a web address or QR code and that was distributed to the participants via posting the link into an announcement on the online learning management system provided by UNTHSC. Participation was voluntary and could be discontinued at any time. Because the items of PSS-10 use a timeframe of the past month, the PSS-10 and APSR were available to participants for 30 days from the date of administration of the EQi. Any survey that was not completed was discarded and not included in the analysis. Any completed survey was considered for at least descriptive

statistical analysis; however, was not included in the correlational analysis if not all three surveys are completed.

The EQi-SM was used for correlational analysis with perfectionism and perceived stress in this study. Students had the opportunity to complete the EQi in the Physical Therapy Department at UNTHSC. It takes 20-30 minutes to complete (MHS, 2011c). Both the APSR and PSS-10 are estimated to take 5-10 minutes each.

### **Data Management**

Participant names and data were confidentially collected and managed using a secure online data collection portal (e.g., Qualtrics, REDCap). Since participants provided names and took the EQi at a different time than APSR and PSS-10, data were collected with an identifier (student name) so that survey results and EQi scores could be linked. An independent coder assigned unique identifiers to the data so that members of the research team conducting analyses were blinded to students' EQi scores. Researchers conducting data collection involving the EQi-SM provided participants these results per their protocol, including following up with a certified coach upon request. Researchers placed individual results from the APSR and PSS-10 in envelopes with the corresponding assigned unique identifier. Using the assigned unique identifier, participants can obtain APSR and PSS-10 results from administrative personnel upon request as well. The participant report included the raw scores for both surveys, description of the PSS-10 tool, and the APSR classification of *Adaptive* or *Maladaptive Perfectionist*, including the scoring cut-offs. See the operationalization of variables section for details. Additionally, the participant report included contact information for campus wellness services.

Individuals who consented to participate in the study accessed the surveys via a URL. Data stored on a secure online data collection portal (e.g., Qualtrics, REDCap) was accessible only to the listed key personnel specifically designated and authorized by the Principal

Investigator. Data were downloaded from the secure online data collection portal (e.g., Qualtrics, REDCap) in password-protected files and stored on UNTHSC secure servers only accessible to authorized study personnel.

All personnel were properly trained and supervised regarding the management and handling of confidential materials. Data collected from participants who withdrew, or were withdrawn, was destroyed. At the completion of this research, all data will be destroyed. The Principal Investigator assumes full responsibility for such training, supervision, and conduct.

### **Data Analysis**

Descriptive statistics were used to describe the sample (e.g., age, year in program, gender identification, and race/ethnicity/origin description). In addition, student characteristics and outcomes (APSR, EQi, and PSS-10) were compared by student year to test for differences. If verified as similar, then their data was combined for analysis. Nominal data were reported as frequencies and percentages. Interval and ratio data were presented as means and standard deviations when they were normally distributed, or medians and interquartile ranges when they were non-normally distributed. All comparisons were two-tailed, and a significance level of less than .05 was considered statistically significant.

The investigators used pairwise deletion to exclude participant data from research question one data analysis when any student characteristic data was missing. For the PSS-10, investigators used pairwise deletion for research question two unless at least 80% of the items were completed. When a participant completed at least 80%, but less than 100% of the PSS-10 items, then investigators used average imputation for the missing data and included the data in data analysis. The missing data plan for the APSR was similar; however, a participant must complete at least 80% of the items on both the APSR-HS and the APSR-D subscales to be included. When either subscale was less than 80% of the items completed, then the investigators

used casewise deletion to exclude participant data from all analyses because all research questions include perfectionism in the analysis.

RQ1: Was there a statistically significant difference in perfectionism level as measured on the APSR-HS subscale by student characteristic (year in program, gender description, and race/ethnicity/origin description) among DPT students at a public university in Texas?

For research question one, investigators used a three-way ANOVA test (e.g., factorial ANOVA) to compare student characteristics. Test assumptions for this test included only one continuous level dependent variable; three independent variables with each consisting of at least two categorical, independent groups; independence of observations; no significant outliers in any cell; approximately normal distribution for each cell of the dependent variable; and homogeneity of variances. Boxplots identified significant outliers, the Shapiro-Wilk test determined normality of data, and the Levene's test assessed equality of variance (Field, 2014a; Kellar & Kelvin, 2013a).

When boxplots indicated significant outlier(s), the analysis continued with and without the outlier(s) to determine if the outlier(s) substantially affected the results. If significant outlier(s) did not significantly impact results, then results included the outlier(s). However, if the outlier(s) substantially affect the results, then a less extreme value (e.g., the next largest value) replaced the outlier(s), and data analysis continued. If, after modification of the significant outlier(s), the data remained non-normally distributed and/or lacked homogeneity of variance, then the investigators transformed all data for this variable and re-ran the tests of assumption. If the transformed outlier(s) still substantially affected the results, then the investigators did not include the outlier(s) in the analysis (Field, 2014e).

RQ1a: Was student characteristic predictive of perfectionism subtype (*Adaptive* or *Maladaptive*) among DPT students at a public university in Texas?

For research question 1a, investigators used a binomial logistic regression to determine if student characteristic was predictive of perfectionism subtype. This binomial regression analysis was exploratory only and was secondary to answering the primary research question. Test assumptions for this test included only one, dichotomous dependent variable; at least one independent variable that was continuous or nominal; independence of observations and the dependent variable as well as all nominal independent variables were mutually exclusive; at least 15 cases per independent variable; linearity between any continuous independent variables and the logit transformation of the dependent variable; no multicollinearity present among independent variables; and no significant outliers. The Shapiro-Wilk test determined the normality of data and the Tolerance Collinearity Statistics table assessed for multicollinearity among independent variables. Additionally, Casewise Diagnostics tested for outliers (Field, 2014b; Kellar & Kelvin, 2013b).

Researchers used tests of assumption to determine which independent variables to include in the regression analysis. Researchers applied a Bonferroni correction to all five independent variables resulting in a statistical significance being accepted when  $p < .01$  (Tabachnick & Fidell, 2014). Any independent variable that failed to meet this threshold was not be included in the regression model. Researchers used a bivariate correlation to assess the assumption of multicollinearity. When Pearson's  $r$  was less than .85, investigators assumed no multicollinearity issues among independent variables. However, when Pearson's  $r$  was .85 or greater between two independent variables, the independent variable that had a weaker correlation with the dependent variable was excluded.

RQ2: Were there statistically significant associations between perfectionism level as measured on the APSR-HS and perceived stress as measured by the PSS-10 among students enrolled in a DPT program at a public university in Texas?

For research question two, investigators completed a bivariate correlation to determine associations between perfectionism level and perceived stress. A Scatterplot determined the linearity of data and outliers. The Shapiro-Wilk test determined normality of data. When residuals were normally distributed, then investigators assumed homoscedasticity. The Pearson's correlation analyzed linear data that were normally distributed with homoscedasticity and no significant outliers. The Spearman Rho analyzed linear data with significant outliers. Finally, a Phi Correlation analyzed non-linear data.

RQ2a: Was perceived stress predictive perfectionism subtype among students enrolled in a DPT program at a public university in Texas?

For research question 2a, investigators used a binomial logistic regression to determine if perceived stress was predictive of the perfectionism subtype. This binomial regression analysis was exploratory only and was secondary to answering the primary research question. Test assumptions for this test included only one, dichotomous dependent variable; at least one independent variable that was continuous or nominal; independence of observations and the dependent variable as well as all nominal independent variables were mutually exclusive; at least 15 cases per independent variable; linearity between any continuous independent variables and the logit transformation of the dependent variable; no multicollinearity present among independent variables; and no significant outliers. The Shapiro-Wilk test determined normality of data and the Tolerance Collinearity Statistics table assessed for multicollinearity among independent variables. Additionally, Casewise Diagnostics tested for outliers (Field, 2014b; Kellar & Kelvin, 2013b).

Researchers used tests of assumption to determine which independent variables to include in the regression analysis. Researchers applied a Bonferroni correction to all five independent variables resulting in a statistical significance being accepted when  $p < .01$

(Tabachnick & Fidell, 2014). Any independent variable that failed to meet this threshold was not be included in the regression model. Researchers used a bivariate correlation to assess the assumption of multicollinearity. When Pearson's  $r$  was less than .85, investigators assumed no multicollinearity issues among independent variables. However, when Pearson's  $r$  was .85 or greater between two independent variables, the independent variable that had a weaker correlation with the dependent variable was excluded.

RQ3: Were there statistically significant associations between perfectionism level as measured on APSR-HS and stress management as measured by the EQi-SM score among students enrolled in a DPT program at a public university in Texas?

For research question three, investigators completed a bivariate correlation to determine associations between perfectionism level and stress management. A Scatterplot determined the linearity of data and outliers. The Shapiro-Wilk test determined the normality of data. When residuals were normally distributed, then investigators assumed homoscedasticity. The Pearson's correlation analyzed linear data that were normally distributed with homoscedasticity and no significant outliers. The Spearman Rho analyzed linear data with significant outliers. Finally, a Phi Correlation analyzed non-linear data.

RQ3a: Was stress management predictive of perfectionism subtype among students enrolled in a DPT program at a public university in Texas?

For research question 3a, investigators used a binomial logistic regression to determine if stress management was predictive of the perfectionism subtype. This binomial regression analysis was exploratory only and was secondary to answering the primary research question. Test assumptions for this test included only one, dichotomous dependent variable; at least one independent variable that was continuous or nominal; independence of observations and the dependent variable as well as all nominal independent variables were mutually exclusive; at least

15 cases per independent variable; linearity between any continuous independent variables and the logit transformation of the dependent variable; no multicollinearity present among independent variables; and no significant outliers. The Shapiro-Wilk test determined the normality of data and the Tolerance Collinearity Statistics table assessed for multicollinearity among independent variables. Additionally, Casewise Diagnostics tested for outliers (Field, 2014b; Kellar & Kelvin, 2013b).

Researchers used tests of assumption to determine which independent variables to include in the regression analysis. Researchers applied a Bonferroni correction to all five independent variables resulting in a statistical significance being accepted if  $p < .01$  (Tabachnick & Fidell, 2014). Any independent variable that failed to meet this threshold was not included in the regression model. Researchers used a bivariate correlation to assess the assumption of multicollinearity. If Pearson's  $r$  was less than .85, investigators assumed no multicollinearity issues among independent variables. However, if Pearson's  $r$  was .85 or greater between two independent variables, the independent variable that had a weaker correlation with the dependent variable was excluded.

## Results

A total of 163 (91.56%) students enrolled in a DPT program at a public university in Texas consented to participate in this study. Only one participant did not select 'male' or 'female' for gender description and was excluded only during analyses involving gender categories. Additionally, three participants had decelerated in the program and had previously taken the EQi-SM composite. Since their experiences may have qualitatively differed from their current classmates, their data were excluded during analyses involving the EQi-SM composite. Two of the participants who decelerated did not complete the PSS-10 or the APSR. Therefore, their data were excluded from all analyses. The other student who decelerated completed the

PSS-10 and APSR. Since that participant had not previously taken those measures, those data were included in analysis involving PSS-10 and APSR. Table 2 lists each cohort's overall participation rates. For nominal data (e.g., gender description, race/ethnicity/origin description, and perfectionism category), investigators used chi-square tests of independence to determine if there were between group differences among the following cohorts of students enrolled in a DPT program: beginning first-year students ( $Y_0$ ), ending first-year students ( $Y_1$ ), ending second-year students ( $Y_2$ ), and ending third-year students ( $Y_3$ ). The investigators visually inspected the histograms to screen the data for outliers. The Shapiro-Wilk Test of normality revealed that the distribution of scores for neither the APSR-HS, APSR-D, PSS-10, nor EQi-SM composite were normally distributed at a  $p = .05$  level among all student cohorts. Using APSR-D as an example,  $Y_0$  ( $p = .19$ ),  $Y_1$  ( $p = .20$ ), and  $Y_2$  ( $p = .20$ ) were normally distributed; however,  $Y_3$  ( $p < .01$ ) was not. Therefore, investigators used Kruskal-Wallis tests to determine if there were between group differences among the same cohorts of students.

### **General Participant Characteristics**

The sample of 163 students reported being predominately female (66.26%), White (61.96%), from a suburban community (63.19%), with a mean age of 24.36 years. Tables 2 and 3 contain additional sample demographics.

**Gender description.** Participants selected one of five options for 'gender description': 'male', 'female', 'transgender', 'not identified', and 'prefer no answer'. All but one student selected 'male' or 'female.' At an alpha of .05, the Pearson chi-square test  $X^2(3, N = 162) = 3.02, p = .39$  indicated that there was no statistical difference in self-reported gender categories between these four student cohorts. The overall effect size was small ( $d = .28$ ). Since there were only two groups (male and female), a pair-wise post hoc analysis was not justified. For this sample overall, 66.26% identified as women, 33.13% as men, and 0.61% preferred not to

answer. For comparison, national averages for DPT students were 61.75% women, 38.21% men, and .05% ‘other/no answer’ (Commission on Accreditation in Physical Therapy Education [CAPTE], 2019). Additional national averages for accepted DPT applicants were 61.36% women, 38.55% men, and .09% ‘declined’ to answer (PTCAS, 2019).

**Race/Ethnicity/Origin description.** The ‘race/ethnicity/origin description’ category consisted of ‘White’, ‘Hispanic, Latino, or Spanish Origin’, ‘Black or African American’, ‘Asian’, ‘American Indian or Alaska Native’, ‘Middle Eastern or North African’, ‘Native Hawaiian or Pacific Islander’, and ‘Some other race, ethnicity, or origin’. However, no students selected ‘Native Hawaiian or Pacific Islander.’ Additionally, the ‘White’ and ‘Hispanic, Latino, or Spanish Origin’ categories were the only cells that consistently reached the five-case threshold. Therefore, the self-reported ‘race/ethnicity/origin description’ categories were collapsed into ‘White’ and ‘Other.’ Table 3 contains race/ethnicity/origin description details. At an alpha of .05 level, the Pearson chi-square test  $X^2(3, N = 163) = 1.09, p = .78$  indicated that there was no statistical difference in self-reported ethnicity, race, and origin (White, Other) categories between these four student cohorts. The overall effect size was small ( $d = .16$ ). Since there were only two groups (White, Other), a pair-wise post hoc analysis was not justified. An alpha of .05 revealed no significant between cohort differences among White and Other categories. For this sample overall, 61.96% self-reported as ‘White or Caucasian,’ 15.34% as ‘Hispanic, Latino, or Spanish,’ 9.20% as ‘Asian,’ 4.91% as ‘Black or African-American,’ and 6.75% selected more than one category. For comparison, national averages for DPT students were 74.57% self-reported as ‘White or Caucasian,’ 6.53% as ‘Hispanic, Latino, or Spanish,’ 8.91% as ‘Asian, and 3.39% as ‘Black or African-American.’ Data for ‘Two or more races’ were not available (CAPTE, 2019). Additional national averages for accepted DPT applicants were 69.88% self-reported as ‘White or Caucasian,’ 8.38% as ‘Hispanic, Latino, or Spanish,’ 9.26% as

'Asian,' 3.56% as 'Black or African-American,' and 3.13% as '2+Race/Ethnicity Designations' (PTCAS, 2019).

### **Participant Outcome Measures**

**Perfectionist type.** The APSR has 23 items and includes Discrepancy, High Standards, and Order subscales. The investigators used previous scoring cut-offs involving the interaction of the APSR-D and APSR-HS subscales to categorize participants as *Adaptive* or *Maladaptive Perfectionist* (Rice & Ashby, 2007). Appendix A conceptually describes the categorization of *Adaptive*, *Maladaptive*, or *Non-Perfectionist* (see the Operationalization of Variables section in Chapter III for details). Since these data ( $n = 163$ ) are considered at a nominal level, a non-parametric chi-square test was used to determine if there was a between-groups difference in perfectionist type among student cohorts. At an alpha of .05 level, the Pearson chi-square test  $\chi^2(6, N = 163) = 10.07, p = .12$  indicated that there was no statistical difference in perfectionist type between the four student cohorts. The overall effect size was medium ( $d = .51$ ). Pair-wise post hoc analysis, with the Fisher's exact test and Bonferroni correction at an adjusted alpha  $< .02$ , revealed no significant between cohort differences among perfectionist type categories. Table 4 contains perfectionist type details.

**Almost Perfect Scale Revised High Standards.** The APSR-HS is a subscale of the APSR and has seven items ranging in score from 7-49. Scores less than 42 were categorized as *Non-Perfectionists*, and scores 42 and greater were categorized as *Perfectionists* (Rice & Ashby, 2007). Appendix A conceptually describes the role of APSR-HS in categorizing a participant as a *Perfectionist* or *Non-perfectionist* (see the Operationalization of Variables section in Chapter III for details). Since the data ( $n = 163$ ) were not normally distributed, a non-parametric Kruskal Wallis test was used to determine if there was a between group difference in APSR-HS subscale scores. The APSR-HS subscale median score for  $Y_0$  was 46.0, for  $Y_1$  was 43.0, for  $Y_2$  was 42.0,

and for  $Y_3$  was 43.0. Table 5 contains APSR-HS details. The Kruskal Wallis test,  $X^2(3, N = 163) = 11.72, p = .01$  indicated there was a significant difference in APSR-HS subscale scores between cohorts of students. The overall effect size was medium ( $d = .56$ ). The pair-wise post hoc analysis, with the Mann-Whitney U test and the Bonferroni correction at an adjusted alpha  $< .01$  revealed differences in APSR-HS subscale scores between  $Y_0$  and  $Y_2$  only. The median difference of 4.0 between starting  $Y_0$  and  $Y_2$  and the reported Mann-Whitney U test  $p$  value of  $< .01$  indicated statistical difference. There were no differences in APSR-HS subscale scores between any other cohorts of students.

**Almost Perfect Scale Revised Discrepancy.** The APSR-D is a subscale of the APSR and has 12 items ranging in score from 12-84. After the APSR-HS was used to categorize a participant as a *Perfectionist*, then the APSR-D can further categorize the *Perfectionists* as an *Adaptive Perfectionist* if the APSR-D score was less than 42 or *Maladaptive Perfectionist* if the APSR-D score was 42 and greater (Rice & Ashby, 2007). Appendix A conceptually describes the role of APSR-D in categorizing a participant as an *Adaptive* or *Maladaptive Perfectionist* (see the Operationalization of Variables section in Chapter III for details). Since the data ( $n = 163$ ) were not normally distributed, a non-parametric Kruskal Wallis test was used to determine if there was a between group difference in APSR-D subscale scores. The APSR-D subscale median score for  $Y_0$  was 38.5, for  $Y_1$  was 31.0, for  $Y_2$  was 38.0, and for  $Y_3$  was 35.0. Table 5 contains APSR-D details. The Kruskal Wallis test,  $X^2(3, N = 163) = 9.51, p = .02$  indicated there was a significant difference APSR-D subscale scores between cohorts of students. The overall effect size was medium ( $d = .50$ ). The pair-wise post hoc analysis, with the Mann-Whitney U test and the Bonferroni correction at an adjusted alpha  $< .01$ , revealed differences in APSR-D subscale scores between  $Y_0$  and  $Y_1$  only. The median difference of 7.5 between starting  $Y_0$  and

$Y_1$  and the reported Mann-Whitney U test  $p$  value of  $< .01$  indicated statistical difference.

There were no differences in APSR-D subscale scores between any other cohorts of students.

**Perceived Stress Scale.** The PSS-10 ranges in score from 0-40 in which lower scores indicate lesser perceived stress (Cohen & Williamson, 1988). Since the data ( $n = 163$ ) were not normally distributed, the non-parametric Kruskal Wallis test was used to determine if there was a between group difference in PSS-10 scores. The PSS-10 median score for  $Y_0$  was 13.5, for  $Y_1$  was 11.0, for  $Y_2$  was 16.0, and for  $Y_3$  was 16.0. Table 6 contains PSS-10 details. The Kruskal Wallis test,  $X^2(3, N = 163) = 30.29, p < .01$  indicated there was a significant difference PSS-10 scores between these cohorts of students. The overall effect size was large ( $d = .96$ ). The pairwise post hoc analyses, with the Mann-Whitney U test and the Bonferroni correction at an adjusted alpha of  $< .01$  revealed differences in PSS-10 between cohorts  $Y_0$  and  $Y_3$ ,  $Y_1$  and  $Y_2$ , as well as  $Y_1$  and  $Y_3$ . The median difference of 2.5 between starting  $Y_0$  and  $Y_3$  and the reported Mann-Whitney U test  $p$  value of  $< .01$  indicated statistical difference. The median difference of 5.0 between the ending  $Y_1$  and the  $Y_2$  groups and the reported Mann-Whitney U test  $p$  value of  $< .01$  indicated statistical difference. The median difference of 5.0 between the ending  $Y_1$  and the  $Y_3$  groups and the reported Mann-Whitney U test  $p$  value of  $< .01$  indicated statistical difference. There were no differences in PSS-10 scores between  $Y_0$  and  $Y_1$ ,  $Y_0$  and  $Y_2$ , as well as  $Y_2$  and  $Y_3$ .

**Emotional Quotient Inventory-Stress Management composite score.** The EQi-SM composite is scaled, such that a score of 100 or greater indicates a higher-use skill, and scoring less than 100 indicates a lower-use skill (MHS, 2011c). Since the data ( $n = 160$ ) were not normally-distributed, a non-parametric Kruskal Wallis test was used to determine if there was a between group difference in EQi-SM composite scores. The EQi-SM composite median score for  $Y_0$  was 107.0, for  $Y_1$  was 105.5, for  $Y_2$  was 105.5, and for  $Y_3$  was 105.0. Table 7 contains

EQi-SM details. The Kruskal Wallis test,  $X^2(3, N = 160) = .81, p = .85$  indicated there was not a significant difference in EQi-SM composite scores between cohorts of students.

### **Effects of Student Characteristic on Perfectionism**

The investigators chose a three-way ANOVA rather than a MANOVA because neither the APSR-HS nor APSR-D subscales data were normally distributed and therefore, violated the normal distribution MANOVA requirement (Field, 2014c; Kellar & Kelvin, 2013a).

Furthermore, there was little, if any association for unaltered data ( $r_s = .05, p = .50$ ), modified data ( $r_s = .05, p = .49$ ), or transformed data ( $r_s = .05, p = .50$ ). Therefore, the APSR-HS and APSR-D violated the moderate correlation assumption required by MANOVA as well (Kellar & Kelvin, 2013a).

**Almost Perfect Scale Revised High Standards subscale score.** Investigators used a three-way ANOVA to determine the effects of year in program, gender description, and race/ethnicity/origin description on perfectionism in a sample of 163 students. Initially, there were three outliers assessed as a value more than 1.5 box-lengths and no more than 3 box-lengths as well as two extreme outliers assessed as a value more than 3 box-lengths (Field, 2014e).

Perfectionism APSR-HS subscale scores were not normally distributed ( $p > .05$ ) for five groups ( $Y_0$  White males,  $p = .02$ ;  $Y_0$  White females,  $p < .01$ ;  $Y_1$  White males,  $p < .01$ ;  $Y_1$  Other females,  $p < .05$ ;  $Y_3$  White females,  $p = .01$ ) as assessed by Shapiro-Wilk's test for normality.

Furthermore, there was homogeneity of variances, as assessed by Levene's test for equality of variances based on medians,  $p = .31$ , but not based on means,  $p = .01$ . There was a statistically-significant three-way interaction between student characteristics ( $F(3,146) = 2.69, p < .05$ ), but there were no two-way interactions accepted at the  $p < .03$  level (year in program, gender,  $F(3,146) = .09, p = .97$ ; year in program, White/Other,  $F(3,146) = 1.11, p = .35$ ; gender, White/Other,  $F(3,146) = .08, p = .78$ ). However, because of the previously mentioned issues and

because the data were moderately, negatively skewed, the investigators applied a square-root reverse data transformation (Field, 2014e).

This transformation improved homogeneity of variances, as assessed by Levene's test for equality of variances based on means,  $p = .12$  and decreased the number of not normally distributed ( $p > .05$ ) groups as measured by the APSR-HS subscale and as assessed by Shapiro-Wilk's test for normality to three ( $Y_0$  White females,  $p = .02$ ;  $Y_1$  White males,  $p < .01$ ;  $Y_1$  Other females,  $p = .02$ ). However, the transformed data increased the number of outliers assessed as a value more than 1.5 box-lengths and no more than 3 box-lengths to 12 and more importantly, there was no longer a statistically significant three-way interaction between student characteristics  $F(3,146) = 2.18, p = .09$ . Therefore, the investigators next modified the outliers to less extreme values. In order to maintain the value ranking, the investigators changed the outlier value to just larger or smaller than the nearest non-extreme value (Field, 2014e).

After modifying the outliers, there was only one remaining outlier assessed as a value more than 1.5 box-lengths and no more than 3 box-lengths. Perfectionism APSR-HS subscale scores were normally distributed ( $p > .05$ ) except for four groups ( $Y_0$  White males,  $p = .02$ ;  $Y_0$  White females,  $p < .01$ ;  $Y_1$  White males,  $p < .01$ ;  $Y_1$  Other females,  $p < .05$ ) as assessed by Shapiro-Wilk's test for normality. There was homogeneity of variances, as assessed by Levene's test for equality of variances based on median,  $p = .09$ , but not based on means,  $p < .01$ . Similar to the original data, after modifying the outliers, there was a statistically significant three-way interaction between year in program, gender, and White/Other,  $F(3,146) = 3.73, p = .01$ . However, there were no two-way interactions accepted at the  $p < .03$  level (year in program, gender,  $F(3,146) = .15, p = .93$ ; year in program, White/Other,  $F(3,146) = 1.55, p = .20$ ; gender, White/Other,  $F(3,146) = .35, p = .55$ ). Therefore, even after modifying the outliers, no statistical difference in perfectionism level was found by student characteristic in this sample.

**Almost Perfect Scale Revised Discrepancy subscale score.** The investigators used a three-way ANOVA to determine the effects of year in program, gender description, and race/ethnicity/origin description on perfectionism using the APSR-D subscale. There was not a statistically significant three-way interaction between year in program, gender, and White/Other,  $F(3,146) = .30, p = .83$ . There were no two-way interactions accepted at the  $p < .03$  level (year in program, gender,  $F(3,146) = .69, p = .56$ ; year in program, White/Other,  $F(3,146) = .56, p = .64$ ; gender, White/Other,  $F(3,146) = .04, p = .84$ ). Additionally, there were seven outliers assessed as a value more than 1.5 box-lengths and no more than 3 box-lengths. Perfectionism APSR-D subscale scores were normally distributed ( $p > .05$ ) except for three groups (Y<sub>3</sub> White males,  $p = .01$ ; Y<sub>3</sub> Other males,  $p = .03$ ; Y<sub>3</sub> White females,  $p = .03$ ) as assessed by Shapiro-Wilk's test for normality. Furthermore, there was homogeneity of variances, as assessed by Levene's test for equality of variances based on medians,  $p = .79$  and based on means,  $p = .29$ . Because of these issues and because the data were moderately, positively skewed, the investigators next applied a square-root data transformation (Field, 2014e).

This transformation reduced the number of outliers from seven to five and reduced the number of groups that were not normally distributed ( $p > .05$ ) from three to two groups (Y<sub>3</sub> White males,  $p = .03$  and Y<sub>3</sub> Other males,  $p = .04$ ). The homogeneity of variances, as assessed by Levene's test for equality of variances based on means,  $p = .38$  and medians,  $p = .74$  remained significant. Similar to the non-transformed data, there was not a statistically significant three-way interaction between year in program, gender, and White/Other,  $F(3,146) = .34, p = .80$ , nor were there any two-way interactions accepted at the  $p < .03$  level (year in program, gender,  $F(3,146) = .93, p = .43$ ; year in program, White/Other,  $F(3,146) = .47, p = .71$ ; gender, White/Other,  $F(3,146) = .07, p = .80$ ). Therefore, the investigators next modified the outliers to

less extreme values. In order to maintain the value ranking, the investigators changed the outlier value to just larger or smaller than the nearest non-extreme value (Field, 2014e).

After modifying the outliers, there was only one remaining outlier assessed as a value more than 1.5 box-lengths and no more than 3 box-lengths. Perfectionism APSR-D subscale scores were normally-distributed ( $p > .05$ ) for all groups except for the same three groups as the non-modified data ( $Y_3$  White males,  $p = .03$ ;  $Y_3$  Other males,  $p = .03$ ;  $Y_3$  White females,  $p = .03$ ) as assessed by Shapiro-Wilk's test for normality. Unlike the non-transformed data, after modifying the outliers, there was homogeneity of variances, as assessed by Levene's test for equality of variances based on medians,  $p = .33$ , but no longer based on means,  $p = .03$ . Similar to the original data, after modifying the outliers, there was not a statistically-significant three-way interaction between year in program, gender, and White/Other,  $F(3,146) = .21, p = .89$ . Additionally, there were no two-way interactions at the  $p < .03$  level (year in program, gender,  $F(3,146) = .93, p = .43$ ; year in program, White/Other,  $F(3,146) = .70, p = .55$ ; gender, White/Other,  $F(3,146) = .01, p = .92$ ). Therefore, even after modifying the outliers from the APSR-D data, no statistical difference in perfectionism level was found by student characteristic in this sample.

### **Association in Perfectionism with Perceived Stress**

Investigators performed bivariate correlations to determine if there was an association between perfectionism and perceived stress in a sample of 163 students. The APSR-HS were not normally-distributed ( $p < .01$ ) and did not meet the assumption of a linear relationship via visual examination of the scatterplot. The investigators modified the outliers to less-extreme values per individual class. In order to maintain the value ranking, the investigators changed the outlier value to just larger or smaller than the nearest non-extreme value (Field, 2014e). Again, the modified APSR-HS values were not normally-distributed ( $p < .01$ ) and did not meet the

assumption of a linear relationship via visual examination of the scatterplot. Next, the investigators excluded the *Non-Perfectionists* and only included the *Adaptive* and *Maladaptive Perfectionists* ( $n = 108$ ). Again, the APSR-HS values were not normally-distributed ( $p < .01$ ); but the assumption of a linear relationship via visual examination of the scatterplot was met. However, there was no association between APSR-HS and PSS-10 ( $r_s = .08, p = .40$ ). Finally, the investigators evaluated the association of the APSR-D subscale and the PSS-10 using the full sample ( $n = 163$ ). Similar to the results using the APSR-HS values, the APSR-D values were not normally-distributed ( $p < .01$ ). However, the linearity assumption was met via visual examination of the scatterplot. Additionally, there was a moderate, direct association ( $r_s = .51, p < .01$ ) of PSS-10 and APSR-D among participants in this sample.

### **Association in Perfectionism with Stress Management**

Investigators performed bivariate correlations to determine within a sample of 160 students if there was an association between perfectionism and stress management. Two students were excluded because they decelerated in the program and had previously taken the EQi-SM, and one case was missing data. As previously noted, the APSR-HS were not normally-distributed ( $p < .01$ ) and did not meet the assumption of a linear relationship via visual examination of the scatterplot. The investigators modified the outliers to less-extreme values per individual class in order to maintain the value ranking (Field, 2014e). Again, the modified APSR-HS values were not normally-distributed ( $p < .01$ ); however, there was a linear relationship via visual examination of the scatterplot. However, there was no association between APSR-HS and EQi-SM ( $r_s = .15, p = .06$ ). Next, the investigators excluded the *Non-Perfectionists* and only included the *Adaptive* and *Maladaptive Perfectionists* ( $n = 107$ ). Again, the APSR-HS values were not normally-distributed ( $p < .01$ ) and did not meet the assumption of a linear relationship via visual examination of the scatterplot.

The investigators evaluated the association between the APSR-D subscale and the EQi-SM ( $n = 160$ ). Similar to the results using the APSR-HS values, the APSR-D values were not normally-distributed ( $p < .01$ ). However, the linearity assumption was met via visual examination of the scatterplot. There was a weak, indirect association between EQi-SM and APSR-D ( $r_s = -.38, p < .01$ ) in this sample. Finally, the investigators excluded the *Non-Perfectionists* and only included the *Adaptive* and *Maladaptive Perfectionists* ( $n = 107$ ). Similar to the results using the APSR-HS values, the APSR-D values excluding *Non-Perfectionists* were not normally-distributed ( $p < .01$ ). However, the linearity assumption was met via visual examination of the scatterplot. There was a weak, indirect association of EQi-SM and APSR-D ( $r_s = -.40, p < .01$ ) among *Adaptive Perfectionist* and *Maladaptive Perfectionist* participants in this sample.

### **Results for Binomial Logistic Regression Analysis**

The investigators categorized participants as *Non-Perfectionists* based on the APSR-HS subscale score and as *Adaptive Perfectionists* or *Maladaptive Perfectionists* based on the interaction of the APSR-HS and APSR-D subscale scores. Appendix A conceptually describes this process. The investigators excluded the *Non-Perfectionist* participants to determine the ability of student characteristic, perceived stress, and/or stress management to predict perfectionism subtypes of *Adaptive* or *Maladaptive*.

**Ability of student characteristic to predict perfectionism subtype.** Investigators performed a binomial logistic regression to ascertain the effects of gender (male, female), current class, and race/ethnicity (White, Other) on perfectionism in this sample ( $n = 108$ ). A Bonferroni correction was applied using all seven terms in the model, resulting in statistical significance when  $p < .01$  (Tabachnick & Fidell, 2014). The logistic regression model was not statistically-

significant,  $\chi^2(5) = 4.97, p = .42$ . Table 8 contains details from the binomial logistic regression. Therefore, these student characteristics were not predictive of perfectionism in this sample.

**Ability of perceived stress score to predict perfectionism subtype.** Investigators performed a binomial logistic regression in this sample ( $n = 108$ ) to ascertain the effects of perceived stress on perfectionism. A Bonferroni correction was applied using all three terms in the model resulting in statistical significance when  $p < .02$  (Tabachnick & Fidell, 2014). Based on this assessment, the continuous independent variable was linearly related to the logit of the dependent variable. There was one standardized residual with a value of 2.79 standard deviations, which was kept in the analysis because it was relatively close to the 2.58 cut-off threshold and less than 3.29 (Field, 2014d). The logistic regression model was statistically-significant,  $\chi^2(1) = 18.73, p < .01$ . The model explained 21.67% (Nagelkerke  $R^2$ ) of the variance in *Maladaptive Perfectionism* and correctly classified 66.67% of cases. Sensitivity was 69.62%, specificity was 58.62%, positive predictive value was 82.09%, and negative predictive value was 41.46%. The area under the curve (AUC) was .74, 95% CI [.65, .83] which is an acceptable level of discrimination according to Hosmer et al. (2013). The perceived stress predictor variable was statistically-significant (as shown in Table 9). Participants with increased perceived stress had 1.17 times higher odds of being categorized as a *Maladaptive Perfectionist* than those with lower perceived stress levels.

**Ability of stress management composite score to predict perfectionism subtype.** Investigators performed a binomial logistic regression to ascertain the effects of the EQi-SM composite score on perfectionism in this sample ( $n = 107$ ). A Bonferroni correction was applied using all three terms in the model resulting in statistical significance being accepted when  $p < .02$  (Tabachnick & Fidell, 2014). Based on this assessment, all continuous independent variables

were found to be linearly related to the logit of the dependent variable. There were three standardized residuals with values of -2.91, 3.32, and 3.56 standard deviations which were all kept in the analysis because they were relatively close to the 2.5 cut-off threshold (Field, 2014d). The logistic regression model was statistically significant,  $\chi^2(1) = 14.40, p < .01$ . The model explained 17.16% (Nagelkerke  $R^2$ ) of the variance in perfectionism and correctly classified 71.96% of cases. Sensitivity was 67.86%, specificity was 73.42%, positive predictive value was 47.50% and negative predictive value was 86.57%. The area under the curve (AUC) was .73, 95% CI [.63, .84] which is an acceptable level of discrimination according to Hosmer et al. (2013). The stress management predictor variable was statistically significant (as shown in Table 10). Participants with increased stress management composite scores had 0.93 times lower odds to be categorized as a *Maladaptive Perfectionist* than those with decreased stress management scores.

### **Discussion and Conclusion**

Previous researchers have addressed the prevalence of perfectionism in a variety of health professions programs (M. W. Enns et al., 2001; Henning et al., 1998; Hu et al., 2019; Wagner & Causey-Upton, 2017); however, it has yet to be addressed in DPT programs. Increased stress levels among students have been reported in multiple health professions programs (Alzahem et al., 2011; Alzayyat & Al-Gamal, 2014; Dutta et al., 2005; Elani et al., 2014; Mosley et al., 1994; Pfeifer et al., 2008) including physical therapy programs (Frank & Cassady, 2005; Frazer & Echternach, 1991; Hodselmans et al., 2018; Jacob et al., 2012; O'Meara et al., 1994). Because of these higher stress levels among health professions students, some educators are considering “humanistic” skills (e.g., emotional intelligence and self-care) as the logical, next step to manage stress levels among health professions students (Birks et al., 2009; Faguy, 2012; Ruiz-Aranda et al., 2014).

Beyond health professions programs, various health care disciplines have advocated for transforming the widely accepted “Triple Aim” (improving the patient experience, improving population health, and reducing health care costs) into a “Quadruple Aim” by adding health care provider well-being (Bodenheimer & Sinsky, 2014; Bowles et al., 2018; Morrow et al., 2018). The purpose of this study was to examine perfectionism among entry-level DPT students and assess its relationship to stress perception and stress management. This is the first study to provide insight into the prevalence of perfectionism among DPT students and the relationship between perfectionism, stress perception, and stress management in this population.

### **Perfectionism**

There was no significant difference among the subtypes of *Adaptive*, *Maladaptive*, and *Non-Perfectionists* by DPT class. This may offer support to previous work indicating perfectionism is stable over time (Azevedo et al., 2010; Moore et al., 2018; Rice & Dellwo, 2001). However, since this work was cross-sectional, one should be cautious in drawing this conclusion. Specific analysis of the APSR-HS subscale found statistical differences between beginning Y<sub>0</sub> students with ending Y<sub>2</sub> students. Additionally, a specific analysis of the APSR-D subscale found statistical differences between beginning Y<sub>0</sub> students with ending Y<sub>1</sub> students. Again, since this research is currently only cross-sectional, it is too early to offer anything beyond conjecture regarding perfectionism stability in this sample. Additionally, prevalence of *Maladaptive Perfectionism* in this sample was consistent with *Maladaptive Perfectionism* for both undergraduate students (Grzegorek et al., 2004; Rice & Ashby, 2007; Rice et al., 2014) and first-year medical students (Hu et al., 2019) but less than a sample of pre-occupational therapy students (Wagner & Causey-Upton, 2017). *Adaptive Perfectionism* prevalence in this sample was also less than that of the pre-occupational therapy students (Wagner & Causey-Upton, 2017) as well as in one undergraduate student sample (Rice et al., 2014), but not the other undergraduate

samples (Grzegorek et al., 2004; Rice & Ashby, 2007). Unfortunately, comparisons with first-year medical students were not possible since those data were not reported (Hu et al., 2019).

**Perfectionism and student characteristics.** There were no statistical differences in perfectionism level by the student-reported characteristics of gender description or race/ethnicity/origin description. Previous literature suggests similar levels of perfectionism across gender identities among graduate students (Cowie et al., 2018), though some early work noted gender differences among undergraduate students (Rice & Ashby, 2007). However, investigators often do not report differences in perfectionism level by gender description in research involving health professions students. This work begins to address this gap in the literature.

There were no significant differences between students who identified as female or male for the APSR-HS or the APSR-D. These results were supportive of previous work involving a general graduate student sample that included a small percentage of health professions students (Cowie et al., 2018) as well as work from a community-based sample similar in age to this sample (Besser, Flett, & Hewitt, 2010). However, some of these current results contrasted results from a sample of undergraduate psychology students where women scored slightly higher on the APSR-HS and APSR-D than men (Rice & Ashby, 2007).

Previous literature regarding race/ethnicity/origin description differences and perfectionism is even more sparse than the literature for gender differences. Previous researchers have called for a more diversified-sample approach that looks beyond predominately White American samples currently found in perfectionism research (Flett & Hewitt, 2015). Currently, there is a paucity of literature regarding race/ethnicity/origin description differences and perfectionism among health professions education students. Similar to the gender description and perfectionism literature, there were no reported consistent trends for race/ethnicity/origin

description and perfectionism (DiBartolo & Rendón, 2012). As previously mentioned, this sample did not have any significant differences in perfectionism level by race/ethnicity/origin description.

It should be noted that this sample was predominately White, and for statistical purposes, the researchers collapsed race/ethnicity/origin description data into 'White' and 'Other.' Furthermore, there was only one demographic question related to race, ethnicity, and origin. Participants were instructed to select more than one if applicable; however, they may have selected only one group, not realizing they could select additional groups. Therefore, this item may not have fully captured race, ethnicity, and origin representation for all participants. This work highlights the need for better descriptive variables and data collection strategies for race, ethnicity, and origin representation in health professions education research.

### **Perceived Stress**

Previous researchers found that physical therapy students reported perceived stress at higher levels than individuals of similar age (Frank & Cassady, 2005; O'Meara et al., 1994; Walsh, Feeney, Hussey, & Donnellan, 2010). However, the results from the present study were not supportive of this. The perceived stress levels reported by students in this sample were lower than the reported stress levels from a sample of individuals younger than 25 years old and a sample 25-34 years old (Cohen & Janicki-Deverts, 2012). More specific to gender and stress, previous results are mixed. Some authors reported higher stress levels among women compared to men (Frank & Cassady, 2005; Jacob et al., 2012). However, supportive of other researchers (Tucker et al., 2006), these data do not indicate a perceived stress level difference between genders.

**Perceived stress and program year.** There were statistical differences in stress perception by year in program in this sample. This included a trend towards the final two years

(Y<sub>2</sub> and Y<sub>3</sub>) being more stressful with Y<sub>1</sub> being less stressful. This result did not support the only other work involving a similar sample. Frank and Cassady (2005) found no differences in stress levels by year in program among students from an entry-level DPT program. Other researchers found significant differences in stress by year in program (Jacob, Itzchak, & Raz, 2013; Tucker et al., 2006). However, these other works included students from Master's and Bachelor's of Science programs (O'Meara et al., 1994), non-U.S., entry-level Master's and Bachelor's of Science programs (Tucker et al., 2006), and non-U.S., entry-level Bachelor's of Science programs (Jacob et al., 2012, 2013; Walsh et al., 2010). Because of the potential differences between DPT and non-DPT curricula and differences between U.S. and non-U.S. programs, it is not possible to compare the results with the results of these other studies.

These results indicated there were significant differences in perceived stress by program year with Y<sub>2</sub> and Y<sub>3</sub> students reporting greater stress than the earlier cohorts. More specifically, Y<sub>0</sub> students had less stress than Y<sub>3</sub> students, and Y<sub>1</sub> students had less stress than Y<sub>2</sub> students as well as Y<sub>3</sub> students. It is not surprising that Y<sub>2</sub> and Y<sub>3</sub> students reported higher stress levels than the other cohorts. The Y<sub>3</sub> students are not only preparing for the licensure board examination, but they are also often engaged in a job search. The Y<sub>2</sub> students are transitioning out of the classroom phase and into the clinical rotation phase, which requires a paradigm shift away from didactic application to psychomotor skill acquisition. Although not statistically significant, there was a trend towards incoming Y<sub>0</sub> students experiencing more stress than Y<sub>1</sub> students. Incoming Y<sub>0</sub> students are starting a graduate program which in itself may cause greater stress levels in this cohort. Although anecdotally and not applicable to all incoming Y<sub>0</sub> students, some are also relocating and moving away from established social support systems which may also result in greater stress levels. These results may be unique to the curricular design for this specific DPT program and may not be generalizable to other DPT programs.

**Perceived stress and perfectionism.** There was no association between perceived stress and perfectionism in general. However, there was an association between perceived stress and the discrepancy dimension of perfectionism. This moderate, direct association occurred between the PSS-10 and the APSR-D and not with the APSR-HS, where there was no association. Understandably, the direct association occurred between the PSS-10 and the APSR-D, but not the APSR-HS, since the intent of the APSR-HS is only to differentiate *Perfectionists* from *Non-Perfectionists*. However, the purpose of the APSR-D is to differentiate *Perfectionists* as either *Adaptive* or *Maladaptive Perfectionists*. These results support previous findings of a direct association between stress and *Maladaptive Perfectionism* in medical students (M. W. Enns et al., 2005, 2001; Henning et al., 1998), pre-occupational therapy students (Wagner & Causey-Upton, 2017) graduate students (Cowie et al., 2018; Witcher et al., 2007), and undergraduate students (Bieling et al., 2004; Flett et al., 2016; Rice & Richardson, 2014).

Applying the Perfectionism Acceptance Theory (PAT) may add clarity to this direct association between perceived stress and perfectionism. According to the PAT (Lundh, 2004), *Adaptive Perfectionists* may better accept non-perfectionism compared to *Maladaptive Perfectionists*. This reduced capacity for non-perfection acceptance among *Maladaptive Perfectionists* offers a potential explanation for the higher stress levels when compared to *Adaptive Perfectionists*.

### **Stress Management**

Regarding stress management, there was not a significant difference in EQi-SM scores between cohorts of DPT students. This is the first study involving DPT students to report year in program comparisons as previous work has involved only one cohort (Van Veld et al., 2018) or did not differentiate students based on year in program (Chambers et al., 2016; Mejia-Downs, 2019). In this sample, the mean EQi-SM score was at least 100 both overall and at the cohort

level, suggesting that stress management is a higher-use skill among DPT students relative to higher-education norms (MHS, 2011c).

**Stress management and perfectionism.** Similar to perceived stress, there was an association between stress management and the discrepancy dimension of perfectionism. However, the association was indirect rather than direct. This weak, indirect association occurred between the EQi-SM and the APSR-D. Also, similar to perceived stress, there was no association between the EQi-SM and the APSR-HS.

A higher APSR-D score indicates an increased likelihood of being a *Maladaptive Perfectionist* and, therefore, an increase in the likelihood of stress management being a lower-use skill. Therefore, greater stress management ability was associated with a decreased likelihood of exhibiting *Maladaptive Perfectionism*. This supports previous research which found that *Maladaptive Perfectionists* have higher rates of perceived stress than *Adaptive Perfectionists* (Ashby & Gnilka, 2017; Békés et al., 2015; DiBartolo et al., 2008; Flett et al., 2016; Shafique et al., 2017; Zureck et al., 2014). Again, perhaps the reason for this may rest in the PAT. According to the PAT, *Maladaptive Perfectionists* demand perfection and only accept perfection, whereas *Adaptive Perfectionists* strive for excellence and accept non-perfection (Lundh, 2004). This demand for perfection, coupled with an inability to accept non-perfection, may explain the higher rates of perceived stress among *Maladaptive Perfectionists* compared to *Adaptive Perfectionists*.

### **Limitations**

This study included a single-site sample of convenience at the primary investigator's academic institution, which may not represent the general DPT student population. There may be factors that are unique to this institution, such as student support services or the supportiveness of faculty and staff, which could influence stress levels. The study was also cross-sectional,

comparing different student cohorts at a specific point during matriculation, rather than longitudinally comparing the same cohort through different points during the entire matriculation process. More specifically, the perceived stress experienced at the time of survey administration may be unique to that window of time rather than representative of students' experiences across the entire program year. For example, most third-year DPT students were searching for jobs and preparing to take the licensure examination at the time of data collection. Also, second-year DPT students were transitioning from the classroom and into the clinic. Another limitation was the fact that the investigators provided only one demographic question related to race, ethnicity, and origin. Although participants were presented with the option to select more than one group, they may not have realized they could select more than one group. Thus, it is not possible to know if these results are generalizable to other entry-level programs because it is not possible to fully assess the potential effect of this student characteristic on the relationship between perfectionism, stress perception, and stress management. Adding a separate question for "Hispanic/Latino" data collection could address this issue and align with the data collection strategy of the two primary reporting agencies for DPT students (Commission on Accreditation in Physical Therapy Education, 2019; Physical Therapist Centralized Application Service, 2019). Finally, longitudinal, multi-site studies with a larger sample size could add to the robustness of the binomial logistic regression models.

### **Implications for DPT Education and Future Research**

This research takes the initial step of identifying perfectionism prevalence among DPT students as well as establishing a relationship between perfectionism, stress perception, and stress management. Future multi-site, longitudinal research will provide a better understanding of these relationships in this population. A better understanding of these interactions may allow

earlier identification of those DPT students at risk for stress-related issues (Melnyk et al., 2016). This may allow for earlier stress management interventions.

Additionally, future research involving perfectionism should not collapse race, ethnicity, and origin description into one question since these are different constructs. By doing this, future investigators may be better able to target under-represented groups and move beyond the current, predominately White, female samples (Flett & Hewitt, 2015). A better understanding of potential cultural components of perfectionism may allow for culturally sensitive stress management interventions.

Future intervention studies should include emotional intelligence training. This may assist in the development of pedagogical and curricular approaches that enhance stress mitigation strategies among DPT students, which ultimately may improve provider well-being. Given the difference in perceived stress levels by year in program from this sample, DPT educators should consider embedding stress management interventions throughout DPT curriculum rather than a one-time intervention. Proactively embedding stress management interventions prior to peak stress times in the DPT curriculum may aid students in mitigating stress. Based on these results, DPT educators should consider an ongoing stress management curriculum with points of emphasis preceding the higher stress observed at program entry ( $Y_0$ ), during the transition from classroom to clinic ( $Y_2$ ), and prior to graduation ( $Y_3$ ). Since the stressors at each of those timepoints may be unique (e.g., licensure board examination preparation and job searching just prior to graduation), the DPT educators could specifically frame the stress management intervention to address the specific stressors occurring at those specific times. Additionally, since the investigators identified the end of the first year as a lower stress time, educators could consider a longer-duration intervention such as a 4 week resiliency training (Mejia-Downs, 2019) or even 8-10 week interventions (Chambers et al., 2016; Willgens et al., 2016). Students

may have an increased learning capacity at these lower stress times, which may positively impact information uptake and students' willingness to engage in a longer intervention (Lepine et al., 2004).

Finally, future research could add deeper context and understanding of the relationship between perfectionism, stress perception, and stress management. For example, the PSS-10 could quantitatively identify higher stress times, and anonymous student surveys could qualitatively provide a contextual understanding of the actual stressors causing the higher reports of stress. This could inform stress management intervention regarding topic sequencing and activity duration. Additionally, small focus groups of students could further inform stress management intervention curriculum by providing a richer understanding of stressors experienced by DPT students at unique time points in the program.

## **Conclusion**

Health care provider burnout is a concern across multiple health care disciplines (Bodenheimer & Sinsky, 2014; Bowles et al., 2018; Morrow et al., 2018). New approaches are urgently needed to improve providers' well-being. One such approach is including stress management interventions throughout the curricula of health professions programs. In this sample, there was a moderate, direct relationship between perceived stress and perfectionism subtype, suggesting that DPT students who are *Maladaptive Perfectionists* may be at greater risk for stress-related issues. Baseline measures of perfectionism, stress perception, and stress management may assist educators in identifying at-risk students and monitoring student response to stress management interventions. DPT students who can effectively manage stress may ultimately have greater well-being and lower rates of burnout.

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Table 1

*Perfectionism Frameworks, Dimensions, Terms, Types, and Tools*

Perfectionism Frameworks, Dimensions, Terms, Types, and Tools							
Framework	Dimensions/Subscales		Factor 1 ("Strivings")	Factor 2 ("Concerns")	Dimension(s) representing perfectionism type:		
	Personal Standards Organization Concerns Over Mistakes	Doubts About Action Parental Expectations Parental Criticism	Personal Standards	Concerns Over Mistakes Doubts About Actions	Adaptive	Maladaptive	Tool
Frost et al. (1990)	Personal Standards Organization Concerns Over Mistakes	Doubts About Action Parental Expectations Parental Criticism	Personal Standards	Concerns Over Mistakes Doubts About Actions	Personal Standards, Organization (Frost et al. 1993)	Concerns Over Mistakes, Parental Criticism, Parental Expectations, Doubts About Action (Frost et al. 1993)	FMPS
Hewitt and Flett (1991)	Self-Oriented Perfectionism Socially-Prescribed Perfectionism Other Oriented Perfectionism		Self-Oriented Perfectionist	Socially-Prescribed Perfectionist	High Self-Oriented Perfectionism with Low Socially-Prescribed Perfectionism (Frost et al. 1993)	High Self-Oriented Perfectionism with High Socially-Prescribed Perfectionism (Frost et al. 1993)	HFMPs
Frost et al. (1993)	Positive Achievement Strivings Maladaptive Evaluative Concerns		Positive Achievement Strivings	Maladaptive Evaluative Concerns	Positive Achievement Strivings (Frost et al. 1993)	Maladaptive Evaluative Concerns (Frost et al. 1993)	FMPS
Slaney et al. (2001)	High Standards Order Discrepancy		High Standards	Discrepancy	High Standards with Low Discrepancy (Slaney et al. 2001)	High Standards with High Discrepancy (Slaney et al. 2001)	APS-R
Stoeberl and Otto (2006)	Perfectionistic Strivings Perfectionistic Concerns		Perfectionistic Strivings	Perfectionistic Concerns	High Perfectionistic Strivings with Low Perfectionistic Concerns (Gaudreau & Thompson, 2010; Stoeberl & Otto, 2006)	High Perfectionistic Strivings with High Perfectionistic Concern (Gaudreau & Thompson, 2010; Stoeberl & Otto, 2006)	varies
Stairs et al. (2012)	High Standards Order Perfectionism Towards Others Reactivity To Mistakes Perceived Pressure From Others	Dissatisfaction Details and Checking Satisfaction Black and White Thinking	Ego-Syntonic	Ego-Dystonic	Order, Satisfaction, Details and Checking, Perfectionism Towards Others, High Standards (Stairs et al. 2012)	Black and White Thinking, Perceived Pressure From Others, Dissatisfaction, Reactivity To Mistakes (Stairs et al. 2012)	M-CUP

Note. This table presents the major perfectionism frameworks including how these frameworks can be used to map the two-factor model (Stoeberl & Otto, 2006) and the Adaptive and Maladaptive Perfectionistic type model (Slaney et al. 2001). It also includes the tool associated with each framework. Frost Multidimensional Perfectionism Scale (FMPS), Hewitt-Flett Multidimensional Perfectionism Scale (HFMPs), Almost Perfect Scale-Revised (APS-R), Measures of Constructs Underlying Perfectionism (M-CUP)

Table 2

*Demographics by Gender and Year in Program*

	Year in Program	<i>n</i>	Class Participation	Category	<i>n</i> (%)
Gender	Y <sub>0</sub>	42	91.30%	Male	15 (35.71%)
				Female	27 (64.29%)
				No Answer	0 (0.00%)
	Y <sub>1</sub>	37	90.24%	Male	8 (21.62%)
				Female	29 (78.38%)
				No Answer	0 (0.00%)
	Y <sub>2</sub>	43	95.56%	Male	16 (37.21%)
				Female	26 (60.47%)
				No Answer	1 (2.33%)
	Y <sub>3</sub>	41	89.13%	Male	15 (36.59%)
				Female	26 (63.41%)
				No Answer	0 (0.00%)
	Total	163	91.57%	Male	54 (33.13%)
				Female	108 (66.26%)
				No Answer	1 (0.61%)

*Note.* Y<sub>0</sub> = beginning year one; Y<sub>1</sub> = ending year one; Y<sub>2</sub> = ending year two; Y<sub>3</sub> = ending year three.

Table 3

*Demographics by Race, Ethnicity, and Origin and Year in Program*

Race, Ethnicity, and Origin	Year in	<i>n</i>	Class	Category	<i>n</i> (%)
	Program		Participation		
	Y <sub>0</sub>	42	91.30%	White or Caucasian	26 (61.90%)
				Hispanic, Latino or Spanish	6 (14.29%)
				Black or African-American	1 (2.38%)
				Asian	4 (9.52%)
				American Indian or Alaska Native	0 (0.00%)
				Middle Eastern or North African	1 (2.38%)
				More than one selection	4 (9.52%)
				Y <sub>1</sub>	37
	Hispanic, Latino or Spanish	4 (10.81%)			
	Black or African-American	3 (8.12%)			
	Asian	4 (10.81%)			
	American Indian or Alaska Native	0 (0.00%)			
	Middle Eastern or North African	0 (0.00%)			
	More than one selection	2 (5.41%)			
	Y <sub>2</sub>	43	95.56%		
				Hispanic, Latino or Spanish	6 (13.95%)
				Black or African-American	2 (4.65%)
				Asian	4 (9.30%)
				American Indian or Alaska Native	1 (2.33%)
				Middle Eastern or North African	1 (2.33%)
				More than one selection	5 (11.63%)
				Y <sub>3</sub>	41
	Hispanic, Latino or Spanish	9 (21.95%)			
	Black or African-American	2 (4.88%)			
	Asian	3 (7.32%)			
	American Indian or Alaska Native	0 (0.00%)			
	Middle Eastern or North African	0 (0.00%)			
	More than one selection	0 (0.00%)			
Total	163	91.57%	White or Caucasian		
			Hispanic, Latino or Spanish	25 (15.34%)	
			Black or African-American	8 (4.91%)	
			Asian	15 (9.20%)	
			American Indian or Alaska Native	1 (0.61%)	
			Middle Eastern or North African	2 (1.23%)	
			More than one selection	11 (6.75%)	

*Note.* Y<sub>0</sub> = beginning year one; Y<sub>1</sub> = ending year one; Y<sub>2</sub> = ending year two; Y<sub>3</sub> = ending year three.

Table 4

*Perfectionism Classification by Year in Program*

	Year in Program	<i>n</i>	Perfectionist	
			Category	<i>n</i> (%)
Almost Perfect Scale - Revised	Y <sub>0</sub>	42	Adaptive	19 (45.24%)
			Maladaptive	13 (30.95%)
			Non	10 (23.81%)
	Y <sub>1</sub>	37	Adaptive	21 (56.76%)
			Maladaptive	6 (16.22%)
			Non	10 (27.03%)
	Y <sub>2</sub>	43	Adaptive	13 (30.23%)
			Maladaptive	10 (23.26%)
			Non	20 (46.51%)
	Y <sub>3</sub>	41	Adaptive	14 (34.15%)
			Maladaptive	12 (29.27%)
			Non	15 (36.59%)
	Total	163	Adaptive	67 (41.10%)
			Maladaptive	41 (25.15%)
			Non	55 (33.74%)

*Note.* Y<sub>0</sub> = beginning year one; Y<sub>1</sub> = ending year one; Y<sub>2</sub> = ending year two; Y<sub>3</sub> = ending year three. Participants were categorized as *Non-Perfectionists* when scoring less than 42 on the APSR-HS; as *Adaptive Perfectionists* when scoring at least 42 on the APSR-HS and less than 42 on the APSR-D; as *Maladaptive Perfectionists* when scoring at least 42 on the APSR-HS and at least 42 on the APSR-D (Rice & Ashby, 2007).

Table 5

*Almost Perfect Scale-Revised Outcome Measure by Year in Program and Gender*

Almost Perfect Scale-Revised	Year in Program	Gender	<i>n</i>	<i>Mean</i>	<i>SD</i>	<i>Min</i>	<i>Max</i>
High Standards	Y <sub>0</sub>	Female	27	45.04	3.77	37	49
		Male	15	44.60	3.89	37	49
		Total	42	44.88	3.77	37	49
	Y <sub>1</sub>	Female	29	43.14	3.11	36	49
		Male	8	43.88	5.19	36	49
		Total	37	43.30	3.59	36	49
	Y <sub>2</sub>	Female	26	41.19	6.10	26	49
		Male	16	41.00	5.20	31	49
		No Answer	1	43.00	0.00	43	43
		Total	43	41.12	5.64	26	49
	Y <sub>3</sub>	Female	26	42.65	5.31	28	49
		Male	15	42.87	3.98	37	49
		Total	41	42.73	4.81	28	49
	Total	Female	108	43.03	4.81	26	49
		Male	54	42.94	4.63	31	49
		No Answer	1	43.00	0.00	43	43
		Total	163	42.99	4.72	26	49
	Discrepancy	Y <sub>0</sub>	Female	27	39.85	12.63	16
Male			15	40.80	10.14	21	57
Total			42	40.19	11.68	16	79
Y <sub>1</sub>		Female	29	31.03	11.63	12	66
		Male	8	37.38	8.52	26	49
		Total	37	32.41	11.24	12	66
Y <sub>2</sub>		Female	26	39.96	13.02	18	65
		Male	16	36.63	14.90	15	68
		Total	43	38.79	13.54	15	68
Y <sub>3</sub>		Female	26	39.88	16.39	17	74
		Male	15	40.47	14.58	28	80
		Total	41	40.10	15.57	17	80
Total		Female	108	37.52	13.86	12	79
		Male	54	38.96	12.63	15	80
		Total	163	38.03	13.40	12	80

*Note.*  $Y_0$  = beginning year one;  $Y_1$  = ending year one;  $Y_2$  = ending year two;  $Y_3$  = ending year three.

Table 6

*Perceived Stress Outcome Measure by Year in Program and Gender*

Measure	Year in Program	Gender	<i>n</i>	<i>Mean</i>	<i>SD</i>	<i>Min</i>	<i>Max</i>
Perceived Stress Scale-10	Y <sub>0</sub>	Female	27	13.19	4.39	5	27
		Male	15	13.93	6.05	3	29
		Total	42	13.45	4.98	3	29
	Y <sub>1</sub>	Female	29	10.76	4.68	2	20
		Male	8	12.88	5.25	5	23
		Total	37	11.22	4.81	2	23
	Y <sub>2</sub>	Female	26	17.19	6.96	3	35
		Male	16	14.07	5.95	2	24
		No Answer	1	15.00	0.00	15	15
		Total	43	16.02	6.62	2	35
	Y <sub>3</sub>	Female	26	17.81	4.43	3	25
		Male	15	15.13	3.54	7	24
		Total	41	16.69	4.27	3	25
	Total	Female	108	14.61	5.91	2	35
		Male	54	14.17	5.17	2	29
		No Answer	1	15.00	0.00	15	15
Total		163	14.47	5.65	2	35	

*Note.* Y<sub>0</sub> = beginning year one; Y<sub>1</sub> = ending year one; Y<sub>2</sub> = ending year two; Y<sub>3</sub> = ending year three. The PSS-10 is used to measure frequency of perceived stress over the past month. For the PSS-10, scores range 0 to 40 with higher scores indicating higher levels of perceived stress. Because the PSS-10 is not a diagnostic tool, there are no cut-off scores established (Cohen & Williamson, 1988).

Table 7

*Emotional Quotient Intelligence 2.0 Stress Management Composite by Year in Program and Gender*

Measure	Year in Program	Gender	<i>n</i>	<i>Mean</i>	<i>SD</i>	<i>Min</i>	<i>Max</i>
EQi-SM	Y <sub>0</sub>	Female	27	106.78	11.02	82	134
		Male	15	102.47	13.88	83	134
		Total	42	105.24	12.13	82	134
	Y <sub>1</sub>	Female	28	105.71	10.28	84	124
		Male	8	100.13	16.23	66	118
		Total	36	104.47	11.82	66	124
	Y <sub>2</sub>	Female	26	106.69	15.83	67	132
		Male	15	105.13	10.99	81	118
		No Answer	1	97.00	0.00	97	97
		Total	42	105.90	14.02	67	132
	Y <sub>3</sub>	Female	25	101.44	12.24	79	127
		Male	15	106.07	7.01	89	114
		Total	40	103.18	10.73	79	127
	Total	Female	106	105.22	12.48	67	134
		Male	53	103.89	11.73	66	134
		No Answer	1	97.00	0.00	97	97
Total		160	104.73	12.19	66	134	

*Note.* Y<sub>0</sub> = beginning year one; Y<sub>1</sub> = ending year one; Y<sub>2</sub> = ending year two; Y<sub>3</sub> = ending year three; EQi-SM = Emotional Quotient Inventory 2.0 – Stress Management Composite.

Table 8

*Logistic Regression Predicting Likelihood of Maladaptive Perfectionism based on Student Characteristic*

	<i>B</i>	SE	Wald	<i>df</i>	<i>p</i>	Odds Ratio	95% CI for Odds Ratio	
							Lower	Upper
Current Class			3.46	3	.33			
Current Class (1)	-0.21	0.54	0.15	1	.70	0.81	0.28	2.33
Current Class (2)	-1.05	0.61	2.92	1	.09	0.35	0.11	1.17
Current Class (3)	-0.08	0.59	0.02	1	.89	0.92	0.29	2.91
Gender (1)	0.36	0.45	0.65	1	.42	1.44	0.60	3.46
White, Other (1)	0.22	0.44	0.25	1	.62	1.24	0.53	2.90
Constant	-0.42	0.54	0.61	1	.43	0.66		

Table 9

*Logistic Regression Predicting Likelihood of Maladaptive Perfectionism based on Perceived Stress*

	<i>B</i>	SE	Wald	<i>df</i>	<i>p</i>	Odds Ratio	95% CI for Odds Ratio	
							Lower	Upper
Perceived Stress	0.16	0.04	14.23	1	<.01	1.17	1.08	1.27
Constant	-2.85	0.68	17.75	1	<.01	0.06		

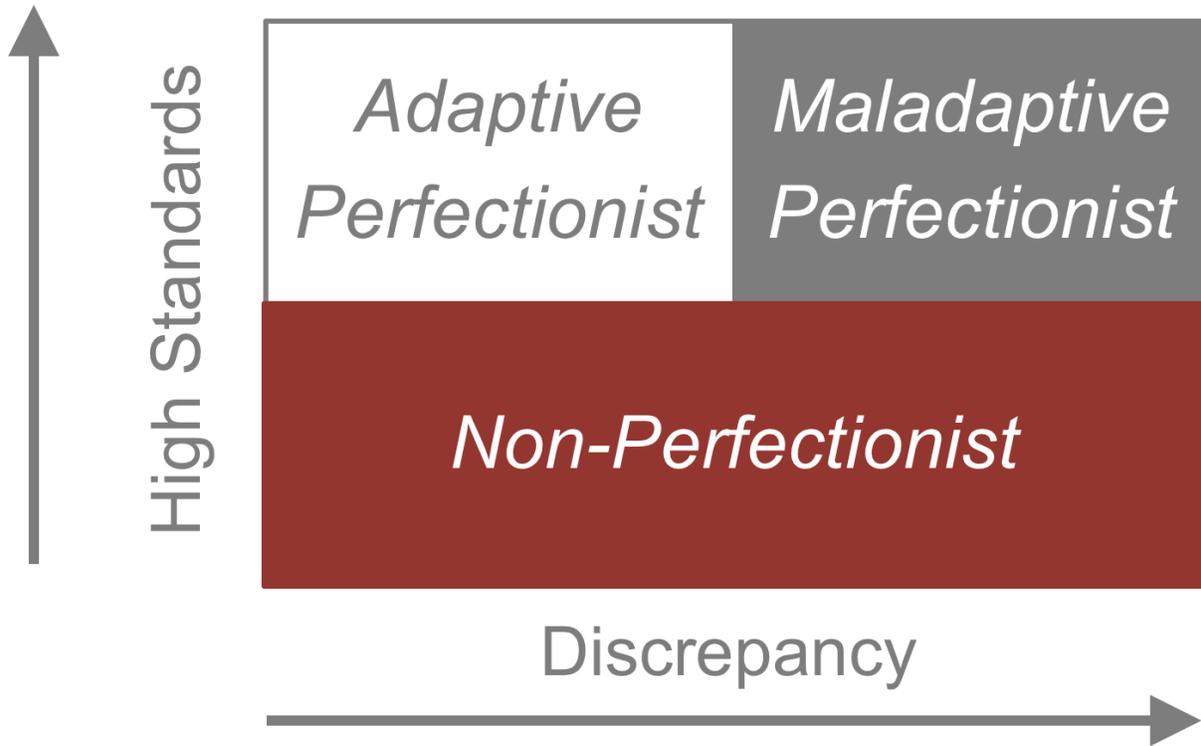
Table 10

*Logistic Regression Predicting Likelihood of Maladaptive Perfectionism based on Emotional Quotient Inventory 2.0 - Stress Management Composite*

	<i>B</i>	SE	Wald	<i>df</i>	<i>p</i>	Odds Ratio	95% CI for Odds Ratio	
							Lower	Upper
EQi Stress Management	-0.07	0.02	11.62	1	< .01	0.93	0.90	0.97
Constant	6.67	2.11	10.02	1	< .01	789.73		

Appendix A

Conceptualization of Perfectionist Type Using the Almost Perfect Scale-Revised Subscales



## Appendix B

## Permission of Use for Almost Perfect Scale-Revised (APSR)

The following is a screenshot stating that the APSR is available for use in research studies (Slaney & Wang, 2018).

## The Perfectionism Scales (Slaney & Colleagues)

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■ **The Almost Perfect Scale (APS-R)** PDF

measures three dimensions of personal perfectionism: High Standards, Discrepancy and Order.

[Chinese \(Simp\) version](#) | [Chinese \(Trad-HK\) version](#) | [Chinese \(Trad-Twn\) version](#) | [Dutch version](#) | [English version](#) | [French version](#) | [German version](#) | [Greek version](#) | [Korean version](#) | [Latvian version](#) | [Lithuanian version](#) | [Russian version](#) | [Spanish version](#) | [Turkish version](#) | [Urdu version](#)

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■ **The Dyadic Perfectionism Scale (DAPS)** PDF

measures perfectionistic expectations that one has for an intimate partner. There are again three sub-scales: High Standards, Discrepancy, and Order.

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■ **The Family-Almost Perfect Scale (FAPS)** PDF

measures the degree to which one experiences one's family as imposing perfectionistic standards on her or him. The sub-scales are the same as above.

[Chinese \(Simp\) version](#) | [Chinese \(Trad\) version](#) | [English version](#) | [Greek version](#) | [Italian version](#) | [Korean version](#) | [Lithuanian version](#) | [Russian version](#)

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■ **Short Almost Perfect Scale (SAPS)** PDF

is an 8-item short form of the APS-R that measures two core dimensions of personal perfectionism: Standards and Discrepancy.

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**\*These scales are available for research use only. We would appreciate hearing about any findings based on the scale or scales. [E-mail us](#)**

## Appendix C

## Permission of Use for Perceived Stress Scale (PSS-10)

The following is a screenshot stating that the PSS-10 is available for use in research studies (Cohen, n.d.).

www.psy.cmu.edu/~scohen/

**For reprints, please contact:**

Sheldon Cohen, Ph.D.  
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[Psychology Department Faculty Page](#)

*Note that many articles, chapters, and scales are available online in the "Vita" section of this website.*

**Permissions**

Permission for use of scales is not necessary when use is for academic research or educational purposes.

## Appendix D

## Online Survey Consent Form

**An Analysis of the Relationship between Perfectionism, Stress, Stress Management, and Sleep Quality among Doctor of Physical Therapy Students**

**Principal Investigators:** Mike Richardson PT, DPT, GCS, COMT

**Co-Investigators:** Evan V. Papa MA, DPT, PhD; Haylie Miller, PhD; Brandy Schwarz, PT, EdD, DPT, OT, MBA; Laura Santurri, PhD, MPH, CPH

**Institution:** University of North Texas Health Science Center

**Introduction/Brief Overview:**

We are conducting a research project to analyze the relationship between perfectionism, stress, stress management, and sleep quality among Doctor of Physical Therapy (DPT) students enrolled in the DPT program at University of North Texas Health Science Center (UNTHSC). We will investigate if there is any statistical difference in perfectionism by student characteristic; if student characteristic or perceived stress level or stress management ability or sleep quality is predictive of perfectionism type; and if there are statistically significant correlations between perfectionism level and perceived stress level or stress management ability or sleep quality.

You are invited to participate in this research study survey because you are enrolled in the UNTHSC DPT program. This survey will measure your levels of perfectionism, perceived stress, and sleep quality. A stress management composite from an emotional intelligence measure will measure your stress management ability. This will occur at a different time administered by a different set of researchers. The survey will take no more than 20-30 minutes.

**Agreement to Participate:**

Participation in the study is completely voluntary. If you decide to participate, you can continue to the next page and complete the online survey.

**Confidentiality:**

You will be asked for your name as part of this survey. This is necessary in order to match your responses from this survey to your responses from the emotional intelligence survey. HOWEVER, an independent coder will assign unique identifiers to your information. THEREFORE, the research group will be BLINDED to your identity.

**Risk/Benefit:**

Since this survey will be de-identified, there is minimal risk of loss of confidentiality from participating in this study. You may receive no direct benefit from participating and you will not be compensated for participating. Using your unique identifier, you have the option to receive your results from these surveys. However, the benefits of this survey will allow us to determine perfectionism rates among DPT students and gain a better understanding of relationship between perfectionism, stress, stress management, and sleep quality, which in turn may help us support improvement of admissions processes, more efficient identification of students at-risk for deleterious effects of stress, and curricular development including stress management skills.

**Leaving the Study:**

Using your unique identifier you may leave the study if you wish. Just notify the principal investigator with your unique identifier and he will omit your data.

**Questions/Concerns:**

If you have any questions regarding this research project, please feel free to contact:

Principal Investigator:  
Mike Richardson at Mike.Richardson@unthsc.edu

If you have any questions about your rights as a research subject, please contact the North Texas Regional Institutional Review Board at (817) 735-0409. Thank you for participating in the study.

- Yes, I consent
- No, I do NOT consent