2023

The Relationship Between Exercise Self-Efficacy, Fear-Avoidance Beliefs, and Exercise in Individual's with Postural Orthostatic Tachycardia Syndrome

Mary Bridget Collins
Walden University

Walden University

College of Allied Health

This is to certify that the doctoral dissertation by

Mary Bridget Collins

has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

Review Committee
Dr. Michael Johnson, Committee Chairperson, Psychology Faculty
Dr. Matthew Howren, Committee Member, Psychology Faculty

Chief Academic Officer and Provost
Sue Subocz, Ph.D.

Walden University
2023

Abstract

The Relationship Between Exercise Self-Efficacy, Fear-Avoidance Beliefs, and Exercise in Individual's with Postural Orthostatic Tachycardia Syndrome

by

Mary Bridget Collins

MS, Benedictine University, 2017

BA, Concordia University Chicago, 2013

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Clinical Psychology

Walden University

November 2023

Abstract

Postural orthostatic tachycardia syndrome (POTS) is a form of dysautonomia in which the autonomic nervous system malfunctions. An effective treatment for POTS is exercise; however, many individuals with POTS are unable to complete a standardized exercise regimen. The purpose of this study was to improve the understanding of why individuals with POTS may or may not engage in the beneficial practice of exercise by exploring factors such as low exercise self-efficacy (ESE) and elevated fear-avoidance beliefs (FAB). The theoretical foundation that grounded this study was the social learning theory (SLT) and social cognitive theory (SCT). The research questions explored the relationship between ESE, FAB, and the number of days an individual with POTS exercises. A regression analysis and mediation analysis were conducted to explore this relationship. A statistically significant relationship was found between ESE, FAB, and exercise engagement, with no mediating effects. Three subscales of the Sources of Self-Efficacy for Physical Activity Scales (SSEPAS) were statistically significant, with FAB including negative affect, mastery experiences, and self-persuasion. The implications for positive social change include developing interventions to improve exercise adherence in individuals with POTS, enhance quality of life, and decrease disability rates.

The Relationship Between Exercise Self-Efficacy, Fear-Avoidance Beliefs, and Exercise in Individual's with Postural Orthostatic Tachycardia Syndrome

by

Mary Bridget Collins

MS, Benedictine University, 2017

BA, Concordia University Chicago, 2013

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Clinical Psychology

Walden University

November 2023

Acknowledgements

I would like to take this opportunity to express my gratitude to the individuals who have contributed to the completion of this dissertation. To my family for their continued love and support throughout my academic journey. Words can hardly describe my thanks and appreciation to my parents, John and Jeannette. Thank you for always believing in me and inspiring me to pursue my dreams. To Caitlin and Comiskey, thank you for standing by my side, providing support, and being a shoulder to lean on during challenging moments. To Meghan, Nick, and Staley thank you for your encouragement, support, and help in making it to the finish line. To Sloane and Isla, thank you for always bringing me joy and laughter when I felt the pressure and stress of my doctoral journey. Lastly, thank you to my beloved furry friend, Ozzie, for being my loyal companion throughout this journey and providing me with countless snuggles.

I would also like to express my deepest gratitude to my dissertation chair, Dr. Michael B. Johnson. Thank you for the invaluable guidance, unwavering support, and continued feedback. Also, I cannot forget to mention your humor, particularly your Taylor Swift references, which made the process enjoyable. I would also like to thank my dissertation committee member, Dr. Matthew Bryant Howren. Your expertise, insightful feedback, guidance, and help have been instrumental in shaping this research project. Lastly, I also extend my heartfelt appreciation to the participants of this study, without whom this study would not have been possible.

Table of Contents

List of Figures v

Chapter 1: Introduction to the Study 1

Background 2

Problem Statement 4

Research Questions and Hypotheses 5

Theoretical Foundation 6

Nature of the Study 7

Definitions 8

Assumptions 9

Scope and Delimitations 9

Limitations 10

Significance 11

Summary 11

Chapter 2: Literature Review 12

Literature Search Strategy 12

Theoretical Foundation 13

Social Learning Theory 13

Social Cognitive Theory 15

Literature Review Related to Key Variables and/or Concepts 18

History of POTS 18

Etiology and Diagnostic Criteria 20

Treatments for POTS 25

Fear Avoidance Beliefs and Exercise Self-Efficacy 31

Summary and Conclusions 36

Chapter 3: Research Method 38

Research Design and Rationale 38

Research Design 39

Methodology 40

Population 40

Sampling Strategy 40

Sample Size 41

Procedures for Recruitment 41

Instrumentation and Operationalization of Constructs 42

Data Analysis Plan 45

Threat to Validity 47

Ethical Procedures 49

Summary 49

Chapter 4: Results 51

Data Collection 51

Results 55

Descriptive Characteristics 55

Research Question 1 57

Research Question 2 57

Research Question 3 58

Research Question 4 59

Summary 61

Chapter 5: Discussion, Conclusions, and Recommendations 62

Interpretation of the Findings 62

Research Question 1 62

Research Question 2 64

Research Question 3 66

Research Question 4 69

Limitations 70

Recommendations 72

Implications 76

Conclusion 77

References 79

Appendix A: Informed Consent 101

Appendix B: Demographic Recruitment Social Media Post 102

Appendix C: Demographic Form 103

List of Tables

Table 1. Demographic Characteristics 54

Table 2. Mean of Fear-Avoidance Beliefs and Exercise Self-efficacy by how long dx with POTS 56

Table 3. Mean of Fear-Avoidance Beliefs and Exercise Self-Efficacy by Race 56

List of Figures

Figure 1. Description of Mediation Analysis.. 45

Chapter 1: Introduction to the Study

Dysautonomia is an umbrella term encompassing several disorders that cause the autonomic nervous system to malfunction. A common form of dysautonomia is postural orthostatic tachycardic syndrome (POTS) (Feigofsky & Fedorowski, 2020). Individuals with POTS experience an abnormal increase in heart rate with a drop in blood pressure upon standing, resulting in symptoms such as lightheadedness, palpitations, generalized weakness, and exercise intolerance (Fisher et al., 2020). These symptoms significantly influence the mental health of individuals with POTS as a decrease in quality of life, significant cognitive dysfunction, moderate to severe depression, and heightened anxiety levels often result (Raj et al., 2018). Treatment options for POTS are limited. However, one effective treatment seen to reduce the severity and frequency of symptoms is exercise, though only 45% of individuals with POTS can successfully complete an exercise program (Blitshteyn & Fries, 2016; Fu & Levine, 2018; Safavi-Naeini & Razavi, 2020).

The current study provided an understanding of the barriers that can impede an individual with POTS from exercising, such as low exercise self-efficacy (ESE) and high fear-avoidance beliefs (FAB). Identifying these barriers can assist in developing psychological interventions for individuals with POTS to improve their exercise adherence, reducing their symptoms and improving their mental health and overall quality of life. This chapter provides a brief overview of the background, justifying the need for this study. Research questions, hypotheses, operational definitions, and the theoretical framework are described. Lastly, the limitations and impact of the current

study are discussed.

Background

The etiology and epidemiology of POTS are not well understood. The first description of POTS can be traced back to the American Civil War; however, this description was not accepted by all physicians. Wood (1941) suggested that POTS was not a physical but a psychological disorder. The belief that POTS is a psychological disorder is still seen today as approximately 75% of individuals with POTS report being misdiagnosed, with 83% encountering a physician who attributed their symptoms to a psychiatric or psychological problem rather than a physical illness (Sebastian et al., 2022; Shaw et al., 2019).

As previously mentioned, common symptoms of POTS include an abnormal increase in heart rate with a drop in blood pressure upon standing, resulting in lightheadedness, palpitations, generalized weakness, and exercise intolerance (Fisher et al., 2020). The symptoms experienced can vary widely based on the sub-type of POTS, including hyperadrenergic, neuropathic, and hypovolemic (Sebastian et al., 2022). The negative impact of these symptoms is evident, as 50% of individuals with POTS are unemployed, with over two-thirds of individuals with POTS losing their employment due to their POTS symptoms (Bourne et al., 2021).

Physical symptoms are not the only burden individuals with POTS face, as mental health co-morbidities frequently occur. For example, a decrease in quality of life, significant cognitive dysfunction, moderate to severe depression, and heightened anxiety often result (Raj et al., 2018). Further, approximately 50% of individuals with POTS

were at high risk of suicide, as 15 to 19% of individuals have reported past suicide attempts and 13% report that they will likely attempt suicide in the future (Cline, 2022).

As the physical, psychological, and economic impact POTS symptoms have on an individual are substantial, an understanding of the treatments for POTS is needed. Currently, treatment options are limited as there are no pharmacological treatments that the U.S. Food and Drug Administration approves for POTS. Therefore, physicians utilize pharmacological approaches to manage symptoms rather than treating the underlying condition. But lifestyle changes have been seen to be efficacious treatment among individuals with POTS. Notably, exercise has effectively reduced the severity and frequency of POTS symptoms. However, only 45% of individuals with POTS can successfully engage and complete an exercise program (Blitshteyn & Fries, 2016; Fu & Levine, 2018; Safavi-Naeini & Razavi, 2020).

The inability to complete an exercise program can occur for numerous reasons, including low ESE and FAB. ESE refers to an individual's view of their ability to exercise successfully (Miller et al., 2018). If an individual with POTS has low ESE, they are unlikely to engage in the highly effective treatment as they do not believe they can successfully exercise. FAB refer to the cognitions and concerns about exercise potentially causing harm (Vergeld et al., 2021). As individuals with POTS often experience exercise intolerance, they experience exacerbated POTS symptoms such as tachycardia and increased rate of perceived exertion; FAB may reinforce the notion that exercise is harmful, leading to chronic avoidance of exercise (Miranda et al., 2018).

Currently, there is a gap in the literature on ESE, FAB, and how they impact the

ability to exercise in an individual with POTS. Understanding this gap is critical to reducing the physical, psychological, and economic issues individuals with POTS endure. Further, the number of individuals diagnosed with POTS is increasing significantly. One reason for this increase is the COVID-19 pandemic, as many individuals who contracted the Coronavirus (COVID-19) later developed POTS (Goldstein, 2021; Kanjwal et al., 2020). With an increase in the number of individuals diagnosed with POTS, a corresponding increase is anticipated in the number of individuals facing mental health and economic challenges, meaning the identification and development of interventions are warranted.

Problem Statement

The literature review for this study supports that there is vast research exploring the pharmacological options for individuals with POTS despite mixed results on the effectiveness of these treatments. When the treatment of lifestyle changes was implemented, consistent results showed significant symptom reduction in individuals with POTS. However, the number of individuals with POTS who can successfully engage in standardized exercise regimens is low. The low adherence among individuals with POTS may occur due to exercise intolerance, a common symptom of POTS, in which engaging in exercise briefly worsens symptoms. With increased symptoms, there is likely an increased fear of engaging in exercise and a decreased belief that they can complete an exercise program. Therefore, if an individual with POTS has high FAB and low ESE, they are unlikely to engage in a potentially highly effective treatment.

The problem is a current gap in the literature on individuals with POTS. No

research to date addresses how psychological factors such as ESE and FAB impacts an individual with POTS ability to exercise. Understanding this gap is essential to reduce the mental health concerns individuals with POTS face and to decrease their economic burdens, especially as more people are being diagnosed with POTS after contracting COVID-19 (Bourne et al., 2021;Goldstein, 2021; Kanjwal et al., 2020). With an increase in the number of individuals diagnosed with POTS, more individuals may face mental health and economic challenges, supporting the need for interventions.

Research Questions and Hypotheses

RQ 1: For those with POTS, what is the relationship between ESE and whether an individual exercised over the past month?

$H_0$1: For those with POTS, there is not a statistically significant relationship between ESE and whether an individual exercised over the past month.

H_a1: For those with POTS, there is a statistically significant relationship between ESE and whether an individual exercised over the past month.

RQ 2: For those with POTS, what is the relationship between FAB and whether an individual exercised over the past month?

$H_0$2: For those with POTS, there is not a statistically significant relationship between FAB and whether an individual exercised over the past month.

H_a2: For those with POTS, there is a statistically significant relationship between FAB and whether an individual exercised over the past month.

RQ 3: For those with POTS, what is the relationship between FAB and the sources of self-efficacy?

$H_0$3: For those with POTS, there is not a statistically significant relationship between FAB and the sources of self-efficacy.

H^a3: For those with POTS, there is a statistically significant relationship between FAB and the sources of self-efficacy.

RQ 4: For those with POTS, is there a mediating effect of either self-efficacy or FAB related to if an individual engaged in exercise?

$H_0$4: For those with POTS, there is not a statistically significant mediating effect of either self-efficacy or FAB related to if an individual engaged in exercise.

H_a4: For those with POTS, there is a statistically significant mediating effect of either self-efficacy or FAB related to if an individual engaged in exercise.

Theoretical Foundation

The theoretical basis for this study was the social learning theory (SLT) and social cognitive theory (SCT) developed by Albert Bandura. The SCT was derived from Bandura's SLT, which helps to understand human behavior. SLT differed from theories during this period as there was no reinforcement emphasis; instead, the SLT primarily posited that human behavior is learned through observational learning. The SCT also helps to explain human behavior, such as engagement in exercise, but through the interaction between a person, environment, and behavior (Bandura, 1977a).

The SCT has six primary constructs: reciprocal determinism, behavioral capability, observational learning, reinforcements, expectations, and self-efficacy. The current study primarily focuses on the construct of self-efficacy. Bandura (1997a) posited that behavior change, such as engaging in exercise, occurs based on self-efficacy or the

person's subjective belief of accomplishing this behavior. Self-efficacy is thought to be developed through four sources: mastery experiences, vicarious experiences, verbal persuasion, and emotional arousal. Without these four components, an individual is unlikely to feel confident in executing the given behavior and will likely perceive this behavior as challenging. When this behavior is perceived as challenging, high levels of anxiety arousal can occur, resulting in the avoidance of this behavior as it is perceived to be difficult and possibly dangerous (Bandura, 1997).

The SCT guided my understanding of exercise behavior among individuals with POTS through the interaction of the person, environment, and behavior. The current research focuses on self-efficacy, or if an individual with POTS believes they can successfully engage in exercise. Additionally, this study focused on whether an individual with POTS views exercise as challenging and how it impacts their self-efficacy.

Nature of the Study

The nature of this study is a non-experimental predictive quantitative design. This design is consistent with trying to understand if ESE and FAB, the independent variables, can predict the number of days an individual with POTS exercised in the past month, the dependent variable. A multiple regression analysis was conducted to analyze the relationship between the dependent and independent variables. In addition, a mediation analysis was performed. The mediation analysis was done to examine if FAB mediate the relationship between ESE and the number of days exercised in individuals with POTS.

This quantitative analysis assists in understanding the barriers that prevent

individuals with POTS from engaging in the treatment of exercise. A convenience sample was utilized in this study, as it allowed me to obtain participants who are comfortable disclosing their diagnosis in a way that is cost and time-efficient ("Convenience Sample," 2008). A minimum sample size of 107 participants who are between the ages 18-55, have received a formal diagnosis of POTS by a physician, and are fluent in English was obtained. Once participants were obtained, they completed an online survey via SurveyMonkey. Participants received information regarding institutional review board (IRB) approval and were asked to fill out demographic information, the Exercise Self-Efficacy Scale (ESES), Sources of Self-Efficacy for Physical Activity Scales (SSEPAS), and the FAB Questionnaire (FABQ). Data were analyzed through SPSS for Macintosh.

Definitions

The following definitions will help clarify the major terms utilized throughout this study.

Dysautonomia: refers to a disorder that causes the autonomic nervous system to malfunction; there are several forms of dysautonomia, one of which is POTS (Feigofsky & Fedorowski, 2020)

Exercise: Refers to the engagement of physical activity that is planned and structured to improve or maintain physical fitness (Stennett et al., 2020).

Fear-avoidance beliefs (FAB): Refers to an individual's cognitions and emotions that foster the concerns and fears that engaging in physical activities such as exercise may result in physical pain or increased POTS symptoms, thus potentially causing harm to one's body (Rainville et al., 2001).

Postural orthostatic tachycardia syndrome (POTS): Is a form of dysautonomia, with the primary symptom of orthostatic intolerance, in which there is a significantly reduced blood volume that returns to the heart after going from a supine to an upright position (Raj et al., 2021).

Self-efficacy: Refers to an individual's cognitions and perceived beliefs that they can successfully enact a behavior, such as exercise (Bandura, 1977a).

Assumptions

I assumed that participants would respond to the questionnaires openly and honestly. Surveys were administered in an electronic format, meaning the questionnaire, which comprised of questions of a sensitive and personal nature, was suggested to be completed in a private setting. The participants were informed that this anonymous questionnaire would not impact their current POTS treatment to reassure them to answer openly and honestly. Second, it was assumed that a representative sample of individuals with POTS was obtained. I posted an IRB-approved social media post in several Facebook POTS support groups to obtain a representative sample of potential participants.

Scope and Delimitations

A delimitation of this study is the use of self-report measures, including the ESES, SSEPAS, and the Modified FABQ. These measures did not allow for an understanding of how self-efficacy or FAB impact the individual’s overall symptom level; instead, they examined if these factors affect their ability to exercise. This study had limited financial resources; therefore, a true random sample was not utilized. Instead,

I chose to use a convivence and voluntary sample.

Limitations

There were several limitations of the current study. First, this study was not a true experiment, as the participants were not randomly assigned to a treatment or control group. A true experiment was not utilized as it is time-consuming, expensive, and may result in possible ethical implications, including autonomy, non-maleficence, and beneficence (American Psychological Association, 2017). Selection bias within this study may have been present, meaning the participants were not comparable at the start of this study. Participants may not be comparable due to co-occurring medical and psychological disorders that frequently co-occur with POTS.

Further, the common symptom associated with POTS, called “brain fog,” may have acted as a limitation, as it can cause cognitive dysfunction, including thinking, memory, and mental reasoning. It should be noted that individuals with POTS experience these symptoms regularly, possibly impacting their ability to report their experience accurately. They may display an adapted way of thinking, as they may become “used to” the brain fog or other symptoms they experience.

Lastly, it should also be noted that the instruments used during this study include the ESES, SSEPAS, and FABQ. However, none of these assessments have been normed among individuals with POTS. No psychological assessments have been normed among individuals with POTS that examine ESE and FAB. Thus, I utilized scales considered valid and reliable among those with chronic illnesses or similar symptoms of POTS.

Significance

The results of the current study provide insight into the barriers that can impede exercise in individuals with POTS, such as low self-efficacy or FAB. Understanding these barriers informs interventions that improve ESE and decrease FAB in individuals with POTS. An improvement in ESE and a decrease in FAB would lead to an increase in exercise adherence and thus an improvement in their overall quality of life.

Summary

To date, there is little research on FAB and ESE among individuals with POTS. Understanding this relationship is warranted, as it may provide insight into why individuals with POTS may or may not engage in exercise. This treatment has been seen to improve the symptom severity of POTS. Once this relationship is understood, mental health clinicians can develop psychological interventions to improve exercise adherence among individuals with POTS, thus reducing their symptoms and improving their overall quality of life. The following chapter contains a detailed review of research on POTS, FAB, and ESE.

Chapter 2: Literature Review

This study addressed why individuals with POTS have difficulty completing an exercise regimen despite its effectiveness in reducing POTS symptoms. The purpose of this study was to improve our understanding of why individuals with POTS may or may not engage in the beneficial practice of exercise by exploring factors such as low self-efficacy (SE) and elevated FAB. An extensive literature review uncovered no research identifying a relationship between SE and FAB among the POTS population. However, this relationship is likely essential as it can provide insight into the possible underpinnings of ESE in individuals with POTS, such as FAB. Understanding the basis of this relationship provided insight into the mental health barriers that impede exercise engagement and adherence in individuals with POTS. Next, the literature search strategies are presented, followed by the study's theoretical foundation and a literature review.

Literature Search Strategy

For this literature review, a search was conducted electronically. Multiple search engines from various institutions and sources were accessed during this literature search, including the Walden University Library, the College of DuPage Library, Google Scholar, and Research Gate. Databases searched include Academic Search Complete, APA PsycArticles, APA PsyInfo, SAGE journal, and the Thoreau multi-database. The keywords searched were *self-efficacy, exercise self-efficacy, fear-avoidance beliefs, kinesiophobia, postural orthostatic tachycardiac syndrome,* and *POTS*. These terms were used in various combinations, including *POTS* and *exercise*, *POTS* and *self-efficacy*, and

POTS and *fear-avoidance beliefs.* The literature search spanned from the year 1871 to the present day. A wide span was used to examine the seminal literature on this condition, particularly the origins of POTS, the development of FAB, and the factors influencing self-efficacy. This search consisted of various scholarly resources, including peer-reviewed articles and books.

This initial search led to minimal resources on POTS, ESE, FAB, and kinesiophobia. Due to this limited research, the terms *chronic illness* and *chronic disease* were used in combination with *self-efficacy* and *fear-avoidance beliefs* to understand how similar conditions impact an individual's self-efficacy and FAB. Further, specific POTS symptoms such as *dizziness, migraine, fatigue,* and *exercise intolerance* were used in conjunction with the terms *self-efficacy, kinesiophobia,* and *fear-avoidance belief* to understand how common symptoms of POTS impact self-efficacy and FAB.

Theoretical Foundation

The theoretical basis for this study was the SCT. SCT, previously referred to as SLT, is used to explain how human behavior is developed, maintained, and modified based on the interaction between the individual's behavior, cognitions, and environment (Bandura, 1986).

Social Learning Theory

During the 20th century, behavioral theories emerged and dominated the field of psychology in search of understanding various human behaviors, such as learning. Albert Bandura challenged these theories by developing the SLT, which explains the learning process without emphasizing reinforcement, the cornerstone of behavioral theories

(Bandura, 2007). SLT was derived from Bandura et al.'s (1961) aggression studies, in which children observed an adult behaving in either an aggressive or nonaggressive manner. Bandura found that children acted in accordance with the behavior they observed. From this study, Bandura posited that behavior is learned through an active process of modeling termed observational learning (Bandura, 1977b).

Observational learning occurs in four stages: attention, retention, motor reproduction, and motivational processes (Bandura, 1977b). The first step of the modeling process, attention, refers to the awareness and perception of what behavior is being modeled and what is acquired or obtained from this exposure. This means that for the modeling process to be successful, the individual must be conscious of the behavior they are exposed to. The second step of the modeling process, retention, refers to the ability to embed and recall a modeled behavior using symbolic representations, which can be demonstrated verbally or imaginatively. The next step of the modeling process is based on the embedded symbolic representation, which must be converted into action that resembles the modeled behavior; however, this can be contingent on the individual's motor and cognitive skills. Lastly, the motivation behind modeling this behavior must be considered. If the behavior is likely to produce a favorable outcome that aligns with one's values, an individual is more likely to act in accordance with this behavior.

Exploring observational learning within the SLT is pertinent to the current study, as observational learning can play a role in the engagement of exercise (Lee et al., 2021; Oyibo et al., 2018; Rostamian & Kazemi, 2016). Specifically, it was seen that observational learning improved self-efficacy, which increased the likelihood of engaging

in exercise. Thus, it is plausible that if individuals with POTS observed another individual with POTS successfully engaging in exercise, their belief about their ability to engage in exercise will improve., and they may be more likely to participate or engage in physical activity.

Social Cognitive Theory

As the age of behaviorism ended, SLT evolved into what is now known as SCT. SCT bridges traditional behaviorist learning theory and a cognitive approach. SCT sought to explain human behavior through reciprocal determinism or the interaction between a person, environment, and behavior (Bandura, 1977a, 2007).

At the forefront of SCT is self-efficacy. First described by Bandura (1977a), self-efficacy refers to subjective beliefs about the ability to engage in a behavior successfully and exert control over events (Bandura, 1986). Self-efficacy refers not to the skills associated with this behavior but to cognitions about the ability to complete a behavior under certain circumstances (Bandura, 1997). If an individual does not feel confident in handling events that may be perceived as challenging, elevated levels of anxiety arousal can result (Bandura, 1997). In addition, a lack of self-efficacy can lead to fear and, thus, avoidance of this behavior (Bandura & Cervone, 1983).

Self-efficacy is developed through four key components: mastery experiences, vicarious experiences, verbal persuasion, and emotional arousal. The most influential of these sources is mastery experiences, which provide tangible evidence of whether behavior can be completed (Bandura, 1977a, 1997b). Vicarious experiences incorporate the key concept of modeling from Bandura's early SLT. Modeling is essential to

vicarious experiences as if a behavior is modeled successfully; it can positively influence self-efficacy, increasing the likelihood of a behavior change (Bandura, 1977a, 1997b). Verbal persuasion can also positively influence self-efficacy when others express faith or boost the belief that they can successfully complete a behavior (Bandura, 1977a, 1997b). Lastly, the emotional reaction refers to the physiological arousal regarding performing a behavior; if an individual does not feel confident in handling events that may be perceived as challenging, high levels of anxiety arousal can result (Bandura, 1977a, 1997). However, having appropriate coping skills to combat this anxiety can contribute to one's sense of personal efficacy (Bandura, 1977a).

A common application of Bandura's SCT is self-efficacy and health-related behavior changes. Bandura (1986) noted that much research has shown that self-efficacy mediates health-related behaviors. Bandura pointed out that those who do not believe they can successfully implement a health-related behavior change will not attempt to make this change. Instead, this individual may feel fearful and avoid this health-related change; the more successful they perceive themselves, the more likely they are to implement it.

SCT and the fear-avoidance model (FAM) are prevalent in research on health-related behavior changes, particularly exercise. For example, Coleman (2010) explored how parental self-efficacy can impact exercise behavior in children. Turning to the literature on chronic illnesses, Vergeld et al. (2021) noted that physical activity benefits individuals with chronic back pain. However, due to FAB, many patients do not engage in physical activity because they fear further injuring their back. When interventions such

as psychoeducation, cognitive-behavioral therapy (CBT), and motivational interviewing (MI) were employed, a reduction of FABoccurred, meaning individuals were more likely to engage and adhere to an exercise regimen. Ho et al. (2022) corroborated these results as CBT was a beneficial intervention in reducing FAB among chronic low back pain patients. However, it was noted that physiotherapy should be used in conjunction with psychological interventions for the best outcome.

Turning to self-efficacy, Stephens (2022) created a self-efficacy-based intervention to improve physical activity in youth with multiple sclerosis (MS), as engaging in physical activity is associated with lower disease activity. Comparably, Selzler et al. (2020) identified low self-efficacy as a barrier to exercise in chronic obstructive pulmonary disease (COPD) patients. Like POTS, symptom reduction occurs in COPD patients with regular exercise, thus increasing health-related quality of life. Selzler et al. employed two self-efficacy-related interventions derived from SCT, mastery experiences and coping, to improve exercise-related self-efficacy in patients with COPD. Further, McGinnis et al. (2021) utilized SCT to inform a health behavior change program among cancer survivors. This program involved an evidence-based counseling program that involved elements of SCT, such as observational learning, to improve exercise adherence in this population. Evidently, using SCT to implement health-related behavior changes such as exercise is warranted in quantitative studies.

Bandura's SCT is pertinent to the current study as it guided how the cognitions of individuals with POTS, precisely their thoughts of fearing and avoiding exercise, are related to their level of self-efficacy. For example, if an individual with POTS observes

another individual with POTS patient suffering from exercise intolerance post-workout, their perceived self-efficacy levels may decrease, meaning they feel incapable of exercising, prompting FAB such as "I should not exercise as it will make me feel worse." Such cognitions would decrease their belief about their ability to exercise and the idea that exercise benefits their POTS symptoms. The current study was conducted to validate the relationship between self-efficacy, FAB, and exercise in individuals with POTS. Further, this study builds on the work of self-efficacy and exercise by examining the role of FAB on ESE.

Literature Review Related to Key Variables and/or Concepts

The following sections present a review of the literature related to the key variables of the study. Such variables include an overview of POTS, including the history, etiology, and diagnostic criteria. The various types of POTS and an exploration of the current treatments are also presented. Further, an overview of ESE and FAB, how they relate to one another, and how these notions are pivotal for POTS treatments is examined.

History of POTS

POTS has slowly evolved into the established diagnosis it is today. The earliest account of this syndrome dates to the American Civil War when physician Jacob M. Costa identified multiple soldiers suffering from an unknown heart condition with symptoms such as a rapid heartbeat, palpations, and breathlessness or difficulty breathing (Da Costa, 1871). DaCosta termed this disorder "irritable heart syndrome," primarily seen in soldiers after an injury, diarrheal illness, or extreme physical exertion (Da Costa,

1871; Gall et al., 2021).

At the onset of World War I, interest in irritable heart syndrome grew as similar symptoms were seen in active soldiers. Sir James Mackenzie grew on Da Costa's work as he observed several other symptoms, including severe fatigue, syncope, precordia pain, vasomotor instability, and an overall sense of feeling unwell (Gall et al., 2021; Mackenzie, 1916). Mackenzie supported an integrated approach to treat this disorder by targeting overall wellness, particularly lifestyle changes. Such lifestyle changes include engaging in low-impact exercises such as walking. After consistently engaging in simple exercises, symptoms and quality of life improved among affected soldiers, allowing them to return to military duty (Mackenzie, 1916).

Despite gaining a better understanding of irritable heart syndrome, interest quickly waned during World War II due to Paul Wood, a British cardiologist. Dr. Wood gave a series of lectures noting irritable heart syndrome was not a physiological issue but a psychological issue (Wood, 1941). Wood described this condition as a somatic manifestation due to difficulty managing emotions like fear. After this series of lectures, irritable heart syndrome was no longer perceived as a physiologic disorder, resulting in diminished research and an overall lack of interest despite many individuals continuing to suffer from this syndrome.

After several decades passed, the interest in this disorder slowly gained traction once again as Schnodorf and Low (1993) found several civilians displaying the same symptoms, leading to a realization that this syndrome is far more widespread than initially thought. Schondorf and Low served as the impetus for modern research on POTS

as they were the first to utilize the term *postural orthostatic tachycardia syndrome*. Since this publication, interest in POTS has grown, resulting in increased awareness and research of this syndrome (Gall et al., 2021).

A new wave of research on POTS is emerging due to the Coronavirus pandemic. The need for a clearer understanding of POTS has arisen as it has been well-documented that a significant number of individuals developed POTS after being infected with COVID (Blitshteyn, 2021; Goodman et al., 2021; Larsen et al., 2021; Varanasi et al., 2021).

Etiology and Diagnostic Criteria

As the research on POTS grew, so did the interest surrounding the physiology of POTS. Despite the growth of research and interest, there was no International Classification of Disease (ICD) code for POTS until June 2022, meaning there was no standardized way of classifying, tracking the prevalence, identifying the etiology, and finding effective treatments for the disorder. Due to a previous lack of standardization, POTS lacked research, awareness, and development of new treatments compared to other conditions. As previously noted, the number of individuals diagnosed with POTS has increased due to COVID-19, sparking the need for research to find effective treatments. This spark of interest has become evident due to the development of an ICD code in June 2022. Next, a snapshot of the overall demographics of individuals with POTS is provided.

Researchers have established the demographic of individual with POTS and the diagnostic criteria. POTS is primarily seen among premenopausal Caucasian females

between the ages of 15 and 45. The diagnostic criterion for POTS includes an increase in heart rate of 30 beats/min or more when moving from a recumbent to a standing position that lasts more than 30 seconds in the absence of orthostatic hypotension or a form of low blood pressure; symptoms of orthostatic intolerance must be present for at least 6 months. As previously noted, common symptoms among individuals with POTS include fatigue, headache, palpitations, sleep disturbance, nausea, bloating, lightheadedness, tremulousness, generalized weakness, blurred vision, exercise intolerance, and fatigue (Blitshteyn, 2021; Fedorowski, 2019).

When a physician diagnoses POTS, the physician should specify whether it is primary or secondary to determine a proper course of treatment. Primary POTS refers to developing POTS symptoms when no other identifiable disorder exists. Secondary POTS occurs when symptoms develop due to another chronic disease, which includes but is not limited to diabetes mellitus, cardiovascular diseases, multiple sclerosis, autoimmune disorders, endocrine disorders, renal failure, amyloidosis, and spinal cord disease (Gunning et al., 2019; Zalewski et al., 2018).

Various subtypes of POTS with differing etiologies have been noted, including hyperadrenergic, hypovolemic, and neuropathic POTS. Approximately 30 to 60% of individuals with POTS have features of the hyperadrenergic subtype, which can be characterized by elevated levels of the stress hormone norepinephrine (Bryarly et al., 2019; Gall et al., 2021; Safavi-Naeini & Razavi, 2020). Individuals with this subtype are more likely to present with palpitations, tachycardia, tremors, and feeling cold and sweaty when upright (Gall et al., 2021; Safavi-Naeini & Razavi, 2020). Further, the

mental health of individuals with POTS with the hyperadrenergic subtype must be considered, as they are more likely to suffer from anxiety.

Hypovolemic POTS has been reported in up to 70% of individuals and is characterized by low blood volume of red cells and plasma (Gall et al., 2021; Safavi-Naeini & Razavi, 2020). Low blood volume can lead to decreased venous return; an increased heart rate compensates for the reduced venous return. Individuals with Hypovolemic POTS have symptoms such as increased weakness and fatigue and a reduced tolerance for exercise (Zhang et al., 2020).

Lastly, neuropathic POTS is considered the most common subtype of POTS (Safavi-Naeini & Razavi, 2020; Zhang et al., 2020). Neuropathic POTS occurs when there is denervation of sympathetic fibers to blood vessels, leading to constriction of blood vessels in extremities, thus decreasing the returned blood volume and causing decreased cardiac, which is compensated by the body through an increase in heart rate (Safavi-Naeini & Razavi, 2020; Zhang et al., 2020). Individuals with neuropathic POTS present with a lower resting heart rate, lower measures of parasympathetic function, lower anxiety and depression, greater ability to carry out daily activities, and greater perceived health-related quality of life (Safavi-Naeini & Razavi, 2020; Zhang et al., 2020).

Despite a clear diagnostic standard, there is no clear understating of the causes of POTS. Researchers have identified several factors that have been seen to precede the onset of POTS symptoms, including immunological stressors such as an upper respiratory or gastrointestinal virus, physical trauma such as a concussion, menarche, pregnancy,

surgery, or significant psychosocial stress (Fedorowski, 2019; Vernino et al., 2021). Approximately 20 to 50% of individuals reported a viral infection prior to the onset of POTS symptoms. However, many patients still do not note any triggering event and experience a gradual onset of symptoms (Fedorowski, 2019).

A familial tendency has been seen among individuals with POTS; however, it is not likely that there is one genetic factor that causes POTS (Boris et al., 2020; Vernino et al., 2021). It is estimated that approximately 14% of individuals with POTS have a family member who has also been diagnosed with POTS (Vernino et al., 2021). Several studies have found an increased prevalence of serum autoantibodies, including antinuclear antibodies, elevation of ganglionic receptors, adrenergic receptors, and muscarinic acetylcholine receptors in individuals with POTS, indicating there may be an autoimmune aspect of this disorder (Fedorowski, 2019; Gunning et al., 2019).

Prior to receiving an official diagnosis of POTS, individuals see an average of 10 doctors, with approximately 15% of individuals waiting more than ten years to be diagnosed (Shaw et al., 2019). This delay has shortened over time but remains significant. Before receiving a diagnosis of POTS, approximately 75% of individuals report being misdiagnosed with another disorder, with 83% of individuals with POTS encountering a physician who attributed their symptoms to a psychiatric or psychological problem rather than a physical illness (Sebastian et al., 2022; Shaw et al., 2019). Evidently, Dr. Wood's belief that POTS is a psychological rather than physiological syndrome can still be seen in modern medicine.

Shaw et al. (2019) noted that co-morbidities are common in individuals with

POTS, with up to 83% afflicted with at least one other medical condition. The three most prevalent conditions seen to co-occur in individuals with POTS were migraine headaches (40%), irritable bowel syndrome (30%), and Ehlers-Danlos syndrome (25%) (Shaw et al., 2019). Other common co-occurring conditions include chronic fatigue syndrome, asthma, fibromyalgia, GI mobility issues such as gastroparesis, mast cell activation disorder, concussion, and chronic pain (Bryarly et al., 2019; Fisher et al., 2020). The prevalence of autoimmune diseases in individuals with POTS provides evidence of an autoimmune component to POTS. Approximately 16% of individuals with POTS also suffer from conditions such as Sjogren's syndrome, Hashimoto's syndrome, lupus, rheumatoid arthritis, and celiac disease (Fisher et al., 2020; Shaw et al., 2019; Vernino et al., 2021).

POTS has also been seen to impact an individual's mental health, meaning mental health co-morbidities, such as depression and anxiety, are common among individuals with POTS, which may influence their treatment outcome. Due to these co-morbidities, lower quality of life and a higher level of somatization and pain catastrophizing occurs in individuals with POTS (Fisher et al., 2020). Males diagnosed with POTS have been seen to have a lower mental health-related quality of life, possibly due to being in the minority of the POTS demographic, thus lacking support (Bourne et al., 2021).

Cline (2022) highlighted the severity of having a co-occurring mental health disorder in individuals with POTS, as it was reported that 50% of individuals with POTS are at a high risk of suicide, with 15 to 19% of individuals reporting past suicide attempts and 13% saying it is likely that they will attempt suicide in the future (Cline, 2022).

When examining depression closely in individuals with POTS, Junghans-Rutelonia et al. (2018) found that in pediatric individuals with POTS, depression partially mediated the treatment outcomes (Junghans-Rutelonis et al., 2018). This means improving POTS treatment, decreasing depression, and improving overall mental health is critical.

Understanding the relationship between anxiety and POTS can be difficult. Many individuals with POTS are perceived to have anxiety due to overlapping diagnostic criteria, including excessive heart rate, nausea, dizziness, and gastrointestinal issues (American Psychiatric Association, 2013; Fedorowski, 2019; Safavi-Naeini & Razavi, 2020). Due to this, there is debate as to whether individuals with POTS are truly experiencing increased anxiety or if these anxiety symptoms are part of the disease itself. Owens et al. (2017) noted that the affective symptoms are frequently seen in individuals with POTS, which may be driven by the physiological sensations that POTS causes, indicating POTS causes anxiety symptoms. Whether POTS causes anxiety or vice versa, these symptoms should not be ignored as they can impact the individual's quality of life.

Treatments for POTS

Due to the heterogeneous nature of POTS, no consistent treatment is effective for all patients. Therefore, the treatment and management of POTS symptoms must be individualized to the patient's needs (Moon et al., 2018; Safavi-Naeini & Razavi, 2020; Y Lei et al., 2020). As a wide range of treatments are offered for individuals with POTS, finding the most effective approach can be challenging and time-consuming. Such treatments include off-label pharmacological treatments, exercise and behavioral treatments, lifestyle changes, and psychotherapy.

Off Label Pharmacological Treatments

Currently, no pharmacological treatments are approved by the United States Food and Drug Administration (FDA) for POTS. Despite no approval, pharmacological approaches to managing POTS symptoms are frequently utilized by physicians in an off-label approach to reduce and manage POTS symptoms to improve the overall quality of life in individuals with POTS.

The first goal of pharmacological approaches to managing POTS symptoms is to increase blood volume, which can be done through acute and chronic intravenous saline infusions. Saline infusions are favorable for individuals with POTS who may have co-occurring GI disorders that impact their ability to hydrate orally (Snapper & Cheshire, 2022). Despite being effective, acute and chronic intravenous saline can be challenging logistically due to the need to coordinate care with an infusion or home health agency. If an individual with POTS receives chronic intravenous saline, a surgically implanted catheter may be necessary, increasing the risk of infection or sepsis (Snapper & Cheshire, 2022).

A second pharmacological approach physicians frequently utilize is prescribing low-dose beta-blockers. Low-dose beta-blockers (ß-Blockers) decrease heart rate, regulate blood pressure, decrease orthostatic intolerance, and improve hemodynamic abnormalities (Deng et al., 2019). Deng et al. (2019) noted that ß-Blockers effectively managed POTS symptoms in children and adolescents. Further, medication to inhibit the sympathetic nervous system or de-active the “fight-or-flight” response can benefit individuals with POTS (Miller & Raj, 2018). Lastly, medications targeting brain fog and

sleep disturbances have been utilized.

As previously discussed, significant mental health co-morbidities are associated with POTS, including depression and anxiety. As co-morbidities are prevalent, medications treating anxiety and depression are commonly used in individuals with POTS, such as selective serotonin reuptake inhibitors (SSRIs), serotonin and norepinephrine reuptake inhibitors (SNRIs), monoamine oxidase inhibitors (MAOIs), and tricyclic antidepressants (TCAs). As pharmacological options for POTS are limited, non-pharmacological approaches are at the forefront of POTS treatment. Alternative treatments, including exercise and behavioral treatments, lifestyle changes, and psychotherapy, must be explored.

Exercise Treatments

Fu and Levine (2018) noted that the first-line approach to treating POTS should be exercise training, which was corroborated by Snapper and Cheshire (2022) and Bryarly et al. (2019). Exercise training was proven superior to pharmacological treatments for POTS as a three-month training program led to improvement and even remission in most individuals with POTS (Bryarly et al., 2019; George et al., 2016; McGregor et al., 2020). Exercise not only improves POTS symptoms but can also improve mental health co-morbidities frequently seen in individuals with POTS, including depression, anxiety, and overall quality of life (Rao et al., 2020). However, implementing this treatment is quite complex due to the symptom of exercise intolerance, which increases POTS symptoms in the short term. Mar & Raj (2020) found that only 41% of individuals with POTS can complete a standardized 3-month exercise program;

with such low adherence rates, it can be concluded that there are many barriers individuals with POTS must overcome to engage in exercise (Mar & Raj, 2020).

When examining the barriers individuals with POTS face, we must turn to exercise intolerance, not to be confused with low levels of physical fitness in which individuals can physically engage in exercise without profound consequences. When turning to exercise intolerance, there is a reduced ability of the heart to engage in exercise at a normally expected level or duration, resulting in severe post-workout effects such as lightheadedness, palpitations, fatigue, weakness, nausea, pain, and a short-term increase in POTS symptoms (Fedorowski, 2019; Pederson & Brook, 2017; Safavi-Naeini & Razavi, 2020; Schmidt et al., 2017). As a result of exercise intolerance, a patient will feel debilitated due to the strong physiological response that occurs (Moon et al., 2018; van der Zalm et al., 2019). Despite the long-term efficacy of exercise as a treatment for POTS, many individuals may not engage in this non-pharmacological treatment due to this strong short-term physiological response (Moon et al., 2018; van der Zalm et al., 2019).

The three-month standardized exercise program described earlier was initially described by Fu et al. (2010). Currently, this protocol is referred to as the Levine protocol or the CHOP/Dallas method. Fu et al. (2010) were the first to describe the influence exercise can have on individuals with POTS, their symptoms, and their overall quality of life. This protocol begins with individuals engaged in recumbent endurance exercises such as rowing, swimming, or biking for 30 to 45 minutes per session two to four times a week. Recumbent positions are utilized to avoid worsening POTS symptoms, such as

orthostatic intolerance resulting from an upright posture. As the individual becomes stronger, the intensity and duration increases. After two to three months, individuals can typically begin tolerating exercise upright, such as a stationary bicycle. Around approximately month five, upright training such as the treadmill or elliptical can occur. Similarly, strength training plays a critical role in this protocol, progressing from recumbent exercises to an upright position with a goal of 20 to 30-minute training sessions.

Lifestyle and Behavioral Changes

Other modifications that have been seen to be beneficial in treating POTS include nutritional approaches; maintaining a healthy weight is an integral part of managing POTS, as excessive weight has been linked to increased POTS symptoms (Gall et al., 2021). Nutritional approaches that have been seen to decrease symptoms in individuals with POTS include a gluten-free diet, even in those who do not have a co-occurring disorder such as celiac disease (Zha et al., 2022). Do et al. (2021) also described a nutritional approach, the FODMAP diet, which restricts fermentable oligosaccharides, disaccharides, monosaccharides, and polyols that decrease POTS symptoms.

Other nutritional considerations that can be beneficial in reducing symptom burden include increasing salt/sodium and water intake (Williams et al., 2022; Y Lei et al., 2020). Garland et al. (2021) found a decrease in the severity of POTS symptoms when a higher sodium diet was implemented as an increased plasma level, decreased standing plasma norepinephrine, and decreased heart rate occurred, leading to improvement in symptoms and counteracting hypovolemia. Rapid water ingestion has

also benefitted the working memory of individuals with POTS in an upright posture, decreasing heart rate and brain fog and improving POTS symptoms (Rodriguez, 2019). There is limited research on nutrition in individuals with POTS; therefore, further research is needed.

Similarly, limited research explores the efficacy of lifestyle changes in individuals with POTS. For example, Bourne et al. (2021) found that wearing compression garments reduced the severity of symptoms as these garments improved blood flow. Further research is needed to understand how lifestyle changes can decrease the syndrome burden.

Psychotherapy

Implementing lifestyle changes, nutritional changes, and exercise behaviors can be challenging to initiate without the proper support network. Support in making these changes, handling the stress of having a chronic illness, and coping with a poor quality of life can be addressed through psychotherapy. Raj, Opie, and Arnold (2018) noted that psychological interventions such as psychotherapy benefit individuals with POTS and their overall quality of life. There is a lack of evidence on psychological interventions in individuals with POTS, but there is a significant amount of research on similar conditions and symptoms. Within this research, stress reduction techniques, cognitive behavioral therapy (CBT), and Mindfulness-Based approaches have been well advocated for among individuals with chronic illnesses.

Cognitive Behavioral Therapy. Cognitive behavioral therapy (CBT) focuses on identifying and challenging unhelpful thought patterns to create awareness of our

thoughts, emotions, and actions and how this impacts our thinking styles. CBT is currently the gold standard for various mental health conditions, including anxiety and depression, both of which frequently co-occur in individuals with POTS (David et al., 2018).

Fisher (2020) found CBT was beneficial when treating a patient's somatic and cognitive reactions to their physiological symptoms of chronic illnesses. Among individuals with POTS, cognitive distortions such as catastrophizing and 'should' statements are prevalent when thinking about exercise and movement due to exercise intolerance. These cognitive distortions may lead to the emotion of fear regarding exercise and movement. Feeling fearful of exercise and movement can result in avoidance of exercise or movement, also called FAB. When engaging in CBT, a clinician would guide individuals with POTS by reframing these maladaptive thoughts and, thus, their thinking styles.

Mindfulness-Based Stress Reduction. In addition to CBT, Mindfulness-based stress reduction (MBSR) can be beneficial. MBSR uses mindfulness as the framework while incorporating psychoeducation on stress and its impacts on the body. Techniques utilized in MBSR include mindful breathing, a body scan, and changing how an individual responds to discomfort (Darnall, 2019). Goldseiten (2021) found that MBSR positively affected the physical and psychological symptoms of POTS, specifically, how the patient perceived illness-related stress.

Fear Avoidance Beliefs and Exercise Self-Efficacy

To understand the barriers individuals with POTS face when exercising, we must

turn to FAB and ESE. The perceived prospective harm that exercise may produce FAB. This perception of harm (i.e., fear) can result from cognitions and emotions invoked when thinking about physical activity and is subjectively perceived. These negative cognitions may stem from failed attempts to successfully engage in exercise or what Bandura would refer to as mastery experiences. Similarly, suppose a POTS patient sees another patient fail in their effort to exercise or witnesses the discomfort of exercise intolerance. In that case, negative cognitions are likely to occur due to a vicarious experience.

Looking closer at FAB, we must turn to the FAM. The FAM assists in understanding how acute pain or acute medical conditions can lead to chronicity and disability. If a patient with acute pain exhibits cognitive distortions related to movement, kinesiophobia or fear of movement can result. Kinesiophobia and FAB are closely related as once kinesiophobia develops, avoidance behaviors are enacted to negate this fear, leading to an inactive and sedentary lifestyle. FAB act as the lens through which an individual views physical activity. Therefore, it is unsurprising that adherence to exercise and FAB are closely related.

The literature has briefly explored the relationship between ESE and FAB. Low ESE has been seen to explain and predict elevated levels of kinesiophobia and FAB, meaning when an individual perceives themselves as unable to engage in exercise avoidance behaviors result (Marques Sule et al., 2022; (Demmelmaier et al., 2018). De Moraes Vieira et al. (2014) corroborated these findings as there was a negative correlation between FAB and SE. This means that when self-efficacy decreases, FAB

increase and vice versa. Not surprisingly, low ESE has been seen to explain elevated kinesiophobia and FAB (Demmelmaier et al., 2018; Marques Sule et al., 2022).

Within the POTS population, FAB, a fear of movement, kinesiophobia, and ESE are relevant as individuals may develop a fear of movement due to the common symptom of exercise intolerance, thus decreasing their ESE. If a POTS patient has low ESE and high FAB, a negative outlook towards exercise can lead to an inactive lifestyle. An inactive lifestyle may increase mortality risk, cardiovascular disease, cancer, metabolic disorders, and musculoskeletal disorders (Park et al., 2020). Further, an inactive lifestyle has placed individuals at a higher risk of mental health concerns such as depression and anxiety (McDowell et al., 2019; Tamminen., 2020). As individuals with POTS already suffer from chronic health issues, an active lifestyle is key to improving their overall health and reducing the risk of further health concerns.

To date, there was minimal research on individuals with POTS, FAB ESE, and kinesiophobia. Therefore, a literature review was conducted on FAB, kinesiophobia, ESE, co-morbidities of POTS, and common symptoms of POTS. Further, the literature search included chronic illnesses or chronic pain syndrome, as this encompasses a vast majority of the POTS population.

As previously noted, cardiovascular symptoms are often found in individuals with POTS, meaning an examination of FAB in patients with cardiovascular symptoms and disorders is warranted. Baykal Sahin et al. (2021) examined patients undergoing a cardiac rehabilitation program incorporating behavior change, exercise training, psychological support, and more. Approximately 74% of patients within this program exhibited

kinesiophobia (Baykal Şahin et al., 2021). Further, among patients, there was a positive correlation between kinesiophobia levels and disease duration, meaning higher levels of kinesiophobia were related to prolonged cardiac disease, explaining the lasting impact FAB may have on one's quality of life (Baykal Şahin et al., 2021).

Nair et al. (2018) and Bay et al. (2018) found similar results as approximately 90% of patients with cardiac disorders presented with FAB, moderate to severe anxiety, and low levels of ESE Among this population; education was seen to play a paramount role in ESE. Almutary and Tayyib (2020) found a correlation between ESE and education level among individuals with chronic diseases, meaning with a higher level of education, a higher ESE was present. When an educational program was added to conventional physiotherapy programs, an improvement in ESE and exercise adherence was seen. Ghisi et al. (2020) corroborated these results as implementing an education intervention improved ESE and exercise adherence.

Evidentially, education plays a significant role in explaining low ESE. Inconsistent information provided by healthcare professionals about the benefits of exercise contributed to elevated levels of kinesiophobia. Similarly, a patient's education level was negatively correlated with kinesiophobia, indicating individuals with a higher level of education had fewer FAB and had a greater understanding of the importance of movement and its benefits (Baday-Keskin & Ekinic, 2022). Evidently, there is a pertinent need for patient education on exercise to improve ESE and decrease kinesiophobia and avoidance behaviors.

Education was not the only factor that was seen to play a role in FAB. Anxiety

sensitivity, or the fear derived from dysfunctional beliefs about bodily sensations, was higher in individuals with chronic medical conditions such as POTS (Taylor, 2020). It is posited that those who experience anxiety sensitivity are likely to experience increases in the risk of chronic medical conditions as these people may engage in unhealthy and sedentary behaviors (Horenstein, 2018). Farris (2019) confirmed this theory as it was seen migraine patients with higher levels of anxiety sensitivity engaged in more sedentary behaviors to avoid uncomfortable bodily sensations such as heavy breathing or increased heart rate commonly occurring during physical activity.

Kessen et al. (2020) found similar results as an inability to interpret bodily signals contributed to higher levels of kinesiophobia (Kessen et al., 2020). Suppose an individual with cardiac issues begins to feel benign chest pain while exercising. In that case, the chest pain may be interpreted as harmful, thus inducing a fear response and eliciting exercise avoidance behaviors (Keessen et al., 2020). Difficulties distinguishing between harmful and non-harmful signals while exercising are likely prevalent among individuals with POTS. Exercise intolerance can be interpreted as worsening POTS symptoms, feeling harmful rather than beneficial. Mindfulness exercises discussed earlier may be beneficial to assist individuals in distinguishing between dangerous and non-harmful bodily signals.

Mental health was also a factor that played a role in FAB and kinesiophobia. Like cardiac patients, the FAB held by chronic neck and back pain patients engaged in rehabilitation negatively impacted their psychological health, resulting in anxiety and

depression (Afzal et al., 2021). Yentur et al. (2019) found similar results, as there was a strong relationship between depression and kinesiophobia in Lupus patients.

Overall, it is possible that various factors can impact ESE, kinesiophobia, and fear avoidance beliefs. These factors include education, anxiety sensitivity, and mental health concerns. Developing interventions related to these factors may be beneficial to improve ESE, reduce kinesiophobia, and reduce fear avoidance beliefs to prevent a sedentary lifestyle.

Summary and Conclusions

The literature review reveals how POTS can have a negative effect on one's physical health, mental health, and overall quality of life. Various treatments for POTS have been established, with exercise standing out as the most effective. However, there are likely numerous barriers an individual with POTS faces to engaging in exercises, such as FAB and ESE. It is unknown how FAB and ESE impact individuals with POTS and their ability to engage in exercise. When investigating similar chronic illnesses, low SE and high FAB have been significant barriers to exercise.

The present study fills the gap as no research to date explores the relationship between ESE and FAB among individuals with POTS. Examining this relationship is important as it can provide insight into the possible underpinnings of ESE in individuals with POTS, such as FAB. Understanding the basis of this relationship offers insight into the mental health barriers that impede exercise engagement and adherence in individuals with POTS. By having this understanding, the knowledge regarding the mental health of individuals with POTS is expanded.

In the following chapter, I provide information regarding the method of this study and how this method answers the research question. Details on the population, procedures, instruments used, data analysis procedure, threats to validity, and ethical procedures are detailed.

Chapter 3: Research Method

The purpose of this study was to improve the understanding of why individuals with POTS may or may not engage in the beneficial practice of exercise by exploring factors such as low self-efficacy (SE) and elevated FAB. I studied the relationship between self-efficacy (SE), FAB, and exercise engagement. The independent variables are self-efficacy and FAB. The dependent variable is the number of days an individual with POTS exercised in the past month. This study fills a gap in the literature as an extensive literature review uncovered no research identifying a relationship between SE and FAB among individuals with POTS. Understanding the basis of this relationship provides insight into the mental health barriers that impede exercise engagement and adherence in individuals with POTS.

Chapter 3 outlines the research design used to explore the relationship between self-efficacy and FAB among individuals with POTS. The current chapter also discusses the study's target population, participants, sampling method, and an operationalized definition of the study's variables. I also describe the research questions and hypotheses, the process of collecting data, the instruments and materials used, and descriptions of any possible ethical or validity concerns.

Research Design and Rationale

The dependent variable is the number of days an individual with POTS exercised in the past month. The independent variables are ESE and FAB. I used a multiple regression and mediation analyses to analyze the relationship between the dependent and independent variables. The number of days of exercise was defined in this study by how

many days the participant engaged in purposeful physical activity to improve their overall health. When an individual with POTS exercised (swimming or using a recumbent bicycle) 3 to 4 times per week for approximately 25 to 40 minutes, a decrease in the severity of symptoms and improved quality of life occurred (Fu & Levine, 2018). ESE is the first independent variable for this study. ESE is defined as an individual's subjective belief about their ability to engage in exercise. ESE is crucial in initiating and maintaining physical activity (O'Neil-Pirozzi, 2021). The second independent variable for this study is FAB, which refer to the underlying perceptions and cognitions that stem from a worry that exercise may increase symptom severity and cause further harm. Understanding the role FAB play among individuals with POTS is essential, as higher FAB were significantly associated with sedentary behaviors, leading to disability and an overall decline in quality of life (Fujii, 2019).

Research Design

A quantitative design is warranted when a study collects data to support a specific theory that examines the relationship among multiple variables (Creswell & Creswell, 2018). A quantitative method was necessary, as numerical continuous and discrete values were assigned to the variables to analyze the data. This approach allowed for objective measurements and data analysis (Mayoux, 2006). This study followed a cross-sectional research design through a survey research approach to determine if there was a relationship between ESE, FAB, and the number of days exercised among individuals with POTS. The study's convivence sample was acquired through social media support groups specific to individuals with POTS.

Methodology

Population

This study's population of interest included individuals formally diagnosed with POTS by a qualified physician. Further, participants must be fluent in the English language. Both male and female participants were included, and the age range was 18 to 55 years old. The prevalence of POTS has not been determined; however, it is estimated that up to .02% of the general U.S. population has POTS. This translates to 500,000 to 1,000,000 individuals in the United States (Raj et al., 2021; Safavi-Naeini & Razavi, 2020). For this study, the participant sample was limited to those between the ages of 18-55 who have received a formal diagnosis of POTS by a physician and are fluent in English.

Sampling Strategy

A non-probability voluntary convenience samples procedure was utilized for this study. A convenience sample is a pool of participants chosen based on their availability and accessibility to the researcher (Creswell & Creswell, 2018). Convenience sampling allowed me to obtain participants who are comfortable disclosing and discussing their diagnosis in a way that is cost and time-efficient ("Convenience Sample," 2008). The primary weakness of a convenience sample is its lack of generalizability, which can be found in a true random sample (Jager et al., 2017). However, conducting a true random sample among individuals with POTS would likely be challenging as many individuals with POTS go undiagnosed or endure a long waiting period to be diagnosed, as previously discussed. Therefore, not every individual with POTS would have an equal

chance of being chosen in a true random sample.

Sample Size

I conducted a power analysis to determine an appropriate sample size that would allow me to determine if there is a significant association between the independent and dependent variables. An appropriate sample size must be obtained to determine if the results of this study are accurate and reliable; if a sample size is too small, the results may be due to chance (Creswell, 2018; Kang, 2021; Warner, 2013). To calculate this study's sample size, calculations were based on the G*Power version 3.1.9.6. (Kang, 2021). An a priori sample size for the multiple regression and mediation analyses was calculated, which revealed a minimum sample size of 119 participants. The linear multiple regression analysis, fixed model deviation from zero, produced the higher value. The method used three predictor values .15 for a small effect, .05 for the alpha level, and .95 for the power level and the F test.

Procedures for Recruitment

For this study, participant recruitment occurred using social media groups specific to individuals with POTS. I utilized an IRB-approved post, which can be seen in Appendix B. Before the start of the survey, participants received informed consent with the purpose of the current study, the right to decline or withdraw from the study at any time, possible consequences, benefits of participating in this study, limits of confidentially, and contact information if there are any questions or concerns regarding the study. This survey consisted of the following measures: demographic information, the ESES, SSEPAS, and the FABQ; together, these three scales consisted of 44 items. After

completing the survey, follow-up information, including a summary of the purpose of this study and my contact information was provided, and the participant's role in the study was then completed.

Instrumentation and Operationalization of Constructs

I created the online survey via Survey Monkey. All participants received information regarding IRB approval and were asked to fill out a demographic form, the ESES, SSEPAS, and the FABQ. The demographic form asked questions regarding gender, age, education level, race/ethnicity, year of POTS diagnosis, type of doctor that diagnosed POTS, and employment information, which can be seen in Appendix C. Further, I inquired regarding the number of days the participant engaged in exercise in the month.

Demographic Information

A demographic information assessment included a request for basic information, including the participant's age, gender, sexual orientation, education level, race/ethnicity, employment information, and current residence/location. Pertinent medical information was also gathered, including what year they received a diagnosis of POTS and the type of doctor that diagnosed them. They were also asked how many times they had exercised in the past month.

Exercise Self-Efficacy Scale

The Exercise Efficacy Scale (ESES) was initially developed by Rodgers et al. (2002) to examine how one psychologically adapts to various exercise routines that vary in frequency and intensity. It was noted the ESES can be utilized for research and

educational purposes without the written permission of the researcher. The use of the ESES is warranted in the current study as it has been previously utilized to understand if self-efficacy plays a role in the engagement of exercise among those with chronic health issues. For example, Terada et al. (2013) used the ESES scale to investigate if self-efficacy is a barrier to engagement in high-intensity versus moderate-intensity exercise in those with type 2 diabetes. Similarly, Mosher (2021) utilized the ESES to investigate if self-efficacy was a mediating factor between perceived benefits or barriers of exercise and self-reported exercise among adults with nonalcoholic fatty liver.

The ESES consists of 10 items with a 10-point Likert scale ranging from “not at all confident” to “completely confident.” The ESES consists of three subscales to measure various types of self-efficacy that are believed to fulfill different roles in exercise motivation, including coping self-efficacy, scheduling self-efficacy, and task efficacy self-efficacy. Scores on the ESES range from 10 to 100, with a higher total indicating a higher perceived ESE; this is calculated by summing the responses on all ten items. Strong internal reliability of the ESES was demonstrated with a Cronbach alpha ranging from .77-.89 on the three subscales before the intervention was implemented (Rodgers et al., 2002). Six weeks into the intervention, the ESES was re-administered, and a Cronbach's alpha was found to range from .77-.90, showing this scale can be a valid and reliable measure (Rodgers et al., 2002).

Sources of Self-Efficacy for Physical Activity Scales

The sources of the self-efficacy scale were developed to have a “reliable and valid scale to assess the sources of self-efficacy for physical activity” (Warner et al., 2014,

p.1299). The SSEPAS is utilized within this study to gain insight into what factors play a role in either strong or weak ESE among individuals with POTS. The SSEPAS consists of 18 items with a 4-point Likert scale ranging from strongly disagree to strongly agree. Within this scale, six subscales exist to measure the components of self-efficacy, including mastery experience, negative affect, positive affect, self-persuasion, verbal persuasion, and vicarious experience.

Warner et al. (2014) found Cronbach's alpha values for factors ranged from .73-.92, indicating good internal consistency. Further, test-retest-reliability values ranged from .59 to .68. It was noted the SSEPAS could be utilized for research and educational purposes without written permission of the researcher.

Fear-Avoidance Beliefs Questionnaire–Modified

The FABQ was developed to measure the cognitions and emotions underpinning concerns and fears about the potential for physical activities to impact or harm one's body negatively (Waddell et al. 1993). This measure also investigates the relationship between pain, FAB, chronic disability, and its impact on daily living and work loss (Waddell et al., 1993). The FABQ is a self-report 16-item questionnaire measured by a 7-point Likert scale, ranging from strongly disagree to strongly agree, taking approximately 5 to 10 minutes to complete. The FABQ consists of two subscales: the physical activity subscale (FABQpa) and the work subscale (FABQw). Waddell et al. (1993) reported Cronbach's alpha of .88, indicating good internal consistency and high test-retest reliability.

The FABQ is commonly used to measure fear of movement, FAB, and disability in patients with chronic pain. Ahlund et al. (2013) and George & Stryker (2011) modified

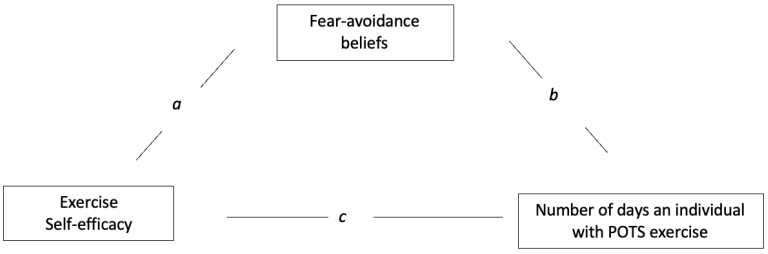
the FABQ to provide clarity for measuring fear avoidance in conditions other than back pain. For example, Ahlund et al. (2013) substituted the terms “pain” and “back” with the words “complaints” and “heart” to accurately reflect the participant's condition of myocardial infarction. The current study adhered to the modifications of Ahlund et al. (2013) to ensure participants' complete comprehension. Lastly, it was noted the FABQ can be utilized for educational and research purposes without the written permission of the researcher.

Data Analysis Plan

SPSS for Macintosh was used to analyze the data. The current study utilized Baron and Kenny's (1986) causal-step approach to complete the mediation analysis in which a multiple regression and mediation analyses were run. The following assumptions were evaluated before running a multiple regression and mediation analysis. The outcome variable (Y) is quantitative, with scores anticipated to be approximately normally distributed. The predictor variables (X1, X2) were also expected to be normally distributed and were quantitative. The relationship among all pairs of variables was found to be linear. Further, no multicollinearity was present, and homoscedasticity was present in which the variance of residuals was constant (Warner, 2013). Testing these assumptions evaluated the veracity of these areas.

Figure 1

Description of Mediation Analysis



Main Research Questions and Hypotheses

This study will attempt to answer the following research questions:

RQ 1: For those with POTS, what is the relationship between ESE and whether an individual exercised over the past month?

$H_0$1: For those with POTS, there is not a statistically significant relationship between ESE and whether an individual exercised over the past month.

H_a1: For those with POTS, there is a statistically significant relationship between ESE and whether an individual exercised over the past month.

RQ 2: For those with POTS, what is the relationship between FAB and whether an individual exercised over the past month?

$H_0$2: For those with POTS, there is not a statistically significant relationship between FAB and whether an individual exercised over the past month.

H_a2: For those with POTS, there is a statistically significant relationship between FAB and whether an individual exercised over the past month.

RQ 3: For those with POTS, what is the relationship between FAB and the sources of self-efficacy?

$H_0$3: For those with POTS, there is not a statistically significant relationship

between FAB and the sources of self-efficacy.

H^a3: For those with POTS, there is a statistically significant relationship between FAB and the sources of self-efficacy.

RQ 4: For those with POTS, is there a mediating effect of either self-efficacy or FAB related to if an individual engaged in exercise?

$H_0 4$: For those with POTS, there is not a statistically significant mediating effect of either self-efficacy or FAB related to if an individual engaged in exercise.

$H_a 4$: For those with POTS, there is a statistically significant mediating effect of either self-efficacy or FAB related to if an individual engaged in exercise.

Threat to Validity

This study aimed to obtain a heterogeneous sample of individuals with POTS; however, a convenience sample was obtained due to my allotted resources. To ensure this data was appropriate, the participants' data was thoroughly examined by reviewing the raw data to assess if any omissions occurred. Within this study, no omissions occurred. If omissions did occur, I would have decided if this data needed to be excluded or if imputation methods were utilized.

The first potential threat to validity is the social desirability bias (Vogt, 2005). The social desirability bias refers to an inaccurate self-report, as the participant responds in a way they perceive to be “good” or viewed favorably by society. As exercise is perceived to be healthy, individuals with POTS may have overreported exercise use as they believe this is what they “should” be doing.

Maturation, or the impact of the passage of time on the dependent and

independent variables, must be considered (Lewis-Beck et al., 2004). Time can play a critical role in an individual with POTS, as symptom severity can fluctuate. For example, the severity of symptoms can worsen due to exposure to various triggers; conversely, if an individual begins to take prescription medication for their POTS, symptom severity may improve over time. If symptoms improve, individuals with POTS may be more likely to engage in exercise; in contrast, if their symptoms worsen, they may be less likely to exercise.

Further, selection bias within this study can occur, meaning the groups are not comparable at the beginning of this study. Selection bias within this study may be present as participants may have co-occurring health issues that other participants did not. For example, some participants may have autoimmune disorders that have overlapping symptoms with POTS. Similarly, some participants may have mental health disorders, such as depression or anxiety, that others did not.

Next, a potential threat to validity lies within a common symptom of POTS discussed earlier called “brain fog,” which refers to mental confusion in which forgetfulness is present. This symptom may have impacted the participant's memory of specific details analyzed within this study, such as the number of times they have exercised in the past month.

As previously noted, individuals with POTS are impacted socially and economically by their diagnosis; participants may have had an adapted way of thinking. For example, they become acquainted with their symptoms, leading them to believe their symptoms are “normal” and not as severe as they objectively are; this may have impacted

the current study and the self-report of their self-efficacy.

Lastly, it should be noted that the instruments being used within this study, the ESES, SSEPAS, and FABQ are not normed among individuals with POTS. To date, no psychological assessments have been normed among individuals with POTS that assess FAB and ESE; therefore, I utilized scales among those with chronic illnesses like POTS were used.

Ethical Procedures

The Walden University Institutional Review Board (IRB) approved the current study (approval no. 02-21-23-0757270). I posted the IRB-approved social media post to several Facebook groups, including the study link. The participants' questionnaire was de-identified to leave no possibility of linking any personal information to specific individuals. I will maintain the data collected for a five-year requirement on a password-protected computer. Only I had access to the data. Lastly, the database file on the computer was password protected, which can only be accessed using an additional password.

Summary

The current study focused on fear avoidance beliefs and ESE among individuals with POTS. The independent variables are (X_1) ESE and (X_2) FAB. The dependent variable (Y) is the number of days an individual with POTS exercised in the past month. This study filled the gap in the literature as no research to date investigates the relationship between self-efficacy, FAB, and the frequency of exercise in those with POTS. Based on the research questions, hypothesis, and variables, I determined that a

multiple regression analysis and mediation analysis was the appropriate statistical test.

The current chapter describes the study's target population, participants, sampling method, operationalized definition of the study's variables, data collection process, and possible ethical and validity concerns. This chapter also included an overview of the research questions and hypothesis. The following chapter describes the data analysis results and how it relates to the research question and hypothesis.

Chapter 4: Results

The purpose of this study was to improve our understanding of why individuals with POTS may or may not engage in the beneficial practice of exercise by exploring factors such as low self-efficacy (SE) and elevated FAB. The following research questions guided this study:

- RQ 1: For those with POTS, what is the relationship between ESE and whether an individual exercised over the past month?
- RQ 2: For those with POTS, what is the relationship between FAB and whether an individual exercised over the past month?
- RQ 3: For those with POTS, what is the relationship between FAB and the sources of self-efficacy?
- RQ 4: For those with POTS, is there a mediating effect of either self-efficacy or FAB related to if an individual engaged in exercise?

The following chapter explores the results of this study, including the data collection method, the time frame for the data collection, baseline descriptive, demographic characteristics, and an analysis of the data.

Data Collection

As previously noted, I utilized a non-probability voluntary convenience sample due to the availability and accessibility of this population. A power analysis was conducted to determine the appropriate sample size for this study. An a priori sample size for the multiple regression and mediation analyses was calculated, which revealed a minimum sample size of 107 participants. The method used two predictor values as well

as .15 for a small effect, .05 for the alpha level, and .95 for the power level and the F test.

The target goal was to include a minimum of data from 107 participants, which was achieved. The target time frame was to collect the data in 2 months, which was achieved as all data was gathered on April 27, 2023. As discussed in Chapter 3, the research plan was followed without any deviations. Potential participants were invited to complete an anonymous survey through SurveyMonkey, with an IRB-approved social media post, seen in Appendix B. I posted once in several Facebook groups specific to individuals with POTS.

Prior to the start of the survey, participants received an informed consent which included the purpose of this study, the right to decline or withdraw from the study at any time, possible risks and benefits of participating in the study, the limits of confidentially, and my contact information. This survey consisted of the following measures: demographic information (i.e., gender, sexual orientation, race, education level, and employment status), the SCI ESES, SSEPAS, and the FABQ. FAB were measured through the FABQ, ESE was measured through the ESES, and the sources of self-efficacy were measured through the SSEPAS. Exercise was measured by participant responses to “In the past month, how many times have you exercised? a. 0; b. 1 to 5 times; c. 5 to 10; or d. More than ten times?” The questionnaire consisted of 44 items. After completing the survey, the participant’s role in the study was complete.

Data were collected on the participants’ demographic data, including gender, sexual orientation, race/ethnicity, education, and employment status. Table 1 shows a summary of the demographics of the study participants. Of the 120 surveys completed,

participants ranged from 18 years old to 55 years old; the gender distribution was predominately female (89.2%), heterosexual (72.33%), and Caucasian (80.8%). Further, it was found that 34.2% of participants completed either an undergraduate or graduate degree, 35% of participants were employed full time, with 21.7% on disability. Overall, this sample aligns with the representative POTS demographic described in the literature; as previously noted, POTS is primarily seen among premenopausal Caucasian females between the ages of 15 and 45.

Table 1

Demographic Characteristics

Sample Characteristics	n	%
Gender		
Female	107	89.17%
Male	11	9.17%
Transgender	2	1.67%
Sexual Orientation		
Heterosexual	88	73.33%
Homosexual	11	9.17%
Bisexual	18	15.00%
Other	3	2.50%
Race/Ethnicity		
European American/Caucasian/non-Hispanic	97	80.83%
Black/African American	3	2.50%
Asian/Pacific Islander	3	2.50%
American Indian/Native American	2	1.67%
Latina/Chicano/Hispanic	5	4.17%
Biracial/Multiracial	6	5.00%
Other	4	3.33%
Education		
High School/GED	10	8.33%
Some college	28	23.33%
Undergraduate degree	41	34.17%
Graduate degree	41	34.17%
Employment Status		
Full Time	42	35%
Part-Time	21	17.5%
Student	8	6.7%
Not employed	23	19.2%
On disability	26	21.7%

Results

Once the data was collected, an analysis was conducted. I conducted bivariate regressions and multiple linear regressions to examine the research questions. An assessment of the assumptions of a bivariate regression and multiple regression were conducted.

First, the dependent, independent, and mediator variables were all on a continuous scale. The assess linearity several scatterplots of FAB, ESE, and if a participant engaged in exercise were plotted with a superimposed regression line. Visual inspections of these scatterplots indicated a linear relationship between variables. The data met the assumption of independent errors, Durbin-Watson value = 2.15. Testing to see if the data met the assumption of collinearity indicated that multicollinearity was not a concern (ESE = 0.75, VIF = 1.34; FAB = 0.75.96, VIF = 1.34). Homoscedasticity was assessed by visually examining a plot of standardized residuals versus standardized predicted values. The assumptions of a bivariate regression and multiple linear regression were met.

Descriptive Characteristics

When examining ESE scores, scores ranged from 8 to 29, with a mean of 25.5. For those who did not engage in exercise, there was a mean of 19.3. For those that did engage in exercise, there was a mean of 25.9. Further, it was noteworthy that ESE scores appeared to vary based on how long the patient has been diagnosed with POTS, with those who were diagnosed 5 to 10 years ago with the lowest mean 23.8 and those who have been diagnosed 1 to 5 years ago with the highest mean 25.9 as seen in table 3.

Lastly, FAB scores appeared to widely range among races, as seen in Table 4, with other races having the highest mean (27.8.) and American Indian/Native American having the lowest mean (19.5).

When examining FAB, scores ranged from 15 to 30, with a mean of 18.5. For those who did not engage in exercise, there was a mean of 23.8. For those that did engage in exercise, there was a mean of 18.1. Further, it was noteworthy that FAB scores appeared to vary based on how long the patient has been diagnosed with POTS, with those who were diagnosed 1 to 5 years ago with the lowest mean 17.8 and those who have been diagnosed 5 to 10 years ago with the highest mean 20.5 as seen in table 3. Lastly, FAB scores appeared to widely range among races, as seen in Table 4, with the Biracial/Multicultural race having the highest mean of 21.5 and Black/African Americans having the lowest mean of 13.

Table 2

Mean of Fear-Avoidance Beliefs and Exercise Self-efficacy by how long dx with POTS

How long ago dx with POTS	Fear-Avoidance Mean	Exercise Self-Efficacy Mean
Under 1 year ago	18.5	25.5
1 to 5 years ago	17.8	25.9
5 to 10 years ago	20.50	23.8
Over 10 years ago	20.33	24.8
Total	18.5	25.5

Table 3

Mean of Fear-Avoidance Beliefs and Exercise Self-Efficacy by Race

Race	Fear-Avoidance Beliefs Mean	Exercise Self-Efficacy Mean
European	18.7	25.7
Black/African American	13	25

Asian/Pacific Islander	19.3	21.3
American Indian/Native American	16.0	19.5
Latina/Chicano/Hispanic	16.0	23.8
Biracial/Multicultural	21.5	26
Other	15.25	27.8
Total	18.50	25.5

Research Question 1

Next, I present the statistical findings by research question. Herein is reported the exact statistics and associated probability values and effect sizes of the independent variables on the dependent variable. First, I examined the relationship between ESE and whether a participant exercised over the past month. A dummy variable was created, in which no = 0 and yes =1, in accordance with the participant's response to "In the past month, how many times have you exercised?"

As the assumptions were met, I then conducted a bivariate regression to evaluate the degree to which ESE predicted if a participant exercised over the past month. Results, $F(1, 118) = 9.65$, $p < .05$, indicated a small effect r^2 was .08. The regression equation for predicting if a participant exercised in the past month from ESE was found to be 0.64 + 0.01X = Y. For each 1-point increase in ESE score, there was a 1% greater chance that a participant exercised. Thus, the null hypothesis H01 was rejected, as there was a statistically significant relationship between ESE and whether a participant exercised over the past month.

Research Question 2

Next, research question two was explored. A bivariate regression was run to evaluate the degree to which FAB predicted if a participant engaged in exercise over the

past month. Results, F(1, 118) =6.05, p < .05, indicated a small effect r^2 was .05. The regression equation for predicting if a participant engaged in exercise over the past month from FAB was 1.09 + -0.01X = Y. This means that for each 1-point increase in the FAB score, it was predicted that there would be a .01 decrease in the number of days a participant exercised in the past month. Thus, the null hypothesis H02 was rejected, as a statistically significant relationship existed between FAB and whether a participant exercised over the past month.

Research Question 3

Next, an examination of the SSEPAS was completed to further understand the relationship between ESE and FAB. Particularly what aspects of ESE can predict FAB. Three subscales were found to be statistically significant with FAB, which included self-persuasion, mastery experiences, and negative affect.

A bivariate regression was then conducted to evaluate the degree to which FAB predicted self-persuasion. Results, $F(1, 118) = 36.16$, $p < .05$, this was a large effect, r^2 was .24. This was a large effect. The regression equation for predicting self-persuasion from FAB was 11.08 + -0.16X = Y. Thus, for each 1-point increase in FAB scores, the predicted self-persuasion score decreases by 0.16.

Next, a bivariate regression was conducted to evaluate the degree to which FAB predicted self-mastery experiences. Results, $F(1, 118) = 59.95$, $p < .05$, this was a large effect, r^2 was .34. The regression equation for predicting mastery experiences from FAB was found to be 9.79 + -0.20X = Y. Thus, for each 1-point increase in FAB, the predicted mastery experience score decreased by 0.20.

Lastly, a bivariate regression was then conducted to evaluate the degree to which FAB could predict the negative affect subscale. Results, $F(1,118) = 6.67$, $p < .05$, this was a small effect, r^2 was .05. The regression equation for predicting negative affect from FAB was found to be $7.26 + 0.07X = Y$. Thus, for each 1-point increase in FAB, the predicted negative affect score increased by .07 of a point**.** Thus, the null hypothesis H04 can be rejected, as there was a statistically significant relationship between FAB and several sources of ESE.

Research Question 4

To examine RQ4, a mediation analysis was conducted to determine if FAB mediated the relationship between ESE and if a participant engaged in exercise (Figure 1). Before conducting an analysis, I created a dummy variable for whether a participant engaged in exercise over the past month with yes = 1 and no = 0.

The first step of the Baron and Kenny (1986) approach was conducted by performing a bivariate regression analysis to test for path *c* alone to evaluate the degree to which ESE predicted if a participant exercised over the past month. The model was statistically significant, $F(1, 118) = 9.65$, $p < .05$, indicating a small effect r^2 was .08. The regression equation for predicting if a participant exercised in the past month from ESE was found to be $0.64 + 0.01X = Y$. For each 1-point increase in ESE score, there was a 1% greater chance that a participant exercised.

To examine path *a* alone (i.e., does level of self-efficacy predict participant fear-avoidance), a bivariate regression was conducted. Results were $F(1, 118) = 39.55$, $p < .001$, and identified a large effect, $r^2 = 0.25$. The regression equation for predicting ESE

from FAB was found to be -34.30 + -0.48*X* = Y. Thus, for each 1-point increase in fear avoidance belief scores, the predicted ESE scores decreased by 0.5 of a point.

A simple linear regression was conducted to examine path *b* alone (i.e., does fear-avoidance predict if a participant exercised or did not exercise). Results, F(1, 118) =6.05, p < .05, indicated a small effect r^2 was .05. The regression equation for predicting if a participant engaged in exercise over the past month from FAB was 1.09 + -0.01*X* = *Y.* For each 1-point increase in FAB, there was a 1% greater chance that a participant did not exercise.

A multiple regression analysis was performed as the first three steps of the Baron and Kenny (1986) mediation analysis were statistically significant. For the overall multiple regression to predict if exercise from ESE and FAB, R=0.29 R2=0.09. That is when both ESE and FAB were used as predictors, about 9% of the variance in if an individual participated in exercise could be predicted. The adjusted R2 = 0.07. The overall regression was statistically significant, $F(2, 117) = 5.42$ $p < .05$. If a participant engaged in exercise =.783 + -.004 x FAB + 0.009 x ESE.

When controlling for ESE, FAB were not statistically significant in predicting participant engagement in exercise, b = -.004, $t(117) = -1.086$, $p = .280$. The estimated direct effect of ESE on if a participant engaged in exercise, controlling for FAB was c = .009, $t(117) = 2.147$, $p < .05$-, with adjusted $R^2 = .069$ and $F(2, 117) = 5.424$, $p < .05$. The indirect effect of ESE via FAB on participant engagement in exercise was 0.02. This was judged to be not statistically significant using the Sobel (1982) test, $z = 0.93$, $p = 0.35$. Thus, the null hypothesis H_05 is not rejected.

Summary

This study aimed to improve our understanding of why individuals with POTS may or may not engage in the beneficial practice of exercise. This study explored the relationship between ESE and FAB related to exercise adherence. The null hypothesis *H*01, *H*02, and *H*03 were rejected as statistical significance was found in those three research questions. There was a statistically significant relationship between ESE and FAB and whether an individual exercised over the past month. Further, there was a statistically significant relationship between FAB and ESE and the sources of SE. The null hypothesis *H04* was accepted as no statistically significant mediating effect was seen among the data collected. In the following and final chapter, I discusses the implications of these findings, the limitations of the study, and recommendations for further research.

Chapter 5: Discussion, Conclusions, and Recommendations

The purpose of this study was to improve the understanding of why individuals with POTS may or may not engage in the beneficial practice of exercise by exploring the relationship between exercise, ESE, and FAB. This study informs mental health professionals, physicians, and other medical professionals on the role of psychological factors that may impact individuals with POTS and influence their health and overall quality of life. I conducted a regression analysis and mediation analysis to explore this relationship. This study found a statistically significant relationship between ESE, FAB, and exercise engagement, with no mediating effects. The section that follows provides an interpretation of the study's findings and does so by research question.

Interpretation of the Findings

Research Question 1

The study's first research question explored the relationship between ESE and if a participant exercised over the past month. Despite finding no studies exploring ESE in individuals with POTS, the literature highlights ESE's role in exercise engagement and overall health. Bergstrom et al. (2015) identified ESE as the strongest psychological correlate of engaging in exercise. Bauman et al. (2012) and O'Neil-Pirozzi (2021) corroborated these results, as ESE was a consistent positive correlate with initiating and maintaining exercise. SE was also predictive of adverse cardiovascular events and strongly associated with cardiovascular events such as stroke and arrhythmia.

An individual's overall health can be affected by their perception of their ability to engage in a behavior, such as exercise. A large percentage of individuals with cardiac

disorders exhibit low ESE (Bay et al., 2018). As POTS patients display similar symptoms to individuals with cardiac conditions, it was reasonable to infer that ESE levels would be similar, supported by the current study. As similar symptoms were present, examining ESE was justified to understand if POTS patients do or do not engage in exercise and how it impacts the quality of life (Alonso et al., 2021; Higgins et al., 2022).

The results of this study aligned with previous research as a statistically significant relationship was shown between ESE and whether a participant exercised over the past month. These results demonstrate that when ESE was higher, there was a greater chance that the participant engaged in exercise. Similarly, when there was lower ESE, there was a greater chance that the participant did not exercise. In other words, positive cognitions and self-talk about one's ability to exercise led to increased confidence and motivation to carry out the behavior of exercising.

One factor that may influence a participant's cognitions and self-talk about their ability to engage in exercise is the experience of exercise intolerance. In this study, almost all participants reported experiencing the symptom of exercise intolerance. As previously noted, exercise intolerance occurs when an individual exercises and experiences a brief increase in POTS symptoms such as breathlessness, weakness, nausea, or dizziness. It is reasonable to suggest that exercise intolerance impacted participants' ESE, as participants are likely to perceive that engaging in exercise caused POTS symptoms to worsen. This means that past experiences of attempting to exercise may have shaped the individual's cognitions, self-talk, and beliefs about their ability to exercise in the future. Such beliefs may result in individuals with POTS perceiving

exercise to harm their health rather than improve their health and decrease POTS symptoms.

A second factor that may have influenced the participants' ESE and therefore exercise engagement was education. The current study showed those with higher levels of education had lower ESE scores. This was inconsistent with previous research that found a positive correlation between ESE and education level among individuals with chronic diseases, meaning with a higher level of education, a higher ESE was present (Almutary & Tayyib, 2020). In sum, if individuals with POTS have negative self-talk and cognitions about their ability to exercise, they will not be certain they can exercise. This uncertainty precedes the knowledge that exercising positively impacts overall health and POTS symptoms.

Research Question 2

Research Question 2 explored the relationship between FAB and whether an individual exercised over the past month. Despite no studies exploring FAB in POTS patients, the literature highlights the vital role FAB play in exercise engagement and overall health. The FAM was developed by focusing on those with chronic pain. The current literature expands on how the FAB model applies to those with chronic pain and illnesses. Nair et al. (2018) identified a large percentage of individuals with cardiac disorders exhibit high FAB. As POTS patients display similar symptoms as those with cardiac conditions, it was reasonable to anticipate FAB levels would be similar, which was supported in the current study.

The literature identifies a clear connection between FAB and their impact on

exercise engagement and adherence. Taulaniemi et al. (2020) and Janela et al. (2023) noted that when an individual experiences fear-based cognitions about exercise (such as the belief that exercise will cause harm to one's body) an avoidance of exercise occurs; thus, a decrease in exercise engagement and adherence occurs. However, among the POTS population, the interpretation of exercise harming one's body may be inaccurate as the symptom of exercise intolerance can be perceived as harmful rather than a temporary increase in symptoms. In the current study, more than nine out of 10 participants reported experiencing exercise intolerance.

As the benefits of exercise have been well documented, avoidance of exercise can negatively impact an individual's health. This notion was validated by Cetingok et al. (2022) and Guclu Et al. (2012), who found a lower quality of life and decreased functioning among those with higher FAB. Hoch et al. (2019) and Janela et al. (2022) also found with an increase in FAB, there was a corresponding rise in anxiety and depression symptoms as well as disability rates. Therefore, an individual's physical health and mental health are significantly influenced by FAB.

I found a statistically significant relationship between FAB and whether a participant engaged in exercise over the past month. When a participant has heightened cognitions that POTS symptoms may increase illness severity, thus viewing exercise as unsafe, exercise avoidance develops. The study's findings aligned with past research, as Taulaniemi et al. (2020) and Janela et al. (2022) found lower exercise adherence among those with higher FAB, thus validating the pattern of avoidance. In the current study, it is evident that over half of the participants were significantly uncomfortable engaging in

exercise due to the perception that exercise is unsafe. Among the participants in this study, the discomfort or perception of being unsafe outweighs the knowledge that exercise is beneficial, safe, and valuable to their health. Overall, this perception of exercise being dangerous results in a pattern of avoidance of exercise. However, as only a small effect was found, other factors likely influence a participant's fear avoidance beliefs and likelihood of exercising.

Research Question 3

Next, I used the SSEPAS to understand the relationship between self-efficacy and FAB. The SSEPAS consists of several subscales derived from Bandura's SCT, including mastery experience, negative affect, positive affect, self-persuasion, verbal persuasion by others, and vicarious experiences. I explored which factors contributed to the participants' ESE, which were more strongly related to FAB. Three of the six subscales were statistically significantly associated with FAB: negative affect, mastery experiences, and self-persuasion.

When exploring the literature, I found that an individual's emotional and physiological state influences the development of ESE, including negative affect or feelings of emotional distress (Bandura, 1977a, 1977b; Redelle et al., 2021). Among individuals with POTS, negative affect or emotional distress occurs frequently; as previously noted, individuals with POTS have heightened levels of depression and anxiety (Clien, 2022; Raj et al., 2018). With elevated levels of depression, it is likely that cognitive distortions such as "I will never be able to exercise" frequently occur. Thus, if an individual with POTS is in a depressed or anxious state, they perceive themselves as

unable to successfully engage in exercise, resulting in a fear of exercise and an avoidance of exercise. Further, if the individual is in a poor physiological state and experiencing symptoms such as increased heart rate, chest pain, sweating, or shortness of breath, this can trigger a negative emotional response, leading to negative effects. Emotional reactions include feeling concerned, worried, scared, weak, and embarrassed. An individual will likely avoid any activity, such as exercise, that can worsen these symptoms and trigger negative emotional states to prevent further distress. The current study found a statistically significant relationship between FAB and negative affect, validating that negative affect and physiological states trigger negative affect and influence the relationship between FAB and ESE.

In addition to negative effects, the literature has shown that verbal persuasion, specifically self-persuasion, impacts the development of ESE(Bandura, 1977a). Rajati et al. (2014) explored strategies to improve exercise engagement and adherence in heart failure patients and found verbal persuasion was among the most influential factors in increasing ESE. This means that it is likely that verbal persuasion plays a significant role in developing and maintaining ESE among POTS patients. However, the distinction should be that this is only self-persuasion, meaning it comes from an internal rather than an external source.

As previously noted, individuals with POTS display cognitive distortions such as "I will never be able to exercise." These negative and irrational cognitions incite the belief they are incapable of exercising, reinforcing the fear of exercise and increasing avoidance. However, when these cognitions are modified, increased self-efficacy and

reduced fears of exercise result as the individual's self-talk incites the belief that they can exercise. When utilizing positive self-persuasion, individuals with POTS can increase their confidence and views about their ability to successfully navigate the symptoms of exercise intolerance, reducing the fear of exercise among this population. Therefore, as expected, a statistically significant relationship existed between FAB and self-persuasion.

The last source of ESE that was found to relate with fear avoidance was mastery experiences. Mastery experiences refer to situations in which an individual completes a challenging task or overcomes adversity to engage in a behavior, such as exercise. Higher levels of exercise engagement were related to increased mastery experiences (Johansson et al., 2021; Sargent-Cox et al., 2015). This means that among the POTS population when an individual successfully engages in exercise, their beliefs about their ability to exercise, or ESE, increase due to past positive experiences. However, if an individual perceives themselves to fail at engaging in exercise, their negative cognitions can build a powerful belief system in which their engagement in exercise decreases. Kinesiophobia can result, and FAB increase (Bandura, 1997a).

Among the POTS population, mastery experiences are not only related to completing the behavior of exercise, but it also means the individual successfully coped with the symptoms of exercise intolerance. Coping with the symptoms of exercise intolerance strengthens the perception that exercise intolerance is merely a symptom of POTS and not harmful. Exercise can be perceived as a benefit to overall health, thus reducing FAB.

I found a statistically significant relationship between mastery experience and

FAB. This means past mastery experiences can influence the FAB of the study's participants. Within this study, mastery experiences had the most substantial relationship with FAB, aligning with the literature as Bandura (1997a) noted mastery experiences are the "most influential source of efficacy" (p. 80).

Research Question 4

In the last research question, I explored if there is a statistically significant mediating effect of either ESE or FAB related to an individual's engagement in exercise. In other words, I sought to understand if levels of FABexplain the process through which ESE and if a participant engaged in exercise are related among individuals with POTS.

Through research questions one and two, I found that levels of ESE led to FAB, which in turn correlated with exercise engagement. The literature validated this notion, as Marques Sule et al. (2022) and Demmelmaier et al. (2018) found low ESE predicted elevated FABAs this relationship was present in the literature, I wanted to examine if this was true among the participants of this study. I explored if the relationship between FAB and ESE explains how ESE and exercise engagement are related, mainly if there was a causal relationship between variables.

The mediated casual model utilized in this study involved a sequence: first, ESE (X_1) causes or influences FAB (X_2); then FAB (X_2) cause or influence if an individual with POTS exercised. The indirect effect or the effect of exposure on exercise engagement that worked through FAB was not statistically significant. Meaning the relationship between ESE (X_1) and participant exercise engagement (Y) cannot be completely or partially explained by FAB (X_2).

Research question four found several factors related to exercise adherence among individuals with POTS. First, ESE, or an individual's subjective beliefs or cognitions about their ability to exercise, predicted exercise engagement. Second, FAB or cognitions that stem from a worry that exercise may cause harm predicted exercise engagement. However, a casual model between these variables was not supported.

Limitations

The present study had several limitations. First, it should be noted this study was not a true experiment. The research did not randomly assign participants to a treatment or control group. Without random assignments or control groups, I had less control over the environment. As this study took place in a real-life setting, it was not possible to control for all possible variables. For example, I could not control if the individual completed the survey in a private environment conducive to sharing personal information. Nor could I control if the participant chose to take the survey when their POTS symptoms were severe, moderate, or mild.

Similarly, I could not control if the participant decided to take the survey when their mental health challenges, such as depression or anxiety, were severe or mild. As this study was not a true experiment, it cannot be determined if changes in ESE and FAB cause a difference in the number of days an individual with POTS exercises. Lastly, it should be noted that this study reflects a snapshot in time, meaning there may or may not be a change in behavior, self-efficacy, or fear avoidance beliefs over time.

A second limitation of the current study is selection bias. Participants were not comparable at the start of this study. For example, participants likely differed regarding

co-occurring medical and psychological disorders. Due to the various medical and psychological conditions that co-occur with POTS and time limitations within this study, finding a homogenous sample of participants was not plausible. In addition to physical, medical, and mental health co-morbidities, the participants were not comparable at the start of the study due to cultural differences, including socioeconomic status, race, education, employment, disability status, gender, sexual orientation, and more. Additionally, factors such as how long the participant has had POTS, the journey the participant went through to be diagnosed with POTS, coping styles, resiliency levels, and comfortableness with navigating the healthcare system differ among participants.

Further exploring the sample of this study, the make-up of participants was representative of the general POTS population. It was evident that this sample is representative of the general POTS population. The literature noted individuals with POTS are primarily Caucasian; approximately 70 to 80% are female from 15 to 45 years old. In the current study, 80% of the participants were Caucasian, 89% of the participants in this study were female, and their ages ranged from 18 to 55 years old. Although this was a representative sample of POTS patients, the sample was still homogenous. The results may not apply to an individual with POTS who falls outside the typical demographic.

Further examining the participant sample, it is noteworthy that the number of individuals diagnosed with POTS is increasing as a significant number of individuals who contracted COVID-19 have developed POTS (Kanjwal et al., 2020). Therefore, it should be noted that the demographic of this population may be changing. In addition,

“brain fog,” or cognitive dysfunction, is a typical symptom among individuals with POTS. This symptom impacted the present study as the participant's thinking, memory, and mental reasoning may have been affected, meaning the self-reported data may be incorrectly recalled or confabulated.

Lastly, a limitation of this study was the instruments used. The instruments being used within this study, the ESES, SSEPAS, and FABQ, have not been normed among individuals with POTS. I could not establish a baseline for comparison, trends, or patterns among the participants. Therefore, any instruments used among this population would have this concern. However, no psychological assessments to date have been normed among individuals with POTS that examine ESE and FAB. Thus, I utilized scales considered valid and reliable among those with chronic illnesses or similar symptoms of POTS. Future research should consider developing assessments specific to the POTS population.

Recommendations

In this section, I describe several recommendations for further research. Specifically, this section will explore additional ideas for future research in enhancing the quality of life of those with POTS. This study had limited financial resources; therefore, a true random sample was not utilized, but rather a convivence and voluntary sample. Due to the nature of the convivence voluntary sample, a relatively small sample size was utilized. As there was a non-significant mediation effect, it should be considered it is possible that the study is underpowered. So, future research should be conducted with a larger sample size.

As the research utilized social media to recruit participants, individuals with POTS who are not on social media were likely unaware of this study and their opportunity to participate. There could be differences between those who do and those who do not engage in social media activity. Some of these differences could influence the study's results. It would benefit researchers to collect information through other sources in future studies. To obtain additional data sources, it may be beneficial to collaborate with primary care physicians, neurologists, cardiologists, and mental health clinicians who frequently treat POTS to recruit participants. Further, other medical professionals who may be beneficial for recruiting POTS patients include nurses, nursing technicians, physical therapists, and occupational therapists who work with POTS patients.

As previously noted, I found that current literature exploring the mental and physical health of individuals with POTS is limited. Therefore, recommendations for future studies are warranted to continue to learn more about this population to determine interventions that can improve the overall quality of life for an individual with POTS.

First, it is recommended that future researchers explore the relationship between mental health and POTS. The literature is scarce in exploring how POTS symptoms influence mental health disorders such as depression or anxiety. Understanding depression among individuals with POTS is particularly critical; as previously noted, Clien (2022) found that approximately 50% of individuals with POTS were at high risk of suicide, 15 to 19% of individuals with POTS reported past suicide attempts, and 13% report that they will likely attempt suicide in the future. Understanding the mental health of individuals with POTS will allow for the development of interventions to improve

mental health and overall quality of life.

Next, the psychological impact of the symptom of exercise intolerance should be further explored. Exercise intolerance should be further explored to understand how individuals with POTS perceive this symptom to impact their physical and mental health. A better understanding of exercise intolerance may also provide further insight into the development of FAB and ESE among this population.

I found the participants' cognitions influenced their FAB, ESE, and, in turn, their exercise behavior. Therefore, psychological interventions stemming from cognitive behavioral therapy (CBT) could be very fertile ground for future research. In particular, the ABC model, which serves as a framework for changing irrational cognitions, should be explored to understand the antecedents and behaviors that can influence ESE, FAB, and exercise engagement (Beck, 2011).

Altering the irrational cognitions an individual with POTS has about exercise may change their behavior and motivation to engage in exercise. Specific interventions such as automatic thought analysis, cognitive restructuring, and cognitive reframing should be further studied to understand the efficacy of this approach in individuals with POTS.

In addition to CBT interventions, I recommend that the efficacy of third-wave cognitive behavior therapy modalities such as Acceptance and Commitment Therapy (ACT) and Dialectical Behavioral Therapy (DBT) be researched among the POTS population. The third wave of CBT was developed to address the shortcomings of preceding models of CBT by emphasizing how we relate to our cognitions rather than the context of these cognitions (Carvalho et al., 2017; Hayes & Hofmann, 2017).

Understanding how we relate to our cognitions is critical among this population. Understanding this would allow us to comprehend how individuals with POTS relate to their beliefs about their ESE and FAB. For example, understanding if an individual with POTS can accept the discomfort of low ESE and high FAB and still engage in exercise.

Rashidi et al. (2021) and Vowles et al. (2014) validated the efficacy of ACT among individuals with chronic pain, chronic illnesses, and cardiovascular disorders, indicating the relevance of this approach among the POTS population. One component of ACT that would be of interest in future research among the POTS population is acceptance. Acceptance among this population may be beneficial as it would allow the individual to accept their fears about exercise rather than having their fear impact their ESE and develop into avoidance.

Like ACT, the efficacy of DBT among individuals with chronic pain, chronic illness, and cardiovascular disorders was validated by Purdy (2013) and Tavakoli et al. (2019). This research indicates the possible relevance of these treatments in the POTS population. DBT is effective in treating intense emotional reactions, which means an individual with POTS would learn how to control their emotional responses to the symptoms of exercise intolerance. By controlling their emotional reaction, the individual may have a mastery experience of successfully coping with exercise intolerance, positively impacting ESE and FAB.

DBT was also seen to be effective in improving treatment adherence, which was the key concern of this study. A critical component of DBT is radical acceptance, in which the POTS patient would work on understanding pain (such asFAB and low ESE)

as a part of life without turning this pain into suffering, like the notion of acceptance previously discussed. Individuals with POTS would learn the symptom of exercise intolerance is inevitable, and they would not judge these symptoms as harmful but instead learn to withstand it.

Lastly, further research should be conducted to understand any barriers other than mental health that affect an individual with POTS's decision to exercise. Such obstacles may include socioeconomic status or co-occurring mental or physical health disorders. In addition, research on persons' education levels and ESE and FAB should be examined due to inconsistencies between the current study and some of the extant research.

Implications

With all that was learned from this study, the implications are many. The implications for social change include the need to focus on (a) developing interventions that improve POTS patients' self-efficacy and fear avoidance perceptions as these relate to their exercise adherence, (b) improving the quality of life of individuals with POTS, and (c) decreasing the prevalence of disability within the POTS population. This study improved the understanding that there is a potential role to be played by an individual's cognitions surrounding exercise adherence. A further understanding of how those with POTS think about exercise likely would benefit our understanding of improving exercise engagement.

The efficacy of cognitive therapy (CT), cognitive behavioral therapy (CBT), and third-wave CBT approaches, such as Acceptance and Commitment Therapy (ACT) and Dialectical Behavioral Therapy (DBT), should be explored as these modalities directly

address an individual's cognitions. Once the cognitions of POTS patients are more fully understood and addressed, it is reasonable to predict improved exercise engagement. If improvement in exercise engagement occurs, a decrease in POTS symptoms and increased quality of life may result. Further, with an improved quality of life, it is likely that disability rates among the POTS population would fall, as they would be able to better contribute to their society.

Conclusion

The purpose of this study was to improve our understanding of why individuals with POTS may or may not engage in the beneficial practice of exercise by exploring factors such as low ESE and elevated FAB. I found a relationship between exercise engagement and FAB. Similarly, I found a relationship between exercise engagement and ESE, which means these factors (ESE and FAB) impact whether the individual may or may not engage in exercise. In addition, FAB and ESE were seen to impact one another through factors that influence the development of ESE (self-persuasion, mastery experiences, and negative affect).

With all that was learned from this study, the implications are many. The implications for social change include the need to focus on (a) developing or implementing interventions (CBT, ACT, DBT) that improve exercise adherence in individuals with POTS, (b) improving the quality of life of individuals with POTS, and (c) decreasing the prevalence of disability within the POTS population.

Given the current results, further research is needed among individuals with POTS, including the role of lifestyle changes, the impacts on mental health, the efficacy

of psychological interventions such as CBT, ACT, and DBT, and an understanding of any barriers, such as exercise intolerance, that may play a role in exercise.

References

Afzal, J., Yasmeen, S., Ishaque, F., Nazar, B., Naz, A., & Azhar, E. (2021). Prevalence of fear-avoidance belief in patients with neck and back pain seeking physiotherapy. *International Journal of Endorsing Health Science Research (IJEHSR)*, *9*(3), Article 3. https://doi.org/10.29052/IJEHSR.v9.i3.2021.302-308

Åhlund, K., Bäck, M., & Sernert, N. (2013). Fear-avoidance beliefs and cardiac rehabilitation in patients with first-time myocardial infarction. *Journal of Rehabilitation Medicine*, *45*(10), 1028–1033. https://doi.org/10.2340/16501977-1219

Almutary, H., & Tayyib, N. (2020). Factors associated with exercise self-efficacy among people with chronic diseases. *Applied Nursing Research*, *54*. https://doi.org/10.1016/j.apnr.2020.151275

Alonso, W. W., Kupzyk, K., Norman, J., Bills, S. E., Bosak, K., Dunn, S. L., Deka, P., & Pozehl, B. (2021). Negative attitudes, self-efficacy, and relapse management mediate long-term adherence to exercise in patients with heart failure. *Annals of Behavioral Medicine*, *55*(10), 1031–1041. https://doi.org/10.1093/abm/kaab002

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders 5th edition*. https://doi.org/10.1176/appi.books.9780890425596

American Psychological Association. (2017). *Ethical principles of psychologists and code of conduct*. https://www.apa.org. https://www.apa.org/ethics/code

Baday-Keskin, D., & Ekinci, B. (2022). The relationship between kinesiophobia and health-related quality of life in patients with rheumatoid arthritis: A controlled

cross-sectional study. *Joint Bone Spine*, *89*(2). https://doi.org/10.1016/j.jbspin.2021.105275

Bandura, A. (1977a). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, *84*(2), 191–215.

Bandura, A. (1977b). *Social learning theory*. Prentice-Hall.

Bandura, A. (1986). *Social foundations of thought & action: A social cognitive theory*. Prentice-Hall.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. Henry Holt & Co.

Bandura, A. (2007). Albert Bandura. In G. Lindzey & W. M. Runyan (Eds.), *A history of psychology in autobiography, Vol. IX.* (pp. 43–75). American Psychological Association. https://doi.org/10.1037/11571-002

Bandura, A., & Cervone, D. (1983). Self-evaluative and self-efficacy mechanisms governing the motivational effects of goal systems. *Journal of Personality and Social Psychology*, *45*(5), 1017–1028. https://doi.org/10.1037/0022-3514.45.5.1017

Bandura, A., Ross, D., & Ross, S. A. (1961). Transmission of aggression through imitation of aggressive models. *The Journal of Abnormal and Social Psychology*, *63*(3), 575–582. https://doi.org/10.1037/h0045925

Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, *51*(6), 1173–1182. https://doi.org/10.1037/0022-3514.51.6.1173

Bay, A., Sandberg, C., Thilén, U., Wadell, K., & Johansson, B. (2018). Exercise self-efficacy in adults with congenital heart disease. *IJC Heart & Vasculature*, *18*, 7–11. https://doi.org/10.1016/j.ijcha.2017.12.002

Bauman, A. E., Reis, R. S., Sallis, J. F., Wells, J. C., Loos, R. J., & Martin, B. W. (2012). Correlates of physical activity: Why are some people physically active and others not? *The Lancet*, *380*(9838), 258–271. https://doi.org/10.1016/S0140-6736(12)60735-1

Baykal Şahin, H., Kalaycıoğlu, E., & Şahin, M. (2021). The effect of cardiac rehabilitation on kinesiophobia in patients with coronary artery disease. *Turkish Journal of Physical Medicine and Rehabilitation*, *67*(2), 203–210. https://doi.org/10.5606/tftrd.2021.5164

Bergström, G., Börjesson, M., & Schmidt, C. (2015). Self-efficacy regarding physical activity is superior to self-assessed activity level, in long-term prediction of cardiovascular events in middle-aged men. *BMC Public Health*, *15*(1), 820. https://doi.org/10.1186/s12889-015-2140-4

Blitshteyn, S., & Fries, D. (2016). Postural tachycardia syndrome is not caused by deconditioning. *Pulmonary Circulation*, *6*(3), 401. https://doi.org/10.1086/687757

Blitshteyn, S. (2021). Is postural orthostatic tachycardia syndrome (POTS) a central nervous system disorder? *Journal of Neurology*, 1–8. https://doi.org/10.1007/s00415-021-10502-z

Blitshteyn, S., & Whitelaw, S. (2021). Postural orthostatic tachycardia syndrome (POTS) and other autonomic disorders after COVID-19 infection: A case series of 20

patients. *Immunologic Research*, *69*(2), 205–211. https://doi.org/10.1007/s12026-021-09185-5

Boris, J. R., Huang, J., Shuey, T., & Bernadzikowski, T. (2020). Family history of associated disorders in patients with postural tachycardia syndrome. *Cardiology in the Young*, *30*(3), 388–394. https://doi.org/10.1017/S1047951120000165

Bryarly, M., Phillips, L. T., Fu, Q., Vernino, S., & Levine, B. D. (2019). Postural Orthostatic Tachycardia Syndrome: JACC Focus Seminar. *Journal of the American College of Cardiology*, *73*(10), 1207–1228. https://doi.org/10.1016/j.jacc.2018.11.059

Bourne, K. M., Sheldon, R. S., Hall, J., Lloyd, M., Kogut, K., Sheikh, N., Jorge, J., Ng, J., Exner, D. V., Tyberg, J. V., & Raj, S. R. (2021). Compression garment reduces orthostatic tachycardia and symptoms in patients with postural orthostatic tachycardia syndrome. *Journal of the American College of Cardiology*, *77*(3), 285–296. https://doi.org/10.1016/j.jacc.2020.11.040

Carvalho, S., Martins, C. P., Almeida, H. S., & Silva, F. (2017). The evolution of cognitive behavioural therapy – The third generation and its effectiveness. *European Psychiatry*, *41*(S1), s773–s774. https://doi.org/10.1016/j.eurpsy.2017.01.1461

Cetingok, S., Seker, O., & Cetingok, H. (2022). The relationship between fibromyalgia and depression, anxiety, anxiety sensitivity, fear avoidance beliefs, and quality of life in female patients. *Medicine*, *101*(39), e30868. https://doi.org/10.1097/MD.0000000000030868

Chu, K. (2018). Efficacy of Propranolol, Bisoprolol, and Pyridostigmine for Postural Tachycardia Syndrome: A Randomized Clinical Trial. *Neurotherapeutics*, *15*(3), 785–795. https://doi.org/10.1007/s13311-018-0612-9

Cline, H. M., & Einhardt, A. (2022). Postural orthostatic tachycardia syndrome: A conundrum for patients and healthcare providers. *The Nurse Practitioner*, *47*(1), 12–19. https://doi.org/10.1097/01.NPR.0000802968.90212.70

Coleman, M. B. (2010). *Development and validation of the Preschool Parent Confidence Questionnaire (PPCQ): A parental self-efficacy instrument* (Order No. 1488407). Available from ProQuest Dissertations & Theses Global. (851700430). https://www.proquest.com/dissertations-theses/development-validation-preschool-parent/docview/851700430/se-2

Convenience Sample. (2008). In L. Given, *The SAGE Encyclopedia of Qualitative Research Methods*. SAGE Publications, Inc. https://doi.org/10.4135/9781412963909.n68

Creswell, J., & Creswell, D. (2018). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (Fifth). Sage Publications. https://us.sagepub.com/en-us/nam/research-design/book270550

Da Costa, J. M. (1871). On irritable heart; a clinical study of a form of functional cardiac disorder and its consequences. *American Journal of the Medical Sciences*, *61*(121), 17–52.

Darnall, B. D. (2019). Cognitive behavioral therapy and acceptance and commitment therapy for chronic pain. In *Psychological treatment for patients with chronic*

pain. (2018-36943-007; pp. 85–98). American Psychological Association. https://doi.org/10.1037/0000104-007

David, D., Cristea, I., & Hofmann, S. G. (2018). Why Cognitive Behavioral Therapy Is the Current Gold Standard of Psychotherapy. *Frontiers in Psychiatry*, *9*, 4. https://doi.org/10.3389/fpsyt.2018.00004

de Moraes Vieira, E. B., de Góes Salvetti, M., Damiani, L. P., & de Mattos Pimenta, C. A. (2014). Self-efficacy and fear avoidance beliefs in chronic low back pain patients: Coexistence and associated factors. *Pain Management Nursing: Official Journal of the American Society of Pain Management Nurses*, *15*(3), 593–602. https://doi.org/10.1016/j.pmn.2013.04.004

Demmelmaier, I., Björk, A., Dufour, A. B., Nordgren, B., & Opava, C. H. (2018). Trajectories of Fear-Avoidance Beliefs on Physical Activity Over Two Years in People With Rheumatoid Arthritis. *Arthritis Care & Research*, *70*(5), 695–702. https://doi.org/10.1002/acr.23419

Deng, X., Zhang, Y., Liao, Y., & Du, J. (2019). Efficacy of β-Blockers on Postural Tachycardia Syndrome in Children and Adolescents: A Systematic Review and Meta-Analysis. *Frontiers in Pediatrics*, *7*, 460. https://doi.org/10.3389/fped.2019.00460

Do, T., Diamond, S., Green, C., & Warren, M. (2021). Nutritional Implications of Patients with Dysautonomia and Hypermobility Syndromes. *Current Nutrition Reports*, *10*(4), 324–333. https://doi.org/10.1007/s13668-021-00373-1

Farris, S. G., Thomas, J. G., Abrantes, A. M., Lipton, R. B., Burr, E. K., Godley, F. A.,

Roth, J. L., Pavlovic, J. M., & Bond, D. S. (2019). Anxiety sensitivity and intentional avoidance of physical activity in women with probable migraine. *Cephalalgia*, *39*(11), 1465–1469. https://doi.org/10.1177/0333102419861712

Fedorowski, A. (2019). Postural orthostatic tachycardia syndrome: Clinical presentation, aetiology and management. *Journal of Internal Medicine*, *285*(4), 352–366. https://doi.org/10.1111/joim.12852

Feigofsky, S., & Fedorowski, A. (2020). Defining Cardiac Dysautonomia—Different Types, Overlap Syndromes; Case-based Presentations. *JAFIB: Journal of Atrial Fibrillation*, *13*(1), 1–8.

Fisher, C. J., Katzan, I., Heinberg, L. J., Schuster, A. T., Thompson, N. R., & Wilson, R. (2020). Psychological correlates of patients with postural orthostatic tachycardia syndrome (POTS). *Autonomic Neuroscience: Basic & Clinical*, *227*, 102690. https://doi.org/10.1016/j.autneu.2020.102690

Fu, Q., & Levine, B. D. (2018). Exercise and Non-Pharmacological Treatment of POTS. *Autonomic Neuroscience : Basic & Clinical*, *215*, 20–27. https://doi.org/10.1016/j.autneu.2018.07.001

Fu, Q., Vangundy, T. B., Galbreath, M. M., Shibata, S., Jain, M., Hastings, J. L., Bhella, P. S., & Levine, B. D. (2010). Cardiac origins of the postural orthostatic tachycardia syndrome. *Journal of the American College of Cardiology*, *55*(25), 2858–2868. https://doi.org/10.1016/j.jacc.2010.02.043

Fujii, T., Oka, H., Takano, K., Asada, F., Nomura, T., Kawamata, K., Okazaki, H., Tanaka, S., & Matsudaira, K. (2019). Association between high fear-avoidance

beliefs about physical activity and chronic disabling low back pain in nurses in Japan. *BMC Musculoskeletal Disorders*, *20*(1), 572. https://doi.org/10.1186/s12891-019-2965-6

Gall, N., Kavi, L., & Lobo, M. D. (Eds.). (2021). *Postural Tachycardia Syndrome: A Concise and Practical Guide to Management and Associated Conditions*. Springer International Publishing. https://doi.org/10.1007/978-3-030-54165-1

Garland, E. M., Gamboa, A., Nwazue, V. C., Celedonio, J. E., Paranjape, S. Y., Black, B. K., Okamoto, L. E., Shibao, C. A., Biaggioni, I., Robertson, D., Diedrich, A., Dupont, W. D., & Raj, S. R. (2021). Effect of High Dietary Sodium Intake in Patients With Postural Tachycardia Syndrome. *Journal of the American College of Cardiology*, *77*(17), 2174–2184. https://doi.org/10.1016/j.jacc.2021.03.005

George, S. A., Bivens, T. B., Howden, E. J., Saleem, Y., Galbreath, M. M., Hendrickson, D., Fu, Q., & Levine, B. D. (2016). The international POTS registry: Evaluating the efficacy of an exercise training intervention in a community setting. *Heart Rhythm*, *13*(4), 943–950. https://doi.org/10.1016/j.hrthm.2015.12.012

George, S. Z., & Stryker, S. E. (2011). Fear-Avoidance Beliefs and Clinical Outcomes for Patients Seeking Outpatient Physical Therapy for Musculoskeletal Pain Conditions. *Journal of Orthopaedic & Sports Physical Therapy*, *41*(4), 249–259. https://doi.org/10.2519/jospt.2011.3488

Ghisi, G. L. de M., Aultman, C., Konidis, R., Foster, E., Tahsinul, A., Sandison, N., Sarin, M., & Oh, P. (2020). Effectiveness of an education intervention associated

with an exercise program in improving disease-related knowledge and health behaviours among diabetes patients. *Patient Education and Counseling*, *103*(9), 1790–1797. https://doi.org/10.1016/j.pec.2020.04.007

Goldstein, B. N., Nowacki, A. S., Sweet, W. E., Stefl, S., Moravec, C. S., Fisher, C. J., & Wilson, R. G. (2021). *Mindfulness-Based Stress Reduction as Adjunctive Therapy for Postural Orthostatic Tachycardia Syndrome*. 1.

Goodman, B. P., Khoury, J. A., Blair, J. E., & Grill, M. F. (2021). COVID-19 Dysautonomia. *Frontiers in Neurology*, *12*, 543. https://doi.org/10.3389/fneur.2021.624968

Guclu, D. G., Guclu, O., Ozaner, A., Senormanci, O., & Konkan, R. (2012). The relationship between disability, quality of life and fear-avoidance beliefs in patients with chronic low back pain. *Turkish Neurosurgery*, *22*(6), 724–731. https://doi.org/10.5137/1019-5149.JTN.6156-12.1

Gunning, W. T., Kvale, H., Kramer, P. M., Karabin, B. L., & Grubb, B. P. (2019). Postural Orthostatic Tachycardia Syndrome Is Associated With Elevated G-Protein Coupled Receptor Autoantibodies. *Journal of the American Heart Association*, *8*(18), e013602. https://doi.org/10.1161/JAHA.119.013602

Ho, E. K.-Y., Chen, L., Simic, M., Ashton-James, C. E., Comachio, J., Wang, D. X. M., Hayden, J. A., Ferreira, M. L., & Ferreira, P. H. (2022). Psychological interventions for chronic, non-specific low back pain: Systematic review with network meta-analysis. *BMJ*, *376*, e067718. https://doi.org/10.1136/bmj-2021-067718

Hayes, S. C., & Hofmann, S. G. (2017). The third wave of cognitive behavioral therapy and the rise of process-based care. *World Psychiatry*, *16*(3), 245–246. https://doi.org/10.1002/wps.20442

Higgins, T. J., Middleton, K. R., Winner, L., & Janelle, C. M. (2022). Physical activity interventions differentially affect exercise task and barrier self-efficacy: A meta-analysis. *Health Psychology*, *33*(8), 891–903. https://doi.org/10.1037/a0033864

Hoch, J. M., Houston, M. N., Baez, S. E., & Hoch, M. C. (2020). Fear-Avoidance Beliefs and Health-Related Quality of Life in Post-ACL Reconstruction and Healthy Athletes: A Case-Control Study. *Journal of Sport Rehabilitation*, *29*(6), 772–776. https://doi.org/10.1123/jsr.2018-0491

Horenstein, A., Potter, C. M., & Heimberg, R. G. (2018). How does anxiety sensitivity increase risk of chronic medical conditions? *Clinical Psychology: Science and Practice*, *25*(3). https://doi.org/10.1037/h0101753

Jager, J., Putnick, D. L., & Bornstein, M. H. (2017). More than Just Convenient: The Scientific Merits of Homogeneous Convenience Samples. *Monographs of the Society for Research in Child Development*, *82*(2), 13–30. https://doi.org/10.1111/mono.12296

Janela, D., Costa, F., Molinos, M., Moulder, R. G., Lains, J., Scheer, J. K., Bento, V., Yanamadala, V., Cohen, S. P., & Correia, F. D. (2023). Fear Avoidance Beliefs in Upper-Extremity Musculoskeletal Pain Conditions: Secondary Analysis of a Prospective Clinical Study on Digital Care Programs. *Pain Medicine*, *24*(4), 451–460. https://doi.org/10.1093/pm/pnac149

Junghans-Rutelonis, A. N., Craner, J. R., Ale, C. M., Harbeck-Weber, C., Fischer, P. R., & Weiss, K. E. (2018). Youth with Chronic Pain and Postural Orthostatic Tachycardia Syndrome (POTS): Treatment Mediators of Improvement in Functional Disability. *Journal of Clinical Psychology in Medical Settings*, *25*(4), 471–484. https://doi.org/10.1007/s10880-018-9558-7

Kang, H. (2021). Sample size determination and power analysis using the G*Power software. *Journal of Educational Evaluation for Health Professions*, *18*, 17. https://doi.org/10.3352/jeehp.2021.18.17

Kanjwal, K., Jamal, S., Kichloo, A., & Grubb, B. P. (2020). New-onset Postural Orthostatic Tachycardia Syndrome Following Coronavirus Disease 2019 Infection. *The Journal of Innovations in Cardiac Rhythm Management*, *11*(11), 4302–4304. https://doi.org/10.19102/icrm.2020.111102

Keessen, P., Latour, C. H. M., van Duijvenbode, I. C. D., Visser, B., Proosdij, A., Reen, D., & Scholte op Reimer, W. J. M. (2020). Factors related to fear of movement after acute cardiac hospitalization. *BMC Cardiovascular Disorders*, *20*(1), N.PAG-N.PAG. https://doi.org/10.1186/s12872-020-01783-9

Larsen, N. W., Stiles, L. E., & Miglis, M. G. (2021). Preparing for the long-haul: Autonomic complications of COVID-19. *Autonomic Neuroscience: Basic and Clinical*, *235*. https://doi.org/10.1016/j.autneu.2021.102841

Lee, S., Kwon, S., & Ahn, J. (2021). The Effect of Modeling on Self-Efficacy and Flow State of Adolescent Athletes Through Role Models. *Frontiers in Psychology*, *12*. https://www.frontiersin.org/article/10.3389/fpsyg.2021.661557

Lewis-Beck, M., Bryman, A., & Futing Liao, T. (2004). Internal Validity. In *The SAGE Encyclopedia of Social Science Research Methods*. Sage Publications, Inc. https://doi.org/10.4135/9781412950589.n436

Mackenzie, J. (1916). THE SOLDIER'S HEART. *British Medical Journal*, *1*(2873), 117–119. https://doi.org/10.1136/bmj.1.2873.117

Maltese, P. E., Manara, E., Beccari, T., Dundar, M., Capodicasa, N., & Bertelli, M. (2020). Genetic testing for autonomic dysfunction or dysautonomias. *Acta Bio Medica Atenei Parmensis*, *91*(13-S), e2020002. https://doi.org/10.23750/abm.v91i13-S.10518

Mar, P. L., & Raj, S. R. (2020). Postural Orthostatic Tachycardia Syndrome: Mechanisms and New Therapies. *Annual Review of Medicine*, *71*, 235–248. https://doi.org/10.1146/annurev-med-041818-011630

Marques-Sule, E., Deka, P., Almenar, L., Pathak, D., López-Vilella, R., & Klompstra, L. (2022). Physical Activity Readiness in Patients with Heart Failure. *International Journal of Environmental Research and Public Health*, *19*(23), 16332. https://doi.org/10.3390/ijerph192316332

Mayoux, L. (2006). Quantitative, Qualitative or Participatory? Which Method, for What and When? In V. Desai & R. Potter, *Doing Development Research* (pp. 115–129). SAGE Publications, Ltd. https://doi.org/10.4135/9781849208925.n13

McDowell, C. P., Dishman, R. K., Gordon, B. R., & Herring, M. P. (2019). Physical Activity and Anxiety: A Systematic Review and Meta-analysis of Prospective Cohort Studies. *American Journal of Preventive Medicine*, *57*(4), 545–556.

https://doi.org/10.1016/j.amepre.2019.05.012

McGinnis, E. L., Rogers, L. Q., Fruhauf, C. A., Jankowski, C. M., Crisafio, M. E., & Leach, H. J. (2021). Feasibility of Implementing Physical Activity Behavior Change Counseling in an Existing Cancer-Exercise Program. *International Journal of Environmental Research and Public Health*, *18*(23). https://doi.org/10.3390/ijerph182312705

McGregor, G., Hee, S. W., Eftekhari, H., Holliday, N., Pearce, G., Sandhu, H., Simmonds, J., Joshi, S., Kavi, L., Bruce, J., Panikker, S., Lim, B., & Hayat, S. (2020). Protocol for a randomised controlled feasibility trial of exercise rehabilitation for people with postural tachycardia syndrome: The PULSE study. *Pilot and Feasibility Studies*, *6*(1), 157. https://doi.org/10.1186/s40814-020-00702-1

Miller, A. J., & Raj, S. R. (2018). Pharmacotherapy for postural tachycardia syndrome. *Autonomic Neuroscience: Basic and Clinical*, *215*, 28–36. https://doi.org/10.1016/j.autneu.2018.04.008

Miranda, N. A., Boris, J. R., Kouvel, K. M., & Stiles, L. (2018). Activity and Exercise Intolerance After Concussion: Identification and Management of Postural Orthostatic Tachycardia Syndrome. *Journal of Neurologic Physical Therapy*, *42*(3), 163–171. https://doi.org/10.1097/NPT.0000000000000231

Moon, J., Kim, D.-Y., Lee, W.-J., Lee, H. S., Lim, J.-A., Kim, T.-J., Jun, J.-S., Park, B., Byun, J.-I., Sunwoo, J.-S., Lee, S.-T., Jung, K.-H., Park, K.-I., Jung, K.-Y., Kim, M., Lee, S. K., &

Mosher, M. (2021). *Factors that Influence Participation in Physical Activity in Adults with Nonalcoholic Fatty Liver Disease* [Georgia State University]. https://doi.org/10.57709/23916069

Nair, S. P., Harania, R., & Rajguru, V. (2018). Evaluation of Fear Avoidance Belief and Kinesiophobia in Patients after Undergoing In- Patient Cardiac Rehabilitation Post Cardiac Surgery. *International Journal of Health Sciences*, *6*, 6.

O'Neil-Pirozzi, T. M. (2021). Cognitive Exercise Self-Efficacy of Community-Dwelling Older Adults: Measurement and Associations with Other Self-Reported Cognitive Exercise Factors. *Brain Sciences*, *11*(6), 672. https://doi.org/10.3390/brainsci11060672

Owens, A. P., Low, D. A., Iodice, V., Critchley, H. D., & Mathias, C. J. (2017). The genesis and presentation of anxiety in disorders of autonomic overexcitation. *Autonomic Neuroscience: Basic & Clinical*, *203*, 81–87. https://doi.org/10.1016/j.autneu.2016.10.004

Oyibo, K., Adaji, I., & Vassileva, J. (2018). Social cognitive determinants of exercise behavior in the context of behavior modeling: A mixed method approach. *DIGITAL HEALTH*, *4*, 2055207618811555. https://doi.org/10.1177/2055207618811555

Park, J. H., Moon, J. H., Kim, H. J., Kong, M. H., & Oh, Y. H. (2020). Sedentary Lifestyle: Overview of Updated Evidence of Potential Health Risks. *Korean Journal of Family Medicine*, *41*(6), 365–373. https://doi.org/10.4082/kjfm.20.0165

Pederson, C. L., & Brook, J. B. (2017). Health-related quality of life and suicide risk in postural tachycardia syndrome. *Clinical Autonomic Research*, *27*(2), 75–81. https://doi.org/10.1007/s10286-017-0399-5

Purdy, J. (2013). Chronic Physical Illness: A Psychophysiological Approach for Chronic Physical Illness. *The Yale Journal of Biology and Medicine*, *86*(1), 15–28.

Rainville, J., Smeets, R. J. E. M., Bendix, T., Tveito, T. H., Poiraudeau, S., & Indahl, A. J. (2011). Fear-avoidance beliefs and pain avoidance in low back pain—Translating research into clinical practice. *The Spine Journal: Official Journal of the North American Spine Society*, *11*(9), 895–903. https://doi.org/10.1016/j.spinee.2011.08.006

Raj, S. R., Bourne, K. M., Stiles, L. E., Miglis, M. G., Cortez, M. M., Miller, A. J., Freeman, R., Biaggioni, I., Rowe, P. C., Sheldon, R. S., Shibao, C. A., Diedrich, A., Systrom, D. M., Cook, G. A., Doherty, T. A., Abdallah, H. I., Grubb, B. P., Fedorowski, A., Stewart, J. M., … Vernino, S. (2021). Postural orthostatic tachycardia syndrome (POTS): Priorities for POTS care and research from a 2019 National Institutes of Health Expert Consensus Meeting – Part 2. *Autonomic Neuroscience*, *235*, 102836. https://doi.org/10.1016/j.autneu.2021.102836

Raj, V., Opie, M., & Arnold, A. C. (2018). Cognitive and Psychological Issues in Postural Tachycardia Syndrome. *Autonomic Neuroscience : Basic & Clinical*, *215*, 46–55. https://doi.org/10.1016/j.autneu.2018.03.004

Raj, V., & RAJ, S. R. (2017). POTS and Suicide: What We Don't Know. *Clinical Autonomic Research : Official Journal of the Clinical Autonomic Research*

Society, *27*(2), 69–70. https://doi.org/10.1007/s10286-017-0407-9

Rao, U. T., Noronha, J. A., & Adiga, K. (2020). Effect of aerobic exercises on depressive symptoms, anxiety, self-esteem, and quality of life among adults with depression. *Clinical Epidemiology and Global Health*, *8*(4), 1147–1151. https://doi.org/10.1016/j.cegh.2020.04.006

Rashidi, A., Whitehead, L., Newson, L., Astin, F., Gill, P., Lane, D. A., Lip, G. Y. H., Neubeck, L., Ski, C. F., Thompson, D. R., Walthall, H., & Jones, I. D. (2021). The Role of Acceptance and Commitment Therapy in Cardiovascular and Diabetes Healthcare: A Scoping Review. *International Journal of Environmental Research and Public Health*, *18*(15), 8126. https://doi.org/10.3390/ijerph18158126

Rodgers, W. M., Hall, C. R., Blanchard, C. M., McAuley, E., & Munroe, K. J. (2002). Task and Scheduling Self-efficacy as Predictors of Exercise Behavior. *Psychology & Health*, *17*(4), 405–416. https://doi.org/10.1080/0887044022000004902

Rodriguez, B., Zimmermann, R., Gutbrod, K., Heinemann, D., & Z'Graggen, W. J. (2019). Orthostatic Cognitive Dysfunction in Postural Tachycardia Syndrome After Rapid Water Drinking. *Frontiers in Neuroscience*, *13*, 327. https://doi.org/10.3389/fnins.2019.00327

Rostamian, M., & Kazemi, A. (2016). Relationship between observational learning and health belief with physical activity among adolescents girl in Isfahan, Iran. *Iranian Journal of Nursing and Midwifery Research*, *21*(6), 601–604. https://doi.org/10.4103/1735-9066.197681

Safavi-Naeini, P., & Razavi, M. (2020). Postural Orthostatic Tachycardia Syndrome. *Texas Heart Institute Journal*, *47*(1), 57–59. https://doi.org/10.14503/THIJ-19-7060

Schondorf, R., & Low, P. A. (1993). Idiopathic postural orthostatic tachycardia syndrome: An attenuated form of acute pandysautonomia? *Neurology*, *43*(1), 132–137. https://doi.org/10.1212/wnl.43.1_part_1.132

Schmidt, L. L., Karabin, B. L., & Malone, A. C. (2017). Postural Orthostatic Tachycardia Syndrome (POTS): Assess, Diagnose, and Evaluate for POTS Treatment (ADEPT). *Integrative Medicine International*, *4*(3–4), 142–153. https://doi.org/10.1159/000484205

Sebastian, S. A., Co, E. L., Panthangi, V., Jain, E., Ishak, A., Shah, Y., Vasavada, A., & Padda, I. (2022). Postural Orthostatic Tachycardia Syndrome (POTS): An Update for Clinical Practice. *Current Problems in Cardiology*, *47*(12), 101384. https://doi.org/10.1016/j.cpcardiol.2022.101384

Selzler, A.-M., Rodgers, W. M., Berry, T. R., & Stickland, M. K. (2020). Coping Versus Mastery Modeling Intervention to Enhance Self-efficacy for Exercise in Patients with COPD. *Behavioral Medicine*, *46*(1), 63–74. https://doi.org/10.1080/08964289.2018.1561411

Shaw, B., Stiles, L., Bourne, K., Green, E., Shibao, C., Okamoto, L., Garland, E., Gamboa, A., Diedrich, A., Raj, V., Sheldon, R., Biaggioni, I., Robertson, D., & Raj, S. (2019). The Face of Postural Tachycardia Syndrome—Insights from a Large Cross-Sectional Online Community-Based Survey. *Journal of Internal*

Medicine, *286*. https://doi.org/10.1111/joim.12895

Snapper, H., & Cheshire, W. P. (2022). Oral and intravenous hydration in the treatment of orthostatic hypotension and postural tachycardia syndrome. *Autonomic Neuroscience*, *238*, 102951. https://doi.org/10.1016/j.autneu.2022.102951

Stennett, A., De Souza, L., & Norris, M. (2020). The meaning of exercise and physical activity in community dwelling people with multiple sclerosis. *Disability and Rehabilitation*, *42*(3), 317–323. https://doi.org/10.1080/09638288.2018.1497715

Stephens, S., Schneiderman, J. E., Finlayson, M., Berenbaum, T., Motl, R. W., & Yeh, E. A. (2022). Feasibility of a theory-informed mobile app for changing physical activity in youth with multiple sclerosis. *Multiple Sclerosis and Related Disorders*, *58*, 103467. https://doi.org/10.1016/j.msard.2021.103467

Tamminen, N., Reinikainen, J., Appelqvist-Schmidlechner, K., Borodulin, K., Mäki-Opas, T., & Solin, P. (2020). Associations of physical activity with positive mental health: A population-based study. *Mental Health and Physical Activity*, *18*, 100319. https://doi.org/10.1016/j.mhpa.2020.100319

Taulaniemi, A., Kankaanpää, M., Rinne, M., Tokola, K., Parkkari, J., & Suni, J. H. (2020). Fear-avoidance beliefs are associated with exercise adherence: Secondary analysis of a randomised controlled trial (RCT) among female healthcare workers with recurrent low back pain. *BMC Sports Science, Medicine and Rehabilitation*, *12*(1), 28. https://doi.org/10.1186/s13102-020-00177-w

Tavakoli, F., Kazemi-Zahrani, H., & Sadeghi, M. (2019). The effectiveness of dialectical behavior therapy on adherence to treatment and self-caring behavior in patients

with coronary heart disease. *ARYA Atherosclerosis*, *15*(6), 281. https://doi.org/10.22122/arya.v15i6.1733

Taylor, S. (2020). Anxiety sensitivity. In J. S. Abramowitz & S. M. Blakey (Eds.), *Clinical handbook of fear and anxiety: Maintenance processes and treatment mechanisms.* (2019-52029-004; pp. 65–80). American Psychological Association. https://doi.org/10.1037/0000150-004

Terada, T., Friesen, A., Chahal, B. S., Bell, G. J., McCargar, L. J., & Boulé, N. G. (2013). Feasibility and preliminary efficacy of high intensity interval training in type 2 diabetes. *Diabetes Research and Clinical Practice*, *99*(2), 120–129. https://doi.org/10.1016/j.diabres.2012.10.019

van der Zalm, T., Alsma, J., van de Poll, S. W. E., Wessels, M. W., Riksen, N. P., & Versmissen, J. (2019). Postural orthostatic tachycardia syndrome (POTS): A common but unfamiliar syndrome. *The Netherlands Journal of Medicine*, *77*(1), 3–9.

Varanasi, S., Sathyamoorthy, M., Chamakura, S., & Shah, S. A. (2021). Management of Long-COVID postural orthostatic Tachycardia Syndrome With enhanced external counterpulsation. *Cureus*. https://doi.org/10.7759/cureus.18398

Vergeld, V., Martin Ginis, K. A., & Jenks, A. D. (2021). Psychological interventions for reducing fear avoidance beliefs among people with chronic back pain. *Rehabilitation Psychology*. https://doi.org/10.1037/rep0000394

Vernino, S., Bourne, K. M., Stiles, L. E., Grubb, B. P., Fedorowski, A., Stewart, J. M., Arnold, A. C., Pace, L. A., Axelsson, J., Boris, J. R., Moak, J. P., Goodman, B. P.,

Chémali, K. R., Chung, T. H., Goldstein, D. S., Diedrich, A., Miglis, M. G., Cortez, M. M., Miller, A. J., … Raj, S. R. (2021). Postural orthostatic tachycardia syndrome (POTS): State of the science and clinical care from a 2019 National Institutes of Health Expert Consensus Meeting - Part 1. *Autonomic Neuroscience*, 102828. https://doi.org/10.1016/j.autneu.2021.102828

Vogt, W. (2005). Social Desirability Bias. In *Dictionary of Statistics & Methodology*. SAGE Publications, Inc. https://doi.org/10.4135/9781412983907.n1826

Vowles, K. E., Fink, B. C., & Cohen, L. L. (2014). Acceptance and Commitment Therapy for chronic pain: A diary study of treatment process in relation to reliable change in disability. *Journal of Contextual Behavioral Science*, *3*(2), 74–80. https://doi.org/10.1016/j.jcbs.2014.04.003

Waddell, G., Newton, M., Henderson, I., Somerville, D., & Main, C. J. (1993). A Fear-Avoidance Beliefs Questionnaire (FABQ) and the role of fear-avoidance beliefs in chronic low back pain and disability. *Pain*, *52*(2), 157–168. https://doi.org/10.1016/0304-3959(93)90127-B

Warner, L. M., Schüz, B., Wolff, J. K., Parschau, L., Wurm, S., & Schwarzer, R. (2014). Sources of self-efficacy for physical activity. *Health Psychology: Official Journal of the Division of Health Psychology, American Psychological Association*, *33*(11), 1298–1308. https://doi.org/10.1037/hea0000085

Warner, R. (2013). *Applied Statistics From Bivariate Through Multivariate Techniques*. Sage.

Waxenbaum, J. A., Reddy, V., & Varacallo, M. (2021). Anatomy,autonomic nervous

system. In *StatPearls*. StatPearls Publishing. http://www.ncbi.nlm.nih.gov/books/NBK539845/

Williams, E. L., Raj, S. R., Schondorf, R., Shen, W. K., Wieling, W., & Claydon, V. E. (2022). Salt supplementation in the management of orthostatic intolerance: Vasovagal syncope and postural orthostatic tachycardia syndrome. *Autonomic Neuroscience*, *237*, 102906. https://doi.org/10.1016/j.autneu.2021.102906

Wood, P. (1941). Da Costa's Syndrome: Aetiology. Lecture III. *British Medical Journal*, *1*(4196), 845–851.

Y Lei, L., S Chew, D., K Sandhu, R., S Sheldon, R., & R Raj, S. (2020). Nonpharmacological and pharmacological management of cardiac dysautonomia syndromes. *Journal of Atrial Fibrillation*, *13*(1), 2395. https://doi.org/10.4022/jafib.2395

Yentür, S. B., Karatay, S., Oskay, D., Tufan, A., Küçük, H., & Haznedaroğlu, Ş. (2019). Kinesiophobia and related factors in systemic lupus erythematosus patients. *Turk J Med Sci*, 8.

Zadourian, A., Doherty, T. A., Swiatkiewicz, I., & Taub, P. R. (2018). Postural orthostatic tachycardia syndrome: prevalence, pathophysiology, and management. *Drugs*, *78*(10), 983–994. https://doi.org/10.1007/s40265-018-0931-5

Zalewski, P., Słomko, J., & Zawadka-Kunikowska, M. (2018). Autonomic dysfunction and chronic disease. *British Medical Bulletin*, *128*(1), 61–74. https://doi.org/10.1093/bmb/ldy036

Zha, K., Brook, J., McLaughlin, A., & Blitshteyn, S. (2022). Gluten-free diet in postural

orthostatic tachycardia syndrome (POTS). *Chronic Illness*, 17423953221076984. https://doi.org/10.1177/17423953221076984

Zhang, Q., Xu, B., & Du, J. (2020). Update of individualized treatment strategies for postural orthostatic tachycardia syndrome in children. *Frontiers in Neurology*, *11*. https://www.frontiersin.org/article/10.3389/fneur.2020.00525

Appendix A: Informed Consent

You are invited to participate in a research study to examine fear avoidance beliefs and exercise self-efficacy related to individuals with POTS. This research can contribute to our understanding of the challenges individuals with POTS face when engaging in exercise, an effective treatment for reducing POTS symptom severity. You were selected as a possible participant because you have been diagnosed with POTS by a physician.

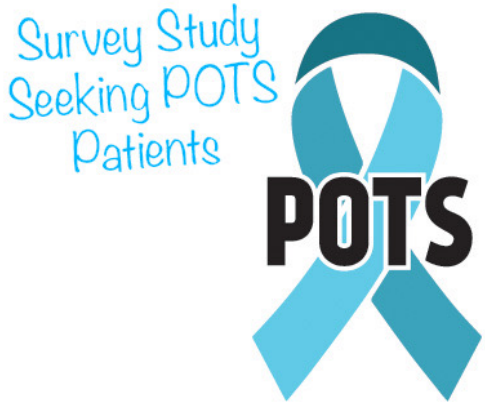
This study is being conducted by Mary Collins a doctoral student in the Walden University Clinical Psychology Program, specializing in Health Psychology. This form is part of a process called an informed consent, which allows you to understand this study's purpose, prior to deciding whether to participate. Your participation is completely voluntary. If you decide to participate in this research study, you are asked to click on the "Agree" button located at the bottom of this page which will begin the survey.

You will then be asked to complete a series of questions related to demographics, your beliefs about your ability to engage in exercise, and thoughts on engaging in exercise. The demographic survey consists of approximately 50 questions, some of which are personal. The entire survey should take 10-20 minutes to complete. If you change your mind about participating, you can withdraw at any time. Declining or discontinuing will not negatively affect you or your POTS treatment. If you choose to withdraw, your data cannot be withdrawn because it is anonymous.

Any data obtained in connection with this study will remain anonymous. No identifying data will be collected as part of this study. Data collected will be maintained on password protected computers. There are no risks associated with participation in the study and your responses will remain anonymous. There may be no direct benefits related to your participation in this study, but results from this study may be used to assist in understanding effective treatments for POTS and the barriers that may prevent individuals with POTS to engaging in this treatment.

The data will only be collected once and there is no monetary compensation for participating in this study. Data will be kept for a period of at least 5 years, as required by Walden University. If you have any questions about this study, please contact Mary Collins by email at mary.collins4@waldenu.edu or my dissertation chair, Dr. Johnson at michael.johnson2@waldenu.edu

Appendix B: Demographic Recruitment Social Media Post



Caption: There is a new study about the experiences of exercising in individuals with POTS that could help healthcare providers better understand and treat POTS symptoms.

About the study:

- This survey will take approximately 10-20 minutes to complete.
- There is no monetary compensation for participating in this study.
- To protect your privacy, this survey will be anonymous.

Volunteers must meet these requirements:

- Between the ages of 18-55,
- Have a diagnosis of POTS by a physician
- Fluent in the English language.

This survey is part of the doctoral study for Mary Collins, a Ph.D. student at Walden University.

Please click the following link if you are interested in participating.

Appendix C: Demographic Form

1. What is your gender?

    a) Male
    b) Female
    c) Transgendered

2. What is your age?

3. What is your sexual orientation?

    a) Heterosexual
    b) Homosexual
    c) Bisexual
    d) Other

4. What is your race?

    a) European American/Caucasian/non-Hispanic
    b) Black/African American
    c) Asian/Pacific Islander
    d) American Indian/Native American
    e) Latina/Chicano/Hispanic
    f) Biracial/Multiracial
    g) Other

5. What is your highest level of education?

    a) High School/GED
    b) Some college
    c) Undergraduate degree
    d) Graduate degree

6. What is your current employment status?
    a) Full time
    b) Part time
    c) Student
    d) Not employed
    e) On disability

7. How long ago were you diagnosed with POTS by a physician?
    a) Under 1 year ago
    b) 1 to 5 years ago

c) 5 to 10 years ago
d) Over 10 years ago

8. What type of doctor diagnosed your POTS?
    a) Primary Care Physician
    b) Neurologist
    c) Cardiologist
    d) Other

9. In this past month, how many times have you exercised?
    a) 0
    b) 1 to 5 times
    c) 5 to 10
    d) More than 10 times