EXAMINING THE ASSOCIATIONS AMONG PHYSICAL ACTIVITY COUNSELING, SELF-EFFICACY, AND PHYSICAL ACTIVITY BEHAVIOR

by

Leslie Ann Snapper

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Approved by:

_____
Dr. Amy H. Peterman

_____
Dr. Victoria C. Scott

_____
Dr. Michael Dulin

ABSTRACT

LESLIE ANN SNAPPER: Examining the Associations Among Physical Activity Counseling, Self-Efficacy, and Physical Activity Behavior. (Under the direction of DR. AMY H. PETERMAN and DR. VICTORIA C. SCOTT)

Physical activity is associated with a myriad of health benefits, yet rates of physical activity among adults in the United States remain low and traditional medical interventions often don't address activity behavior. Despite evidence supporting the use of physical activity counseling in medical settings, the mechanisms involved are not well established and there is a lack of consensus on the best approach to use. Rooted in social cognitive theory, self-efficacy has emerged as a key construct relative to physical activity behavior and general health behavior change. This study investigated the potential role of self-efficacy as a mediator in the relationship between physical activity counseling and physical activity behavior. An online survey was completed by 119 adults with recent visits to a primary care provider. The survey assessed current activity level, health status, perceived self-efficacy, and components of the physical activity counseling received during the recent visit. Results indicated that self-efficacy significantly predicted physical activity behavior independent of physical activity counseling exposure. Neither self-efficacy nor behavior were predicted by physical activity counseling in the present sample. Results did not find self-efficacy to mediate the relationship between counseling and behavior. Results from this study indicate a need for further research to explore the potential mechanisms of action for behavior change and additional approaches to improve the implementation of physical activity counseling.

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5As	Five As counseling approach
CDC	Centers for Disease Control & Prevention
ESES	Exercise self-efficacy scale
EVS	Exercise as a vital sign
MI	Motivational interviewing
MTurk	Amazon's Mechanical Turk Platform
PA	Physical activity
PAAT	Physical activity assessment tool
PCP	Primary care physician
RCT	Randomized control trial
SCT	Social cognitive theory
SDT	Self-determination theory
TPB	Theory of planned behavior
TTM	Transtheoretical model
US	United States

CHAPTER 1: INTRODUCTION

1.1 Benefits of Physical Activity

It is well established that physical activity (PA) is associated with health and wellbeing (Mokdad, Marks, Stroup, & Gerberding, 2004; Warburton & Bredin, 2017; Warburton, Nicol, & Bredin, 2006). Health benefits of PA include lower morbidity and mortality rates; reduced risk of diabetes, hypertension, colon cancer, and heart disease; maintenance of healthy bones, muscles, and joints; and improved ability to perform daily activities (Warburton & Bredin, 2017; Warburton et al., 2006). There are also notable mental health benefits to PA, including reduced feelings of depression and anxiety, enhanced positive mood, and improved body image and self-esteem (Bertheussen et al., 2011; Lox, Ginis, & Petruzzello, 2016; Paluska & Schwenk, 2000; Penedo & Dahn, 2005).

Conversely, physical inactivity is associated with chronic disease and mortality (Mokdad et al., 2004; Warburton & Bredin, 2017; Warburton et al., 2006). Physical inactivity can reduce an individual's functional capacity through premature development of chronic diseases (Blair, 2009). Low functional capacity can result in a reduction in individual quality of life and creates a burden on the economy through increased need for medical coverage as well as disability payments (Oldridge, 2008; Sallis, 2015). In addition, physical inactivity has been found to adversely impact individual health care costs with inactive individuals reported to have 30% higher health care costs than those who are active (Anderson et al., 2005).

1.2 Physical Activity Guidelines

Due to the many benefits of PA, healthcare professionals suggest exercise be viewed as a form of medicine and used as a first-line option for the prevention and treatment of chronic diseases (Sallis et al., 2015; Vuori, Lavie, & Blair, 2013). Furthermore, Healthy People 2020 includes PA as a leading health indicator with fifteen specific objectives to increase activity levels and improve health outcomes and quality of life.

There is substantial evidence and national guidance about the types and amount of PA associated with measurable health benefits (2018 Physical Activity Guidelines Advisory Committee, 2018). According to the Center for Disease Control and Prevention (CDC), adults should participate in at least 150 minutes of moderate-intensity or 75 minutes of vigorous-intensity aerobic exercise each week (U.S. Department of Health and Human Services, 2018). Examples of moderate intensity exercise include a thirty-minute brisk walk, thirty minutes of yard work (e.g., mowing the lawn or raking leaves), or a fifteen-minute run. Vigorous intensity exercise includes similar activities performed at a higher intensity or for a longer duration. Finally, the CDC also suggests that adults engage in muscle-strengthening activities on two or more days per week (U.S. Department of Health and Human Services, 2018). These recommendations are considered to be the minimum weekly PA behavior. There is evidence that greater weekly PA is associated with increased health benefits (Kraus et al., 2002; Tanasescu et al., 2002).

There is evidence that any amount of exercise has a positive impact on health, even if it does not meet the minimum recommended amount, and individuals are

encouraged to take every opportunity to be active (U.S. Department of Health and Human Services, 2018). Interventions aimed at increasing PA may still be successful even if individuals do not adopt exercise habits that meet the national guidelines (i.e., 150 minutes of moderate intensity exercise per week). Simply increasing daily PA levels can have positive effects on health and wellbeing (Sallis et al., 2015; U.S. Department of Health and Human Services, 2018).

There is a critical difference between physical activity and exercise. Physical activity is broader and can encompass general leisure activity, while exercise is a type of physical activity that requires planning and occurs within a specific timeframe (World Health Organization, 2017). However, for the purposes of this paper, exercise and physical activity are used interchangeably. This is due to a lack of distinction in the national guidelines, which assess physical activity primarily through exercise behavior.

While there is ample national guidance on recommended PA activity levels, less than a quarter (23.2%) of adults in the United States (US) meet the current guidelines (U.S. Department of Health and Human Services, 2018). The myriad of health benefits coupled with the low percentage of individuals meeting the current guidelines (and being generally inactive) illuminate a public health opportunity to increase rates of PA to improve well-being. Simply informing individuals of health benefits, as well as the consequences associated with inactivity, often fails to produce significant action (Ashenden, Silagy, & Weller, 1997). Possessing the knowledge that something will negatively impact one's health does not lead to the termination of that behavior (Arlinghaus & Johnston, 2018; Bandura, 2004; Kelder, Hoelscher, & Perry, 2015). This is also commonly seen in other health-related behaviors such as smoking and nutrition

(Graybiel & Smith, 2014). Knowledge about the benefits of PA is necessary but not sufficient for behavioral change (Kelly & Barker, 2016). Successful adoption and maintenance of PA behavior can be supported by professional interventions that specifically target behavioral change. PA counseling is a promising strategy.

1.3 Physical Activity Counseling

In this paper, PA counseling refers to the various types of interventions occurring within medical settings to promote individual engagement in regular PA (Meriwether, Lee, Lafleur, & Wiseman, 2008). PA counseling includes a range of activities such as assessing PA level, advising individuals on PA benefits and how their PA level matches up to the national guidelines, providing exercise prescriptions, engaging in goal setting, and setting up appropriate follow-up procedures (Meriwether et al., 2008). Table 1 provides an overview of common PA counseling approaches according to: underlying theoretical background, counseling structure, counseling components, and reported outcomes.

There has been a growing movement to increase PA counseling within medical settings (Albright et al., 2000; Patrick et al., 1994; Sallis, 2015; Wattanapisit, Tuangratananon, & Thanamee, 2018). Healthy People 2020 included a specific objective aimed at increasing the percentage of physician visits that include counseling for PA; specifically, to increase the percentage of physician visits involving counseling and/or education related to exercise from 7.9% (2007) to 8.7%. This objective pertains to all physician visits, including primary care and other specialties.

Table 1. Types of Physical Activity Counseling

Physical Activity Counseling Approaches	Theoretical Framework	Structure	Counseling Components	Outcomes
Exercise as a vital sign	N/A	Delivered by medical assistants (e.g., nurses). Prompts providers to continue discussion and provide additional counseling if necessary.	Two questions to assess current activity level: calculates the average minutes per week of moderate or vigorous intensity physical activity.	Shown to be easy to implement and widely accepted by healthcare professionals (Sallis et al., 2015). No research on the impact on PA behavior.
Green Prescription Physical Activity Program	N/A (some influence from TTM)	Three-month program. Consultation with primary care provider. Includes telephone-based support from exercise specialists.	Motivational Interviewing Stages of change Collaboratively developed goals written down and given to patient at end of consult.	Statistically significant increase in mean energy expenditure and leisure time exercise with an average increase of 34 minutes of exercise per week (Elley, Kerse, Arroll, & Robinson, 2003). Statistically significant increase in leisure walking at 12-month follow-up (Kolt et al., 2012).
Activity Counseling Trial (ACT)	SCT TTM	Comparison of three groups ranging from minimal involvement (provider counseling only) to extensive support (involving support from health educators or behavioral change counselors).	Insufficient information regarding what the counseling entailed was provided.	No differences between the groups were found and they did not investigate increases in PA within groups (Albright et al., 2000).
Patient-Centered Assessment and Counseling for Exercise (PACE)	SCT TTM	Brief counseling by providers (2-5 minutes). Tailors intervention to individual's stage of change (TTM).	Precontemplation: increase awareness of benefits and guidelines. Contemplation: identify specific plan and strategy for overcoming barriers. Maintenance: identify motivation for continuing and strategies to prevent relapse.	PACE group showed increase in walking by 30 min per week and changes in readiness (stage of change) compared to controls (Calfas et al., 1996). Feasible to implement in primary care settings and shown to increase provider confidence (Long et al., 1996).
Five A's (5A's)	SCT TTM	Brief counseling designed to help prime patients for more detailed discussions about PA.	*Assess* current behavior *Advise* focusing on benefits (and risk of inactivity) *Agree* on collaborative plan *Assist* in shared decision making process *Arrange* follow-up	Shown to be effective with smoking cessation and thought to be promising in the application to PA promotion, although little research has been done to investigate efficacy with PA (Sallis et al., 2015; Whitlock, Orleans, Pender, & Allan, 2002).
Motivational Interviewing	N/A (post hoc association with SDT)	Delivered by health care professionals. Focus on resolving ambivalence. Goal-directed techniques rooted in client-centered therapy approaches.	Four steps *Engaging:* rapport building *Focusing:* develop direction for change *Evoking:* elicit motivation *Planning:* establish commitment	Evidence for the effectiveness of MI techniques to promote behavior change in medical settings is unclear (Morton et al., 2015). Shown to be effective with substance use (Burke, Arkowitz, & Dunn, 2002).

Note. SCT = Social Cognitive Theory. TTM = Transtheoretical Model. SDT = Self-Determination Theory.

As Table 1 shows, PA counseling has been operationalized in a variety of ways and there is substantial overlap between PA counseling approaches. These approaches share similar theoretical foundations, primarily Social Cognitive Theory (SCT) and the Transtheoretical Model (TTM; also known as stages of change). While some approaches vary in the extent to which they include individual components, there is one that maps onto the common components – the 5As (Glynn & Manley, 1989; U.S. Preventive Services Task Force, 2019). The 5As are: Assess, Advise, Agree, Assist, and Arrange.

Based in SCT and TTM, the 5As have been viewed as a best practice for improving patient-provider communication and encouraging health behavior change (Hunter, Goodie, Oordt, & Dobmeyer, 2017). The model was originally the 4As (Ask, Advise, Assist, and Arrange), which was developed for smoking cessation (Glynn & Manley, 1989). The fifth A (Agree) was added by the Canadian Task Force on Preventive Health Care (Sherson, Yakes Jimenez, & Katalanos, 2014). The full model was adapted as a brief counseling model to help prime patients for more detailed discussions about PA (Kreuter, Chheda, & Bull, 2000). Existing literature cites multiple variations of the 5As model, with the present one being the primary version referenced by the United States Preventive Services Task Force (U.S. Preventive Services Task Force, 2019; Whitlock et al., 2002). Table 2 provides a summary of the 5As and cross-references the core components with other constructs and approaches. The 5As are generally conducted sequentially, as they build off one another. For behavior change, the 5As are more broadly considered as a patient-centered approach. The present study will focus on the 5As framework for the measurement and assessment of PA counseling.

Table 2. Cross-reference of 5As and other PA counseling constructs, theories, and approaches.

Five A's core construct	Definition	Overlapping approaches and activities	Components
Assess	Ask about behavioral risk(s) and factors affecting choice of behavior change goals/methods.	Stages of Change (TTM) Motivational Interviewing Exercise as a Vital Sign (EVS)	Gathering information and asking questions. Assessing current activity level.
Advise	Give clear, specific, and personalized behavior change advice, including personalized information about harms and benefits.	Motivational Interviewing	Advising individuals on physical activity benefits and how their physical activity level matches up to the national recommendations.
Agree	Collaboratively select appropriate treatment goals and methods based on the patient's interest in and willingness to change the behavior.	Stages of Change (TTM) Shared Decision Making Motivational Interviewing Goal setting	Collaboratively setting goals based on the patient's interest and motivation to change. Assessing importance, confidence (e.g., self-efficacy) and readiness to change physical activity behavior.
Assist	Aid patient in achieving agreed upon goals by acquiring the skills, confidence, and social/environmental supports for behavior change.	Exercise prescription SMART goals	Brief counseling by providers (2-5 minutes). Tailors intervention to individual's stage of change
Arrange	Arrange follow-up (in person or by telephone) to provide ongoing assistance and support.	Referrals	Specify plans for follow-up (e.g., visits, phone calls, mail reminders) Provide referrals if applicable

Assess. The first construct of the model, *Assess* or *Ask*, encourages providers to evaluate the patient's current behaviors. This may include current PA level, sedentary behavior, health risk, and psychosocial factors that could potentially influence a patient's likelihood of changing their activity level. During this phase, it would also be important to determine the patient's readiness to change (stage of change; TTM) to help tailor the rest of the intervention as well as the provider's expectations for PA counseling (Meriwether et al., 2008). Self-efficacy, or one's confidence in their ability to change their behavior and increase PA, should also be assessed at this stage (Meriwether, Wilcox, & Parra-Medina, 2007; Whitlock et al., 2002). The provider should also be consider a patient's general ability to increase their activity level and whether they have

any health conditions that may make it difficult (Meriwether et al., 2008). The *Assess* stage of the 5As can be combined with Exercise as a Vital Sign (EVS), which focuses on determining a patient's current activity level to help prompt providers to continue the discussion with the patient. This stage goes beyond just the two questions included in EVS and encourages additional assessment of readiness and other key factors relevant to the patient's health behaviors. In addition to TTM and EVS, the assess stage also incorporates concepts from motivational interviewing (MI). MI is a technique used to elicit behavior change by identifying ambivalence or resistance and evoking the individual's own desire to change (Miller & Rollnick, 2012). Within the 5As, MI concepts are used when asking questions to engage with the patient and to promote non-judgmental communication (Meriwether et al., 2008).

Advise. Once the provider has gathered the necessary information and assessed factors that may influence a patient's likelihood of increasing their activity level, then the provider helps to *Advise* change (Whitlock et al., 2002). Patients are advised to increase or decrease their PA in relation to specific health conditions or relevant factors. For example, they may be encouraged to increase their activity level to help them manage their depression, hypertension, insomnia, weight issues, or stress. One focus during the *Advise* stage is to inform patients about the recommended physical activity levels (e.g., CDC guidelines). Depending on the results of the *Assess* stage, providers may build on activities in which the patient is already engaged. In addition, the *Advise* stage should help establish realistic expectations for the patient's activity. Providers are instructed to give clear and specific advice tailored to the individual, focusing on risk related to inactivity, and benefits of increasing PA. The provider might rely on the national

guidelines or may focus on modest increases in PA depending on the patient's current activity level (Hunter et al., 2017).

Agree. The third construct, *Agree*, encourages providers to engage in a collaborative process with their patients and set goals based on the patient's interests and willingness to change (Vallis, Piccinini–Vallis, Sharma, & Freedhoff, 2013). This stage helps the provider evaluate whether or not increasing PA is important to the patient. At this point, it may be necessary for further assessment of confidence (e.g., self-efficacy) and readiness (e.g., stages of change) in addition to importance. This stage aims to assess patient buy-in to the recommended PA activities (Hunter et al., 2017). *Agree* focuses on constructs that are similar to shared decision making (SDM) and patient-centered care. SDM is an approach used in medical settings where providers and patients collaboratively review viable options for patient-centered care. As a patient-centered approach, SDM supports patients in considering options and making informed decisions instead of allowing the providers making decisions on their behalf (Barry & Edgman-Levitan, 2012; Elwyn et al., 2010). This is important as there has been a deliberate movement within the medical community toward patient-centric over provider-centric healthcare (Baker, 2001; Stoutenberg, Shaya, Feldman, & Carroll, 2017).

Assist. Like *Agree*, the *Assist* construct highlights the importance of an SDM process and the patient-provider relationship. *Assist* encourages counseling to be patient-centered rather than provider-led, empower patient autonomy, and be nonjudgmental (Glasgow, Emont, & Miller, 2006; Vallis et al., 2013).

While the 5As are generally patient-centric, specific components are more patient-centric than others. For example, *Assess* and *Advise* have the potential to be

patient-centric but may come across as more provider-centric if implemented poorly. Whereas, *Assist* includes facets of motivational interviewing to help patients overcome barriers. It is primarily oriented toward using behavior change techniques (Meriwether et al., 2008).

The first step within the *Assist* stage is to identify the activity and how the patient is going to increase their activity level. This can help stimulate discussion regarding options to increase PA. For example, if they are already physically active but not at the recommended level then counseling may include discussions focused on increasing the frequency or duration of the activities they are engaged in. This is the stage in which counseling is tailored to specific patients based on their background, current or past activity level, and barriers to increasing physical activity.

The second step within assist is to set specific goals to help the patient plan for when and how they will engage in PA. This can also help establish a plan to gradually increase the patient's activity level over time.

The third step in the assist stage is to measure progress. For example, patients may write down the days they exercise and the activities they engage in or use a wearable device (e.g., Fitbit) to help them track their activity.

The fourth step within the assist stage is to prevent relapse, which can be done by continuing the discussion of foreseeable barriers with the patient as well as strategies to overcome those barriers, such as an alternative plan (Hunter et al., 2017).

Arrange. The final component of the 5As model is to *Arrange* follow-ups. This may include scheduling follow-up visits to check in, or providing referrals to specialists for additional assistance. Providers are also encouraged to check-in with patients over the

phone or via email (or using electronic chart communication) in between visits (Meriwether et al., 2008). This construct may be one of the more difficult to implement due to some system level barriers, such as lack of reimbursement (AuYoung et al., 2016).

The 5As model has primarily been evaluated as an approach for smoking cessation counseling (Glynn & Manley, 1989). Based on the model's efficacy with other health behaviors (e.g., smoking, nutrition, and weight loss), it is a convenient and promising approach for PA counseling in primary care (Meriwether et al., 2008; Whitlock et al., 2002). Since all behavior change is often grouped together, evidence of the efficacy for targeting one behavior suggests that method may be applicable to changing other behaviors as well. Despite the 5As being a highly recommended and frequently cited PA counseling approach (Gagliardi, Faulkner, Ciliska, & Hicks, 2015; Meriwether et al., 2008; Vallis et al., 2013), little empirical research has been conducted in order to demonstrate the effectiveness of using it to increase PA behavior (Sallis et al., 2015). More research is needed.

As depicted in Table 1, several common PA counseling approaches are rooted in social cognitive theory (SCT). Self-efficacy is a key construct of SCT and has been associated with PA behavior. A meta-analysis focusing on SCT found a moderate association between self-efficacy and PA behavior (Spence et al., 2006). More research is needed to understand the relationship between different types of PA counseling and patient outcomes, including self-efficacy and PA behavior change. The following sections introduce self-efficacy and the construct's relationship to both PA counseling and PA behavior.

1.4 Self-Efficacy and Social Cognitive Theory

Social Cognitive Theory was developed by Albert Bandura as a theoretical framework for human learning (Bandura, 1977). Evolving out of Social Learning Theory (Bandura, 1969), SCT posits that dynamic and reciprocal interactions between people, the environment, and one's behavior create contexts for individual growth (Bandura, 1977). SCT considers both internal and external factors that shape an individual's motivation to engage in certain behaviors. For this reason, SCT is often applied to the promotion of health behaviors. The theory stems from the belief that humans have the capacity to exercise control over their thoughts and actions, as well as their motivations. This gives individuals the power to change themselves and their situations and is defined as "personal agency" (Bandura, 1969). Self-efficacy is one construct related to the concept of personal agency.

Social cognitive theory suggests that one's belief in their own ability to make a change and engage in that behavior (i.e., their self-efficacy) affects their likelihood of doing so (Beauchamp, Crawford, & Jackson, 2019). SCT has been commonly used as the guiding theory to several interventions targeting behavior change. In the case of PA counseling, SCT is the theoretical framework for interventions such as ACT, PACE, and the 5As. Since knowledge about the benefits of a certain behavior have already been established as insufficient for implementing sustained adoption of that behavior, alternative factors have been explored that may increase the effectiveness (Stretcher, DeVellis, Becker, & Rosenstock, 1986). One of the common threads among these intervention approaches is the concept of targeting self-efficacy in order to help individuals initiate and maintain behavior change. For example, engaging with

individuals in an effort to build confidence in their ability to engage in exercise has the potential to increase their self-efficacy for engaging in PA. Approaches grounded in SCT, which specifically target self-efficacy, have shown promising results in increasing rates of PA (Desharnais, Bouillon, & Godin, 1986; Rodgers, Hall, Blanchard, McAuley, & Munroe, 2002; Sheeran et al., 2016; Williams et al., 2008).

Self-efficacy plays a central role in behavior change by guiding individuals in the behaviors they choose to engage in and how they respond to various barriers they may face (Bandura, 1998). Additionally, self-efficacy has been linked to PA behaviors through intention to engage in said behavior, adoption of the behavior or action, and maintenance of the behavior. Intentions are seen as an important predictor of health behavior change and are often influenced by various factors including, but not limited to, perceived self-efficacy. Self-efficacy is thought to play a role in determining whether an individual actually decides to attempt to engage in a behavior, or merely intends to engage in that behavior. In order to adopt a health behavior, individuals usually must form an intention first (Schwarzer & Fuchs, 1996). Intention is also a key aspect relevant to readiness to change, as assessed by TTM (Prochaska & Velicer, 1997). Intention lines up with the stages of contemplation and preparation, and therefore can be viewed on a continuum of readiness. For example, an individual might have the intention to change their behavior, but not making the necessary plans to produce action. This would put them in the contemplation stage. In comparison, an individual may have the intention as well as a specific plan, but has not yet carried out the action. This would place them in the preparation stage. In the next two sections, the relationships between self-efficacy and both physical activity and physical activity counseling will be outlined.

1.5 Self-Efficacy and Physical Activity

Individuals are more likely to initiate and maintain physical activity if they feel confident about their ability to succeed and if they are afforded a variety of opportunities to actively participate (Cress et al., 2005). For example, individuals might not like the idea of joining a gym if they don't know what to do in that setting, or don't feel comfortable exercising in front of others. Instead, they might feel more comfortable going on walks around their neighborhood or doing home workouts. Helping patients identify ideal scenarios of physical activity engagement can increase their confidence in their ability to follow through and engage in that activity.

Self-efficacy has been shown to be a predictor of several health behaviors including reducing alcohol consumption (Oei & Burrow, 2000), smoking cessation (Baldwin et al., 2006), and condom use (Hendriksen, Pettifor, Lee, Coates, & Rees, 2007). Self-efficacy has also been shown to significantly predict PA behavior in healthy adults (Kaewthummanukul & Brown, 2006; Rovniak, Anderson, Winett, & Stephens, 2002; Sharma, Sargent, & Stacy, 2005). There is evidence supporting a significant positive relationship between self-efficacy and PA behavior. Specifically, higher self-efficacy is associated with increased PA behavior. This has led some to postulate that self-efficacy has a causal role on PA behavior. There is some preliminary evidence showing self-efficacy to be a significant predictor of PA behavior, including exercise adherence (McAuley & Blissmer, 2000). This suggests that individuals with higher self-efficacy for exercise are more likely to engage in greater PA.

Several studies have highlighted the correlation between self-efficacy and PA behavior. An early study in 1984 found that perceived self-efficacy was a moderate (r =

.47) predictor of exercise (Kaplan, Atkins, & Reinsch, 1984). A study investigating exercise behavior over the course of seven weeks in over 300 college students found a significant correlation between exercise and perceived self-efficacy (Dzewaltowski, 1989). A meta-analysis found a moderate correlational ($r = 0.35$) relationship between self-efficacy and PA (Spence et al., 2006). A systematic review looking at successful behavior change in obesity interventions found higher self-efficacy to be a significant predictor of PA behavior (Teixeira et al., 2015). These studies and reviews indicate a positive relationship between self-efficacy and PA behavior. Specifically, they show that higher levels of self-efficacy are associated with a greater likelihood of adopting PA behavior, or engaging in greater amounts of PA behavior. In order to initiate and maintain PA behavior, an individual must believe they are able to do so. Self-efficacy's role in PA behavior extends beyond intention and behavior adoption, and also influences maintenance of the behavior.

Perceived self-efficacy is also thought to influence how persistent an individual is in continuing to engage in a behavior when faced with barriers or challenges (Desharnais et al., 1986; Fletcher & Banasik, 2001). For example, if the individual has difficulty walking a mile due to lack of sidewalks or physical discomfort (after having been cleared by a provider as physically able to exercise), their self-efficacy might help determine their motivation to persevere despite the challenges and barriers. To initiate and maintain health behaviors, one must believe that they are capable of performing, or engaging in, the behavior (Schwarzer & Fuchs, 1996).

1.6 Self-Efficacy and Physical Activity Counseling

Physical activity promotion often includes interventions that are grounded in frameworks for health behavior change and typically include some aspect of self-efficacy. Theoretically, if an intervention is grounded in the construct of self-efficacy, then effective implementation would likely change individual self-efficacy. This is an assumption that many interventions make because it is known that self-efficacy is associated with PA behavior, as outlined in the previous section. There is evidence to support these assumptions and show that PA interventions do increase self-efficacy.

An intervention targeting PA promotion based on TTM and SCT, and delivered through primary care physicians, was found to significantly increase self-efficacy for exercise compared to controls in older adults (Pinto, Lynn, Marcus, DePue, & Goldstein, 2001). The increase in self-efficacy was sustained at a six-week follow-up, but not at an eight-month follow-up, suggesting that interventions are effective at targeting short-term changes in exercise self-efficacy, but not necessarily long-term. Another study found an increase in self-efficacy in an intervention targeting PA behavior through self-regulation strategies in older adults, which coincided with exercise adherence for 11 months following the intervention (McAuley et al., 2011). A systematic review of interventions for PA (lifestyle and recreation) aimed to increase self-efficacy found a significant, albeit small, relationship between the interventions and changes in self-efficacy (d=0.16) (Ashford, Edmunds, & French, 2010). The review also found that certain intervention components were associated with increases in self-efficacy, while others were associated with lower levels of self-efficacy. Specifically, interventions that were tailored to the individual, incorporated vicarious experiences of similar individuals, provided feedback

based on the individual's progress, included rehearsing the behavior during sessions, and/or included goal setting, were associated with higher levels of self-efficacy. In comparison, interventions that included persuasion from the interventionist, graded mastery (i.e., increased difficulty of behavior engagement), and barrier identification (without adequate exploration of strategies to overcome relevant barriers) were associated with lower levels of self-efficacy (Ashford et al., 2010). This provides evidence that certain components of PA counseling approaches are more effective at increasing self-efficacy than others.

Health promotion interventions that enhance self-efficacy have been shown to increase the relevant health behavior, such as PA (Maibach & Murphy, 1995; Williams & French, 2011). Many interventions start by assessing an individual's status in terms of their current behaviors, as well as their readiness to change, risk factors, and barriers to change. Congruent with motivational interviewing concepts, many patient-centric approaches aim to empower the individual to feel confident in their ability to engage in the behavior and overcome barriers. Although this is the goal of many approaches, few may be successfully able to do so, as evidenced by studies showing that PA counseling frequently stops at either assessing or advising (Jay, Gillespie, Schlair, Sherman, & Kalet, 2010).

It is important to note that self-efficacy alone is not enough to generate desirable behavior. Individuals must also have the behavioral capability (knowledge and/or skill) to perform the specific act. Just as knowledge alone is not enough, behavior change requires the combination of knowledge, skill, and belief in one's ability to produce the desired effect. The interaction between self-efficacy and health literacy significantly predicts

weekly exercise (Guntzviller, King, Jensen, & Davis, 2017). In addition, as an individual's health literacy increases, so does the positive relationship between self-efficacy and the associated health behavior (Guntzviller et al., 2017). So even if knowledge alone is not enough, it's still important to inform individuals about the benefits of physical activity and the national guidelines. When considering necessary components of PA counseling, this suggests that advising and informing patients is still a crucial part of the overarching goal. Both behavioral capability and self-efficacy are needed to produce behavior change. Thus, a more comprehensive approach to PA counseling that involves shared decision-making and follow-up is useful for promoting PA behavior change.

1.7 Self-Efficacy as a Mediator of PA Counseling and Behavior

Existing research suggests that self-efficacy may mediate the relationship between PA counseling (in the form of promotion) and behavior. A study of adolescent girls found that a school-based PA intervention successfully manipulated self-efficacy levels and resulted in increased PA behavior (Dishman, 2004). The results of the study highlighted self-efficacy as a partial mediator and led researchers to suggest continued investigation into the potential role of self-efficacy as a mediating variable in interventions promoting increases in PA behavior. This study is limited in generalizability due to the specific sample population and setting. There is a need for additional research examining self-efficacy as a mediator and this study seeks to address this gap.

1.8 Primary care practices as optimal settings for PA counseling

Primary care practices are optimal settings for physical activity counseling and for the implementation of interventions for behavior change (Vuori et al., 2013). Primary

care physicians (PCPs) have more frequent contact with the general adult population compared to other health care professionals (Stoutenberg et al., 2017). Eighty-four percent of Americans visit a primary care physician each year, with 76.4% having a designated regular primary care provider (National Center for Health Statistics, 2016). When surveyed, a majority of patients expect to receive advice on health behaviors from their providers (Stoutenberg et al., 2017) and have identified PCPs as their preferred source of initial PA counseling (Patrick, Pratt, & Sallis, 2009; Vuori et al., 2013). Furthermore, there is evidence that an individual's health behaviors are influenced by provider advice (Elley et al., 2003; Grandes et al., 2009). Patients identify PCPs as their primary source of credible information regarding healthy lifestyle decisions. Despite this, less than one-third of patients report receiving physical activity advice from their PCPs (Blair et al., 1998; Long et al., 1996). It is unclear whether there have been recent changes in these statistics, as updated information is not available.

1.9 Current Study

The present study aims to investigate the association among PA counseling, self-efficacy, and PA behavior. Specifically, it aims to examine whether self-efficacy mediates the relationship between PA counseling and PA behavior. Figure 1 depicts the proposed mediation relationship between PA counseling, self-efficacy, and PA behavior.

To examine the potential mediating role of self-efficacy between PA counseling and PA, this study will investigate four proposed hypotheses:

H1: Greater levels of PA counseling (i.e., greater participant self-reported exposure to the 5A stages during PA counseling) is associated with higher levels of PA behavior.

H2: Greater levels of PA counseling is associated with higher self-efficacy for PA behavior.

H3: Higher levels of PA self-efficacy is associated with higher levels of PA behavior.

H4: Self-efficacy mediates the relationship between PA counseling and PA behavior.

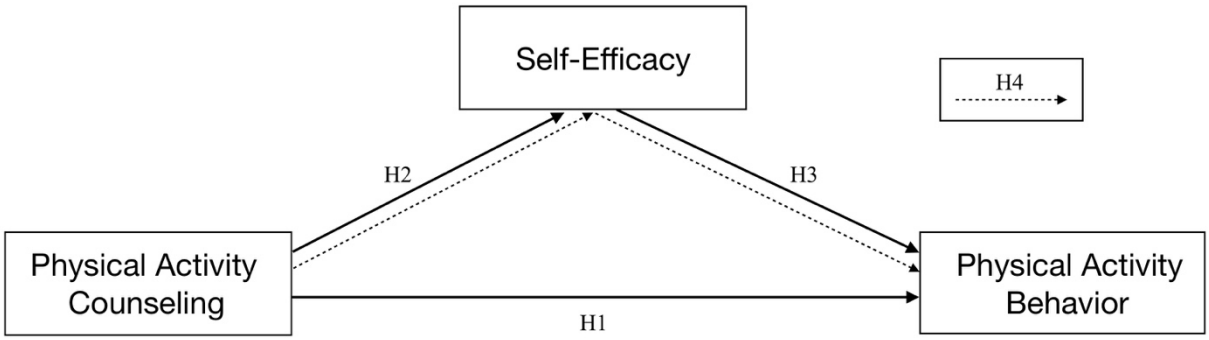

Figure 1. Model of Relationship Between Physical Activity Counseling, Self-efficacy, and Physical Activity Behavior.

CHAPTER 2: METHOD

2.1 Participants

A sample of 181 adults with a recent routine visit to their primary care physician (PCP) was recruited through Amazon Mechanical Turk (Mturk). Mturk was chosen over other systems in order to reach a broader range of participants with more diverse primary care experiences. Participants were eligible if they were, i) English reading, ii) 18 years of age or older, iii) have undergone routine care or a physical exam with a primary care physician in the U.S. within the past 90 days (defined as a recent visit), and iv) discussed physical activity or exercise with their physician during their recent visit. Routine care was defined as visits for chronic disease management or preventative care. Routine care did not include visits for acute illness or injury (e.g., cold, flu, or recent accident).

A total of 62 participants were excluded from data analysis; 14 were excluded for incomplete data, 31 participants were excluded for entering an invalid date for their recent doctor's visit (e.g., greater than 90 days before the date they completed the survey), one participant was excluded for completing the survey a second time, eight participants were excluded because they indicated that they did not discuss physical activity during their recent PCP visit, and the remaining 11 were excluded for missing items on the main measures which prevented them from being included in the analyses. The final sample included in analyses was 119 participants.

2.2 Procedure

Participants were invited to complete an online survey regarding a recent visit with a primary care physician. Eligible respondents on Mturk were then directed to a Qualtrics survey. Mturk is an online marketplace used for research purposes among

psychology and other social sciences (Goodman, Cryder, & Cheema, 2013). Mturk is advantageous to use as an online data collection platform due to having a slightly more diverse participant demographic pool compared to other internet samples. Additionally, participant recruitment is rapid, and the data obtained is as reliable as that obtained from other traditional collection methods (Buhrmester, Kwang, & Gosling, 2016; Mortensen & Hughes, 2018).

To determine eligibility, participants were asked to provide their birthdate, date of last PCP visit, and indicate whether or not they discussed physical activity during their last visit. Screening questions can be found in Appendix F. Only the participants who met eligibility criteria were included in analyses. Eligibility requirements were included in the study description on Mturk. Eligible participants read and electronically agreed to the informed consent prior to beginning the survey. The survey consisted of demographic information, current physical activity level assessment, experience with physical activity counseling in primary care based on the 5As, and perceived exercise self-efficacy. The survey took an average of 10-15 minutes for most respondents. Upon completion of the survey, participants were provided monetary compensation ($3.75) for their time through the Mturk system online. This study was approved as an exempt study by the Institutional Review Board at UNC Charlotte (IRB Number: 19-0563).

2.3 Measures

Demographics. Participants were asked to complete items indicating their age, gender, height, weight, race and ethnicity, education level, income, insurance status, location of care, and current employment status. Location of care assessed environment and quality of care received and whether the location was a private practice, community

health center, or hospital setting. In addition, participants were asked to report the date of their visit with their primary care physician. Demographic variables, including weight status and age, have been found to significantly influence factors associated with physical activity behavior, including perceived benefits and barriers (Clark, Pera, Goldstein, Thebarge, & Guise, 1996; Patel, Schofield, Kolt, & Keogh, 2013). A full list of demographic questions can be found in Appendix A.

Perceived Health Status. Perceived health status is being assessed as potential confounding variable due to the impact of perceived health on self-efficacy and physical activity engagement. Perceived health status was assessed using two questions adapted from the VA Short Form 12 (SF-12V), adapted as the GSRH (DeSalvo, Fisher, Tran, Bloser, Merrill, & Peabody, 2006). The two items used here are a single item of the "standard" version as well a single item referred to as the "comparative" GSRH question (Appendix B). Perceived health status was calculated by averaging the two items. Both the standard and comparative questions demonstrated good reliability with an Intraclass Correlation Coefficient (ICC) of 0.69 and 0.85, respectively (DeSalvo et al., 2006). Single-item health ratings have demonstrated adequate reliability, comparable to longer assessments for health status (Macias, Gold, Öngür, Cohen, & Panch, 2015).

Current Physical Activity Behavior. Current physical activity behaviors was assessed by the Physical Activity Assessment Tool (PAAT). This tool was originally designed to assess patients' physical activity and facilitate counseling (Meriwether, McMahon, Islam, & Steinmann, 2006). It captures both moderate and vigorous activity, which allows for comparison to national health guidelines (e.g., 150 minutes of moderate intensity or 75 minutes of vigorous intensity each week). Examples of moderate physical

activity include yoga, walking fast, gardening, playing with children, and dancing. Examples of vigorous physical activity include running, bicycling (more than 12 mph), martial arts, and swimming laps. The assessment also includes a comparison of current activity level to usual physical activity over the past 30 days to get a clearer understanding of an individual's general physical activity behavior. In addition, it assesses plans for physical activity over the next six months, medical problems that may interfere with engagement in physical activity, salient benefits of physical activity, and confidence in ability to increase physical activity. The variable of physical activity behavior is assessed by calculating the total number of minutes of moderate intensity PA per week (with vigorous intensity PA being converted to moderate intensity by multiplying the time of vigorous intensity PA by a factor of 2).

The PAAT has been shown to be both valid and reliable in a sample of adults with varying degrees of activity level (Meriwether et al., 2006). The tool has demonstrated acceptable test-retest reliability ($r = 0.618$) comparable with other self-report instruments (i.e., International Physical Activity Questionnaire) for assessing PA behavior as well as wearable accelerometers (Meriwether et al., 2006). The PAAT was found to have acceptable concurrent validity through a significant correlation with the IPAQ ($r = 0.585$) for moderate-to-vigorous physical activity (MVPA). In addition, the PAAT was found to have acceptable criterion validity through significant correlations with an accelerometer device for MVPA ($r = 0.392$), vigorous physical activity ($r = 0.380$), and moderate physical activity ($r = 0.392$). These significant correlations between the PAAT and wearable accelerometers is comparable to those between the IPAQ and accelerometers, further supporting criterion validity of the PAAT. The tool was determined to meet criteria for concurrent and criterion validity (Sallis & Saelens, 2000).

Physical Activity Counseling. Experience with physical activity counseling was assessed through questions reflecting each component of the 5As model: assess, advise, agree, assist, and arrange. The questions measure the rate and quality of PA counseling, and are primarily adapted from 5A measures for obesity and weight loss (Jay, Gillespie, et al., 2010; Jay, Schlair, et al., 2010; Vallis et al., 2013). An assessment of 5As for obesity counseling included 19 total items across the stages, and assessing basic and advanced skills in each. Questions from this assessment also investigated discussions focused on weight and nutrition behaviors. The original items, as part of an assessment for weight loss counseling in medical settings, have been shown to have adequate internal consistency, ranging from .77 to .90 for each of the 5As (Jay et al., 2008). In addition, significant differences in counseling scores (i.e., number of 5A's) were found to be correlated with motivation and intention to lose weight among those counseled on obesity (Jay, Gillespie, et al., 2010).

The Physical Activity Counseling measure includes 10 questions evaluating each of the five stages. Questions from a 5As assessment of obesity counseling were adapted to focus specifically on physical activity behavior (Jay, Gillespie, et al., 2010). For example, a question asking if an individual's doctor discussed their weight with them was adapted to assess if an individual's doctor discussed their physical activity behavior. A full list of questions by their respective stages can be found in Appendix D.

Exercise Self-Efficacy. Perceived exercise self-efficacy was assessed using the Exercise Self-Efficacy Scale (ESES), which was adapted from a previous study (Kroll, Kehn, Ho, & Groah, 2007). This scale consists of ten items in which participants rate their confidence regarding their ability to carry out regular physical activity and exercise.

Each item is rated on a 4-point scale (1 = not always true, 2 = rarely true, 3 = moderately true, 4 = always true). A full list of items can be found in Appendix E. The scale was validated on a sample of older adults as well as a sample of individuals with spinal cord injury, with the majority being white, middle-aged adults. The scale has been shown to have high internal consistency (Cronbach's alpha = 0.93) among samples of individuals with spinal cord injury. In addition, the scale was significantly correlated with a generalized self-efficacy scale (Spearman RHO = 0.316). The moderate correlation size indicates the scale has a good fit with general self-efficacy concepts. In addition, it designates that it is also specific enough to the concepts of exercise self-efficacy beyond the same elements of the generalized self-efficacy scale (Kroll et al., 2007). The scale demonstrated high internal consistency in the present study (Cronbach's alpha = 0.88).

Physical Activity Motivation and Intention. Participants were asked two questions to assess their motivation and intention for behavior change. Both questions were modified from previous research and were assessed on a 4-point scale; 1 = not at all, 2 = only a little, 3 = somewhat, and 4 = very (Jay, Gillespie, et al., 2010). These questions were included to provide additional context for interpreting the findings as there are variations in motivation, intention, and actual behavior. Both items can be found in Appendix G.

Perceived Change in Physical Activity and Self-Efficacy. Two questions were included to assess participants perceived change in PA behavior and self-efficacy following their recent PCP visit. These questions were included due to limitations inferring causal relationships between the main variables without a longitudinal study or controlled intervention. Both items were dichotomous variables. These questions were

included to provide additional context for interpreting the findings and to add the context of perceived change. Both items can be found in Appendix H.

COVID-19. Due to the timing of data collection, additional questions were included to assess the potential impact of the COVID-19 pandemic and accompanying changes and restrictions. Participants were asked to specify whether their visit was conducted in person or virtually, whether this recent visit was different compared to others in the past, and their perception of time spent discussing PA versus health concerns associated with the pandemic. In addition, participants were asked whether or not their PA behavior changed as a result of the pandemic and to what extent. A full list of these items can be found in Appendix I.

CHAPTER 3: DATA ANALYSIS

Due to conflicting information regarding the appropriateness of using a power analysis to determine an adequate sample size for a mediation model, the required sample size was determined based on prior literature. A meta-analysis reviewed studies reporting on mediation analyses and indicated a range of sample sizes in order to reach appropriate power for the specific analytic steps in testing a mediation model. For a simple mediation, defined as a model 4, which includes one independent variable (IV), one dependent variable (DV), and one mediator (Hayes, 2017), a sample size between 86 and 325 is recommended to test a direct effect between the IV and DV. A sample size between 115 and 285 is recommended to test for an indirect effect. We aimed to recruit 125 participants. Based on the recommendations from previous literature, 115 was the minimum number necessary for .8 power (Fritz & MacKinnon, 2007). A total of 181 participants were recruited. Following data cleaning and removal of incomplete responses and ineligible responses, 119 participants remained, which is sufficient to detect small to medium effects.

Descriptive statistics were run as the first step to ensure that the data was normally distributed, and that there was enough variance to run the subsequent analyses. Key variables were centered using z-scores to aid in interpretation and reduce multicollinearity. Zero-order correlations were computed to determine associations between study variables. Correlations were used to identify sources of multicollinearity and determine variables that needed to be included in regression analyses as potential covariates. Pearson product moment correlations were used for continuous variables, including the main study variables (PA counseling, Self-efficacy, and PA behavior), with

the assumption of linear relationships between these variables. Point-biserial correlations were used to investigate correlations between continuous and dichotomous variables, such as PA counseling and gender. Kendal coefficient for rank order correlation was used to determine associations between ordinal variables and continuous variables, such as PA counseling and education. Finally, the Spearman coefficient was used to assess correlations between two ordinal variables, such as intention to change PA and education. These types of correlations are consistent with recommendations and best practices based on the variable pairings for continuous, ordinal, nominal, and dichotomous variables (Akoglu, 2018).

To examine the aim of the study, a mediation analysis was conducted to assess if self-efficacy mediates the relationship between PA counseling and PA behavior. PROCESS macro model 4 in SPSS was used to examine the proposed mediation model (Hayes, 2017). The PROCESS macro in SPSS provides output that tests the hypotheses relevant to a mediation model. PROCESS uses Ordinary Least Squares (OLS) regressions to test direct and indirect effects. Bootstrapping confidence intervals were computed as part of the PROCESS macro to determine the significance of the direct and indirect effect between the independent and dependent variables. PROCESS uses bias-corrected bootstrap estimates and confidence intervals to test the significance of the indirect effect (Preacher & Hayes, 2008).

Additional binary logistic regressions were conducted to assess the predictive relationships between PA counseling and perceived change in PA and self-efficacy. These additional analyses were used primarily to support and provide context for the interpretations of the main findings. Binary logistic regression was used because PA

change and change in self-efficacy were dichotomous (yes/no) variables. Due to the timing of this data collection during the COVID-19 pandemic, additional analyses were conducted to assess the potential impact of the pandemic on the proposed model. This included descriptive statistics and correlation analyses.

CHAPTER 4: RESULTS

4.1 Participant Characteristics

One hundred sixteen participants had complete data and were included in subsequent analyses. The average age of participants was 39.06 (SD = 12.42). The sample consisted of individuals identifying as either female (55.5%) or male (44.5%) and all participants reported being cis-gender. A majority of the sample identified as White or European American (94; 79%) with 15 (12.6%) identifying as Black or African American or Afro Caribbean, 4 (3.4%) identifying as South Asian or South Asian American, 2 (1.7%) as Middle Eastern, Arabic American, or North African, and 2 (1.7%) as Hispanic, Latino/a, or Spanish Origin. Two participants (1.7%) did not report their race/ethnicity. The mean annual income for participants was around $40,000 with 101 (84.9%) reporting having full time jobs, 9 (7.6%) working part time, and 9 (7.6%) reporting being either unemployed, retired, or unable to work due to disability. There was a range of education levels among participants with 21 (17.6%) indicating having a high school diploma, 12 (10.1%) being currently enrolled in college, 11 (9.2%) having an associate's degree, 40 (33.6%) having a bachelor's degree, 11 (9.2%) currently enrolled in graduate school, 23 (19.3%) having a Master's degree, and 2 (1.7%) having a terminal degree. Participant characteristics are reported in Table 3.

Table 3. Participant characteristics

	M	SD
Age (n=119)	39.06	12.41
BMI (n=118)	27.42	7.25
	N	%
Gender (n=119)		
Female	66	55.5
Male	53	45.5
Race and Ethnicity (n=119)		
White or European America	94	79

Table 3. Participant Characteristics (continued)

Black, African American, or Afro Caribbean	15	12.6
South Asian or South Asian American	4	3.4
Middle Eastern, Arab American, or North African	2	1.7
Hispanic, Latino/a, or Spanish Origin	2	1.7
Unknown	2	1.7
Occupation Status (n=118)		
Full time jobs	101	84.9
Part time jobs	9	7.6
Unemployed	3	2.5
Retired	3	2.5
Student	1	0.8
Unable to work (disability)	1	0.8
Education (n=119)		
High school diploma	21	17.6
Enrolled in college	12	10.1
Associates degree	11	9.2
Bachelor's degree	40	33.6
Enrolled in graduate school	10	8.4
Master's degree	23	19.3
Terminal degree	2	1.7
Marital Status (n=119)		
Single (never married)	40	33.6
Married	53	44.5
Common law marriage	2	1.7
In a relationship	9	7.6
Separated	1	.8
Divorced	12	10.1
Widowed	2	1.7
Health Insurance (n=119)		
Yes	108	90.8
No	11	9.2
Annual Income(n=119)		
Less than 10,000	1	0.8
10,000 – 14,999	6	5.0
15,000 – 19,999	9	7.6
20,000 – 24,999	8	6.7
25,000 – 29,999	9	7.6
30,000 – 39,999	15	12.6
40,000 – 49,999	13	10.9
50,000 – 74,999	27	22.7
75,000 – 99,999	13	10.9
100,000 – 149,999	12	10.1
Greater than 150,000	6	5.0

4.2 Preliminary Analyses

Descriptive statistics and zero-order correlations for study variables are reported in Table 4 and Table 5. Apart from PA behavior and self-efficacy, all means were within an expected range based on existing literature, with standard deviations indicating

appropriate variability. The mean for PA behavior was 347.9 minutes per week. Kurtosis was greater than |2| for PA behavior, suggesting the variable was not normally distributed. The median for PA behavior was 225 minutes per week. Thirty-five (29.41%) reported less than 100 minutes of physical activity per one week with 11 (9.24%) reporting zero minutes of PA. Seventy-one (59.67%) reported less than 350 minutes per week of PA. Seven (5.88%) reported greater than 1,000 minutes of PA and one participant reported greater than 2,000 minutes of PA for one week. Two participants were identified as outliers with PA behavior values greater than three standard deviations above the mean. These outliers were removed from subsequent analyses. In addition, since the data was positively skewed and not normally distributed, square root transformation was used on PA behavior values prior to subsequent analyses. Following square root transformation of PA behavior, the skewness was reduced from 1.22 to 0.15 and kurtosis was reduced from 1.02 to -0.63.

Descriptive statistics revealed a slight negatively skewed distribution for self-efficacy scores. The scale for self-efficacy for exercise ranged from 10 to 40 with a mean of 31.65 (SD= 5.5). Higher scores indicate greater perceived self-efficacy. A score of 30 would indicate moderate confidence to exercise. Skew was less than |2| and kurtosis was 2.48. All other variables had skew and kurtosis less than |2|. The mean score for PA counseling was 16.34 (SD = 8.11). The mean is about half of the total possible score (28) and indicates that on average participants were only engaged in a portion of the 5As for PA counseling with their PCP. Ten participants reported receiving all the 5As and indicated high quality and satisfaction for each.

The average BMI of participants was 27.45 (SD=7.22) with a range of 16.41 to 53.23 and a median of 25.04. The average BMI for this study falls in the "overweight" range according to CDC guidelines (CDC, 2020). Participants reported self-rated health (M=3.39, SD=1.02) and self-rated health compared to others (M=3.37, SD=1.03) with the average response being "good." There was a range in self-rated health reported with acceptable skew and kurtosis (less than |2|). Self-rated health was significantly correlated with PA intention (.20, p=.03) and self-efficacy (.31, p<.001). Self-rated health compared to others was also significantly correlated with both PA intention (.27, p=.003) and self-efficacy (.33, p<.001).

Most participants reported having health insurance (90.8%) with 77 (64.7%) indicating private insurance, 13 (10.9%) Medicaid, 16 (13.4%) Medicare, and 2 (1.7%) indicating Other. Most participants also reported receiving their regular medical care from a private practice clinic (92.4%). Participants ranged in their stage of change for PA behavior. Six participants (5.1%) indicated being in the precontemplation stage, 22 (18.6%) in the contemplation stage, 43 (36.4%) in the preparation stage, 23 (19.5%) in the action stage, and 24 (20.3%) in the maintenance stage. One participant did not indicate stage of change. Stage of change was significantly correlated with PA behavior (0.49, p<.001), PA intention (0.28, p=.003), PA counseling (0.21, p=.023), and self-efficacy (0.49, p<.001).

More than half (57.5%) reported their recent PCP visit was in person, while 42.5% reported virtual visits. The start of data collection coincided with the timing of the widespread COVID-19 quarantine and stay at home orders; as a result, a portion of the reported healthcare visits occurred prior to the impact of COVID-19. Specifically, 45

(38%) reported visits were prior to March 10, 2020. An additional 41 (34%) of reported visits were from March 10, 2020 through March 31, 2020. The remaining 33 visits (28%) occurred between March 31, 2020 through July 2, 2020. Sixty-six (55%) reported discussing COVID-19 during their recent visit. Of those 66, 19 (28.8%) indicated that it took time away from discussing PA while 47 (71.2%) indicated that it did not. Sixty-eight (56.7%) participants reported that the pandemic had an impact on their motivation to engage in PA. Of those 68 individuals, 42 (61%) reported increased motivation to engage in PA while 26 (38.2%) reported decreased motivation to engage in PA. In addition, 49 (40.8%) reported greater PA for the past week compared to the past three months while 29 (24.2%) reported less PA in the past week and 41 (34.3%) reported their past week's activity to be about the same as the past three months. Of note, none of the items assessing the potential impact of the pandemic on the PCP visit or on PA behavior were found to be related to or impacting the main study variables and were therefore not included as potential covariates in the subsequent mediation analysis to assess the aim of the study.

Table 4. Descriptive Statistics and Correlations for Study Variables (n=117)

Variable	Min.	Max.	Mean	SD	Skewness	Kurtosis	1	2	3
1. PA Counseling	1	28	16.41	8.15	-.15	-1.28	___		
2. Self-Efficacy	10	40	31.56	5.49	-.91	2.52	.22*	___	
3. PA Behavior (min)	0	2040	347.9	363.79	1.22	1.02	.26**	.36**	___
4. Intention to Change PA	1	4	3.12	.98	-.87	-.29	.37**	.29**	.18*

Note. PA = Physical Activity; *$p < .05$, **$p < .01$

Pearson product moment correlation analysis revealed PA counseling to be significantly correlated with self-efficacy (0.22, p=.017) and PA behavior (0.26, p=.005).

Self-efficacy was also significantly correlated with PA behavior (0.36, $p<.001$). Additional correlation analyses revealed a significant correlation between intent to change PA level in the next month and PA counseling (0.37, $p<.001$). Intention was also significantly correlated with self-efficacy (0.29, $p<.001$) and with PA behavior (0.18, $p=.011$). Of the potential confounding variables, income and BMI were the only two showing significant correlations with any of the main study variables. Income was found to be significantly correlated with PA counseling (0.14, $p=.044$), self-efficacy (0.21, $p=.002$), and PA behavior (0.20, $p=.002$), so income was included as a covariate in the model predicting PA behavior. There was not a significant correlation between intention and income. BMI was found to be significantly correlated with PA behavior (-0.31, $p=.001$). BMI was not significantly correlated with PA counseling, self-efficacy, or PA intention. BMI was included as a covariate in the model predicting PA behavior. Stage of change for PA was significantly correlated with self-efficacy (0.48, $p<.001$), PA behavior (0.39, $p<.001$), PA intention (0.29, $p=.001$), and PA counseling (0.20, $p=.031$).

4.3 Substantive Analyses

The full model predicting PA behavior was significant, $R^2=.26$, $F(4, 111)=9.73$, $p<.001$. Self-efficacy significantly predicted PA behavior ($\beta=.24$, $p<.01$) even after accounting for income and BMI as covariates. Contrary to expectations PA counseling was not a significant predictor of PA behavior or self-efficacy, although the relationships were trending towards significance. In addition, self-efficacy was not found to mediate the relationship between PA counseling and PA behavior. Neither the direct nor indirect effects of the model were significant. The results of this model are detailed in Table 5.

Table 5. Mediation Model Results (n=116)

	Consequent					
	M (Self-Efficacy)			Y (PA Behavior)		
Antecedent	*β*	SE	*p*	*β*	SE	*p*
X (PA Counseling)	0.16	0.09	.065	0.16	0.08	.063
M (Self-Efficacy)	—	—	—	0.24	0.09	.006**
C_1 (BMI)	-0.02	0.01	.143	-0.03	0.01	.004**
C_2 (Income)	0.09	0.04	.013*	0.07	0.03	.046*
Constant	-0.15	0.45	.733	0.45	0.41	.269
	R^2= 0.12			R^2= 0.26		
	F(3,112) = 5.18, *p* = .002**			F(4,111) = 9.73, *p* < .001***		

Note. PA = Physical Activity, BMI = Body Mass Index; *p<.05, **p<.01, ***p<.001

4.4 Post-Hoc Analyses

Post-hoc analyses were also conducted based on the findings from the descriptive statistics and correlations. These analyses included replacing the dependent variable, PA behavior in the main mediation model with a variable that assessed intention and plan to change PA behavior in the next month. This change was made due to inconsistencies observed in the reporting of PA behavior, the non-normality of the response distribution due to a positive skew, correlation findings, and the findings from the hypothesized mediation model. The revised model is shown in Figure 2.

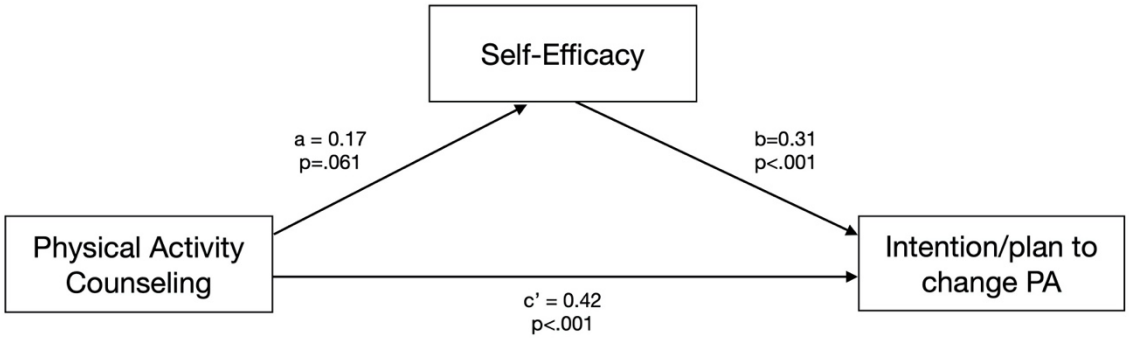

Figure 2. Revised Model of Relationship Between Physical Activity Counseling, Self-efficacy, and Intention to Change Physical Activity.

The full model predicting intention to change PA was significant, R^2=.31, F(3, 113)=16.77, p<.001. Full results of the model are presented in Table 6. Both PA counseling (β=.42, p<.001) and self-efficacy (β=.31, p<.001) explained significant variance in intention to change PA. Contrary to expectations, PA counseling did not significantly predict self-efficacy (β=.17, p=.061) and there was not a significant indirect effect, which does not confirm self-efficacy's potential role as a mediator in the model.

Table 6. Post-Hoc Mediation Model Results (n=117)

	Consequent					
	M (Self-Efficacy)			Y (PA Intent)		
Antecedent	β	SE	p	β	SE	p
X (PA Counseling)	0.17	0.09	.061	0.42	0.08	<.001***
M (Self-Efficacy)	—	—	—	0.31	0.08	<.001***
C (Income)	0.10	0.03	.010**	-0.04	0.03	.253
Constant	-0.67	0.26	.012*	0.26	0.24	.272
	R^2= 0.10			R^2= 0.31		
	F(2,114) = 6.60, p = .002**			F(3,113) = 16.77, p < .001***		

Note. PA = Physical Activity; *p<.05, **p<.01, ***p<.001

Results from binary logistic regression found PA counseling to significantly predict likelihood of perceived PA change (B=.20, SE_B=.04, OR=1.23, 95% CI: 1.14-1.31). PA counseling was also found to significantly predict likelihood of change in self-efficacy, or confidence to engage in PA (B=.11, SE_B=.03, OR=1.12, 95% CI: 1.06-1.18).

CHAPTER 5: DISCUSSION

5.1 Discussion of Primary Findings

This study investigated the relationship between PA counseling, self-efficacy, and PA behavior. Specifically, the present study aimed to examine whether self-efficacy to engage in PA mediates the relationship between PA counseling and behavior. The present findings show that self-efficacy is significantly associated with PA behavior, but not PA counseling. Contrary to the study hypothesis, self-efficacy is not a significant mediator between PA counseling and behavior. The lack of a significant mediation has also been cited in other recent studies (Peels et al., 2020).

A recent randomized control trial (RCT) investigating the effects of PA promotion on behavior in adults over the age of 50 found that self-efficacy significantly predicted behavior. However, they also found that self-efficacy was not influenced by the intervention and therefore not supported to mediate the relationship between the intervention and PA behavior (Peels et al., 2020). The authors suggested that one explanation for their findings might be the presence of a serial mediation involving both action planning and self-efficacy. A serial mediation has been supported by prior studies investigating behavior change for diet (Godinho, Alvarez, Lima, & Schwarzer, 2014; Kreausukon, Gellert, Lippke, & Schwarzer, 2012). It has also been suggested that directly targeting self-efficacy may be ineffective for targeting physical activity behavior, despite the evidence supporting higher self-efficacy increasing likelihood of behavior change (Lewis, Williams, Frayeh, & Marcus, 2016).

Nevertheless, other studies have supported self-efficacy as a significant mediator between interventions and PA behavior. An intervention with mothers of young children

in Australia found self-efficacy to partially mediate the effect of PA promotion on behavior (Miller, Trost, & Brown, 2002). Another study investigating PA promotion in primary care settings in the US supported the role of self-efficacy as a mediator between the intervention and behavior six weeks after (Pinto et al., 2001). Evidence from prior literature has suggested that research on the significance of self-efficacy has differed depending on the sample population and the setting (Lewis, Marcus, Pate, & Dunn, 2002). While there is prior evidence supporting self-efficacy as a potential mediator, more research is needed to determine the unique role it plays in PA promotion.

There are several explanations for the lack of significant mediation in the present study. First, self-efficacy was measured at one time point following the primary care visit. The present study did not directly assess change in self-efficacy and did not include longitudinal data points. A rudimentary assessment of perceived change in the present study revealed almost 60% of participants self-reported changes to their confidence/motivation to exercise following their recent doctor's visit. About 40% reported no perceived change. Despite this context, it is inconclusive whether or not the intervention led to changes in self-efficacy. Second, and consistent with the health belief model, other factors beyond self-efficacy, such as perceived benefits and barriers, have been reported to influence behavior change (Stretcher et al., 1986). Third, the present sample size may be too small to detect a mediation, given it was on the low end of the recommended sample size and the relationship trending towards significance.

In this study, we found self-efficacy significantly predicted PA behavior. This is consistent with prior studies (Parkinson, David, & Rundle-Thiele, 2017; Peels et al., 2020; Sheeran et al., 2016). A meta-analysis found changes in self-efficacy to have a

medium effect on both PA intention and behavior (Sheeran et al., 2016). A 12-week weight management intervention that targeted both diet and exercise found self-efficacy to significantly predict exercise behavior, consistent with the Theory of Planned Behavior (Parkinson et al., 2017). Although both this previous study and the current study found self-efficacy to be a significant predictor of PA behavior, it is noteworthy that the assessment tool for self-efficacy differed. Parkinson et al. (2017) included three questions to assess self-efficacy, with two focusing on confidence and perceived ability related to intention to exercise and one on overcoming barriers. This differs from the present study, which focused on confidence to overcome various barriers that might make it difficult to engage in physical activity.

A significant relationship between PA counseling and self-efficacy did not manifest in the present study. Prior investigations of interventions targeting PA, including PA counseling, on self-efficacy and PA behavior have shown mixed results. In part, this may be due to differences in the theory of behavior change operationalized for the specific intervention used. Notably, this study investigated current implemented practices rather than a controlled intervention of PA counseling. A systematic review found inconclusive results for PA promotion interventions significantly increasing self-efficacy (Lewis et al., 2002). A study in older adults found a significant increase in self-efficacy following a 12-month intervention targeting PA. Increases in self-efficacy were also associated with greater exercise adherence (McAuley et al., 2011). In addition, intervention techniques shown to increase self-efficacy have also been shown to increase PA (Williams & French, 2011). These results support the notion that changing self-efficacy may be a mechanism to lead to behavior change. However, the specific

interventions techniques necessary to reach these changes may be crucial to consider as they likely impact potential outcomes. Additionally, a recent meta-analysis found that interventions targeting PA had moderate success in changing self-efficacy (Sheeran et al., 2016). Prior literature has also demonstrated potential differential effects for domains of self-efficacy for PA. Task and barrier self-efficacy are two that have been identified and noted to have impacts from PA interventions (Higgins, Middleton, Winner, & Janelle, 2014). The operationalization of self-efficacy in the present study focused on confidence to overcome barriers to engaging in PA, which is consistent with guidelines from Bandura (1997).

While self-efficacy has been highlighted as important for PA behavior change, not all interventions have shown changes in self-efficacy. A recent review found significant changes in self-efficacy in only 12 out of 41 interventions (30%) at six months or later (Murray et al., 2018). In addition, only 34% of 413 studies investigating mediators for behavior change found that the intervention was effective for changing the targeted mediator. Previous results have demonstrated that despite a variable being shown to predict behavior, interventions changing that same variable do not always cause changes in the behavior (Sheeran, Harris, & Epton, 2014). These findings suggest a difference in the prediction of behavior and mechanisms of behavior change. Current behavior change techniques may not be appropriate for changing constructs related to behavior change. This may also differ depending on the specific population and setting the intervention is being used with. Finally, these results raise further concerns about the discrepancy between theory of behavior change and implemented interventions.

The present study found self-efficacy to significantly predict PA intention. Consistent with these findings, previous literature has also supported the significant predictive relationship between self-efficacy and PA intention (Mirkarimi et al., 2016; Peels et al., 2020; Sheeran et al., 2016). An RCT using motivational interviewing in overweight women found that self-efficacy significantly predicted PA intention (Mirkarimi et al., 2016). In addition, a meta-analysis found self-efficacy to predict PA intention. Intention was also found to be a significant predictor of PA behavior (Sheeran et al., 2016). A study using survey data did not find self-efficacy to significantly predict PA intention (Parkinson et al., 2017). Consistent with present findings, a recent RCT found increases in self-efficacy following a three-month intervention were associated with a significant increase in PA intention, despite the change in self-efficacy not being statistically influenced by the intervention (Peels et al., 2020). Interventions that aim to target a specific factor thought to be associated with behavior change are not always successful (Sheeran et al., 2014).

Despite inconclusive results about self-efficacy's role in behavior change interventions, previous literature has noted self-efficacy playing a significant role in behavior and has linked it beyond behavior to health outcomes (Infurna & Gerstorf, 2013; Infurna, Gerstorf, Ram, Schupp, & Wagner, 2011). In addition, there is evidence that self-efficacy can be modified in a way to have potential implications on motivation as well as behavior change (Bandura, 1998; Lachman, Lipsitz, Lubben, Castaneda-Sceppa, & Jette, 2018). If targeting self-efficacy has the potential to change health behaviors in a way that then improves health outcomes, then additional research can aid in improving these efforts.

One additional consideration related to self-efficacy is how the construct is measured, as previously noted. Despite the widely-referenced use of self-efficacy, there are inconsistencies in how it is operationalized and assessed throughout the literature. For example, some research simply assesses self-efficacy as confidence to exercise regularly (Jay, Gillespie, et al., 2010), while others include a scale of questions assessing one's confidence in their ability to exercise despite various barriers or restrictions (Kroll et al., 2007). There is a wide range of measurements used for self-efficacy, from single item assessments to longer scales of ten or more items. In addition, self-efficacy for exercise or physical activity is operationalized in different ways, with some focusing on task self-efficacy and others focus on barrier self-efficacy (Blanchard et al., 2007). These differences limit the degree to which findings across studies can be compared as well as the overall conclusions that can be made regarding self-efficacy. Future efforts should strive for greater consistency and homogeneity in how self-efficacy is operationalized and measured in relation to behavior change.

Self-efficacy as a construct is widely integrated into theoretical frameworks of health behavior change. While these theoretical frameworks are crucial in aiding our empirical understanding of behavior change and practice implementations, there are limits to these frameworks. Behaviors and the nuanced factors that influence behaviors are complex, as are attempts to target and change behaviors. It has frequently been noted that behavior change is difficult to accomplish. As evidenced by the bioecological model (Bronfenbrenner, 1994), there are a multitude of factors and interactions that influence an individual and the contexts they are in. Our conceptualization of health behavior change attempts to accommodate several factors, but might be too simplistic when considering

broader perspectives of health and wellbeing. This may be particularly important when considering the practice implementation of behavior change interventions beyond the empirical evidence found in studies. In short, there are many things that influence an individual's health. There are likely more factors than we are aware of or that we can address in a theoretical model. This speaks to the very nature of behavior change and the broader concept of health being complex constructs.

Despite some limitations to our current theoretical conceptualizations of behavior change, it is still necessary to use them in guiding intervention approaches. A recent meta-analysis found that PA interventions were most effective at targeting PA behavior when they were driven by theory (Chase, 2015). Another finding from the same meta-analysis noted the importance of combining theory driven approaches with cognitive and behavioral components. These components might include identifying and overcoming perceived barriers, increasing perceived confidence in one's ability to engage in PA (e.g., self-efficacy), and discussing individual beliefs and perceived benefits. While attempts to conceptualize behavior change have come a long way over the years, there is still room for additional progress and greater understanding of these processes. There continue to be gaps between our theoretical understanding and the norms of practice. For example, despite knowledge of the benefits of PA and supported behavior change counseling models, there continues to be difficulty implementing PA counseling and targeting PA behavior change. These difficulties suggest that there are still pieces of this complex puzzle missing. It is not a straightforward or simple, direct relationship between receiving counseling and changing your behavior. One such complexity related to behavior change

is the impact of stages of change and the difference between increased intentions and actual behavior change.

5.2 Discussion of Ad-Hoc Findings

The present study found PA counseling significantly predicted intention for PA, but not PA behavior. While there are limitations in the conclusions that can be drawn from this observation of the results, it raises questions about the implications for the relationship between PA counseling, intention, and behavior. These results are consistent with the intention-behavior gap described in the literature (Faries, 2016). In addition, the difference between intention and behavior in the present findings poses questions regarding the extent to which behavior change interventions are effectively targeting behavior. Intention is easier to target compared to behavior and therefore efforts targeting behavior change might stop at those factors. Counseling approaches might be targeting intention more so than behavior change. If this is the case, future efforts could focus on addressing factors that affect behavior change, beyond intention. Intention has also been reported as a potential mediator, specifically related to the influence of self-efficacy on health behaviors (Webb & Sheeran, 2006). This evidence further indicates a causal relationship between intention and behavior, despite the noted gap in the literature likely due to other factors. These findings also support investigating intention as an outcome variable when researching behavior change (Sheeran et al., 2016). Relatedly, these findings might also have implications for the mapping of behavior change counseling approaches onto an individual's stage of change.

As mentioned previously, the difficulty involved in changing behaviors is an ongoing issue in the field of health psychology. Both adoption of an initial behavior

change as well as sustained change over time are difficult to obtain despite evidence of the impact on health and wellbeing. The Theory of Planned Behavior (TPB) proposes that an individual's intention can predict their actions as an indicator of how much effort they are willing to put towards executing a behavior (Ajzen, 1991). In recent years, the relevance of TPB has been questioned due to the observed disparity between intention and behavior cited throughout the literature, referenced as the intention-behavior gap (Sniehotta, Scholz, & Schwarzer, 2005). The gap describes the observations of unchanged behaviors despite reporting increased intentions to engage in a particular behavior. The intention-behavior gap is quite large, with intentions only being translated into actions about 50% of the time (Sheeran et al., 2016). While one can argue that half of those with increased intentions are still adopting behavior change, the discrepancy is notable and likely related to the difficulty associated with adopting a behavior. Not everyone who was counseled on PA and reported intention to exercise more will show changes in their behavior following counseling.

This gap represents failed attempts to translate intentions into behaviors. A multitude of variables have been suggested to moderate the intention-behavior gap, including motivation, self-efficacy, attitude, subjective norm, perceived control, and various barriers, such as time and resources (Faries, 2016). It's estimated that intention alone predicts only 30-40% of behavior variation (Armitage & Conner, 2001; Rhodes & de Bruijn, 2013). The intention-behavior gap has been described as pervasive and hindering effective behavior change counseling efforts (Faries, 2016; Rhodes & Dickau, 2012). Despite the gap, intention still explains part of the variation in behavior change and is recognized as an important component. Although intention is often insufficient on

its own to produce behavior change, change is far less likely to occur without also adjusting one's intention for that behavior (Schwarzer, 2008). Intention is also related to an individual's readiness or stage of change for a certain behavior (Prochaska & Velicer, 1997). The Transtheoretical Model (TTM) emphasizes the importance of considering the stage one might be in and adapting behavior change counseling methods to it. Changing one's behavior occurs in the action stage. Many individuals may start in precontemplation or contemplation and take additional approaches to move towards the action stage. Increasing intention for engaging in the behavior might be part of the process to move someone from precontemplative or contemplative to preparation. Previous research has shown intention significantly predicted progression through each of the stages of change (Courneya, Plotnikoff, Hotz, & Birkett, 2001). Most therapeutic interventions are focused on bringing mindfulness to thought, which can lead to future change for that individual. Behavior change does not happen overnight; it requires time and energy. Often, individuals will need to discuss something multiple times before they think about making a change to their lifestyle. While intention is not always a strong predictor of PA behavior, it does explain part of the variance and serves as a proxy for understanding factors related to behavior and behavior change. Assessing intentions at minimum provides a way of investigating behavior change processes and efforts following an intervention.

Much of our current literature on health behavior change shows support for interventions targeted at increasing motivation or intention to exercise. There is less research showing connections between interventions and sustained behavior change. In part, this is likely due to the complexity of behavior change and life contexts that might

impact behaviors. Even if someone has increased intention or their desire to exercise more, they may face barriers (individual, family, social, environmental, structural, etc.) which prevent them from doing so.

Present findings of the predictive relationship between PA counseling and PA intention are consistent with prior literature (Jay, Gillespie, et al., 2010), such that greater PA counseling (number and quality of A's) is associated with greater intention to change PA behavior. Studies investigating the effects of behavior change counseling often focus on the perspective of the individuals providing the counseling (e.g., primary care physician) to assess the quality of the counseling provided. It is less common that studies focus on the patient perspective beyond the reporting of satisfaction or behavior change. While there are limitations to survey data due to reliance on self-reporting, assessing the patient's perspective of behavior change counseling broadens the understanding of how the counseling is received. For example, whether or not it is having the intended impact on the individuals receiving the counseling. Future research would benefit from exploring both ends of the dynamic with direct observation of the counseling interactions and self-report measures from both the provider and patient. Direct observation alone is also insufficient for assessing behavior change counseling since it is missing important context regarding differences in individual perception and experience. Cognitive psychology highlights that even the same stimulus is perceived differently across individuals. Therefore, it is unlikely there is a one-size-fits-all approach to counseling.

It is possible that current practices in PA counseling, despite encouragement of best practices, are not effectively targeting self-efficacy or behavior change. It is unclear to what extent the various experiences with PA counseling focused on enhancing self-

efficacy. It is possible there is a gap between best-practices based on empirical literature and typical practices utilized in real-world medical settings. Primary care physicians typically only have about 15 minutes scheduled with each patient. While we know from the literature that PA is important to address, it may be prioritized less due to other complex presenting concerns or due to the provider's own confidence in engaging in PA counseling due to the overall difficulty associated with behavior change. If behavior change counseling is perceived as too challenging with the effort being higher than the likelihood of a positive outcome (i.e., behavior change), then providers may prioritize other prevention or treatment approaches over PA counseling. One example is in the treatment of depression and depressive symptoms. PA has been shown to be an effective treatment for mild to moderate depression (Cooney et al., 2013; Dinas, Koutedakis, & Flouris, 2011). However, it is unclear how frequently provider's in the US prescribe exercise for mild to moderate depression symptoms. There are many additional factors that might impact the relevance and importance of PA counseling as well as the likelihood that PCP visits will discuss PA.

5.3 COVID-19 Considerations

The timing of data collection for the present study coincided with the beginning of the COVID-19 pandemic and accompanying changes in daily routines. More than half of respondents noted an impact of COVID-19 on their PA, both increases and decreases. Since this perceived change in behavior following COVID-19 was significantly correlated with self-reported PA behavior, interpretations of the relationships between PA counseling and PA behavior are limited. The potential impact of COVID-19 exemplifies the various ways in which environmental and contextual factors might affect behaviors.

These factors are often challenging to account for in both assessment and analyses. Controlling for these variables statistically is not always sufficient for considering their potential impact. For example, it is possible that the changes in PA behavior due to the COVID-19 pandemic interfered with observing a predictive relationship between PA counseling and PA behavior. PA behavior was only assessed for the past week in the present study. Given the rapid and continuously evolving changes at the beginning of the pandemic outbreak, it is possible that PA behavior also changed week to week. Since data was only collected at a single time point, it is difficult to draw conclusions about the impact of COVID-19 on PA counseling, self-efficacy, and PA behavior.

Controlling for changes due to COVID-19 statistically would not be appropriate in this case since it's not a directional variable. Including it as a covariate in the model would not remove the impact and reveal whether a predictive relationship would have been observed between PA counseling and PA behavior. In addition, the COVID-19 pandemic is unprecedented and therefore was not factored into the original model hypothesis. As can be expected, the global pandemic has had an impact on people's lives, including their PA behavior. However, preliminary correlation results suggest that the pandemic has had less impact on people's self-efficacy for PA. Further research is needed to explore factors influencing self-efficacy. The data collected in the present study is insufficient to explore the extent to which the COVID-19 pandemic may have influenced behavior and the present hypotheses. This raises limitations on the generalizability of these findings outside of the context of the pandemic.

5.4 Limitations

In addition to the limitations associated with the COVID-19 pandemic, there are several key factors limiting the interpretation of the present study's findings. As previously noted, this study utilized survey data, which relies on self-report. There are limitations to the reliability of individual recall and general accuracy of self-report, specifically for PA counseling and PA behavior. In contrast, measurement of self-efficacy and intention to engage in PA rely on self-report tools. Interpretation of the findings related to PA behavior are limited due to the use of a non-physiological or standardized measure. Although self-report is commonly used, it is subjective and prone to error. Due to the study collecting data on an online survey platform about a recent PCP encounter, measurement of PA behavior was limited to self-report in order to get an estimate of how active participants were. In addition, PA behavior was only assessed for the past week with a general comparison to the past month. A more precise assessment might measure PA behavior through physiological tools, such as assessing MET's or heart rate (Jetté, Sidney, & Blümchen, 1990) and longitudinally, using pre- and post-intervention assessments.

Another limitation related to measurement is that PA intention was assessed using a single item. This item was included as part of the 5As assessment adapted from previous literature to provide additional context on the findings. Due to the limitations with PA behavior and lack of significant relationship between PA counseling and PA behavior, PA intention was investigated further in post-hoc analyses. PA intention was assessed with a single item measured on a 4-point scale. This item was previously used in a study investigating the use of 5As for obesity counseling (Jay, Gillespie, et al., 2010).

The study did not report on reliability and validity of this item but did reference that it used Ajzen's (2006) guidelines for writing behavior intention items to draft the question. Since PA intention was assessed using a single item rather than a scale, there are limitations to the interpretation of the results related to that variable. For example, there is mixed evidence on the reliability and validity of single item scales to measure a construct (Diamantopoulos, Sarstedt, Fuchs, Wilczynski, & Kaiser, 2012; Sarstedt, Diamantopoulos, & Salzberger, 2016). Of note, PA intention was positively correlated with stage of change such that greater intention to change PA behavior was associated with increased stage of change. This is consistent with expectations of higher stages of change indicating greater intentions.

A third limitation in the present study is that there was not a direct assessment of whether or not PA counseling promoted or enhanced self-efficacy. Conclusions about whether or not counseling directly target aspects of self-efficacy is limited due to a lack of direct assessment, such as observation, of the specific contents of PA counseling received. The extent to which PA counseling focused on self-efficacy is unclear. Since this is a major assumption of theoretical frameworks supporting health behavior change and counseling approaches, it is important to consider the impact of not being able to directly measure it. A proxy measure for perceived self-efficacy change indicated that more than half of participants reported greater confidence to exercise following the PA counseling encounter. This is particularly important to note due to the non-significant predictive relationship between PA counseling and self-efficacy for exercise.

The sample demographics also pose limits to the generalizability of the present study findings. The sample was largely homogeneous, consisting of primarily White

participants who have health insurance with incomes above the national poverty line. Although the average BMI of the sample is considered "overweight," the sample seems to consist of predominately healthy adults.

Lastly, while the proposed mediation model was not significant in the present study, the individual predictive relationships in the model were approaching significance. If PA counseling was found to be a significant predictor of self-efficacy, then a significant mediation may have been observed. Both the relationships between PA counseling and self-efficacy as well as PA counseling and PA behavior were not found to be significant but were trending towards significance. This trend suggests that a larger sample size may have increased the power of the effect and detected significant relationships.

While various inferences can be made about PA counseling based on the data collected in the present study, these interpretations are still limited. It is important to highlight that data was collected from individuals living across the United States to increase generalizability and avoid limitations from focusing on individual practices. While this provides advantages in terms of understanding current PA counseling practices more broadly across the country, there are also a couple of key limitations to consider. Specific patient-provider interactions that may influence PA counseling and subsequent behavior are unable to be fully assessed through online survey data. Direct observations would allows for a more in depth understanding of the specifics of PA counseling but would likely be limited to a specific practice or groups of practices. For example, direct observation allow for better understanding of complex relationship dynamics and communication factors. The present study also does not have data on the

content or process of the recent PCP visits beyond the format (e.g., virtual or in person) and PA counseling components based on the 5As.

5.5 Future Directions

As stated throughout the discussion, there is substantial need and opportunity for future studies to continue investigating in order to aid in our understanding and implementation of effective PA counseling. Future research might use a randomized control trial to compare comprehensive PA counseling based on the 5As to other PA counseling and no PA counseling. In addition, a RCT could compare pre- and post-intervention measures to assess change and causality. Additional follow-up using a longitudinal study design can inform regarding implications for longer-term impact of PA counseling on behavior. While still fitting the counseling efforts to the individual patient needs, variations in the amount or type of counseling received can be more closely assessed or controlled for. Additional research focusing on direct observation and manipulation of these variables can aid in better understanding of the effects of counseling interventions and cognition components, such as self-efficacy) on both intentions and behaviors. Future studies should aim to use more precise measures for main study variables, specifically for PA behavior and behavior change. Beyond focusing on RCT to directly investigate the impact of PA counseling, future research should also consider direct observation and qualitative data to further understand aspects specifically related to practice and implementation beyond controlled research studies.

CHAPTER 6: CONCLUSIONS

Overall, this study discusses factors related to PA counseling in primary care settings and behavior based on theories of health behavior change. Despite being widely cited throughout the literature as important for understanding PA behavior and behavior change, self-efficacy was not supported as a mediator in this study. Self-efficacy significantly predicted PA intention and behavior, but results indicate that this relationship does not appear to be driven by PA counseling. If self-efficacy is not a significant mechanism for PA counseling to target for behavior change, then other factors should be investigated as potential mediators. In addition, the implementation of PA counseling efforts should be further explored. Additional research is required to explore potential mechanisms of behavior change and the relationships between PA counseling approaches and subsequent behavior. This research is important to better understand how to improve PA counseling in order to better target behavior change in alignment with improving overall health and wellbeing. Relatedly, further research is needed to better understand the intention-behavior gap and the complex set of factors that might influence it, in order to improve the effectiveness of counseling approaches. There are still substantial gaps in our understanding of behavior change and effective interventions to promote behavior change that warrant continued investigation.

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APPENDIX A: DEMOGRAPHIC QUESTIONS

*Required items

1. *What is your date of birth? _____

2. *What is your gender assigned at birth?
    a. Male
    b. Female
    c. Other (please specify): _____

3. *How tall are you? ___Feet ____Inches

4. *How much do you weigh? (in pounds) ____lbs

5. Do you identify with a Hispanic, Latino, or Spanish origin?
    a. Yes
    b. No

6. Which one of the following groups would you say best represents your race (check all that apply):
    a. White or European American
    b. Black or African American
    c. Asian or Asian American
    d. Native Hawaiian or Other Pacific Islander
    e. Native American or Alaska Native
    f. Middle Eastern or Arab American
    g. Other (please specify): _____

7. What is your marital status?
    a. Single and never married
    b. Married
    c. Common law marriage
    d. In a relationship
    e. Separated
    f. Divorced
    g. Widowed

8. What is the highest level of education you have completed
    a. Graduate or professional training
    b. College
    c. Some college
    d. High school diploma or GED
    e. Some high school
    f. Other (please specify): _____

9. Which of the following categories best describes your pre-tax household income in the last year
    a. Less than 10,000
    b. 10,000 to 24,999
    c. 25,000 to 49,999
    d. 50,000 to 74,999
    e. 75,000 to 99,999
    f. More than 100,000

10. What is your current occupation status?
    a. Employed full time
    b. Employed part time
    c. Not employed outside the home but looking for a job
    d. Not employed outside the home and not looking for a job
    e. Retired

11. Do you have health insurance? Yes, No
    a. If yes, please indicate which type of health insurance
        i. Private
        ii. Medicaid
        iii. Medicare
        iv. Other (please specify): _____

12. In what setting do you receive regular medical treatment?
    a. Private practice (primary care or family medicine)
    b. Community mental health clinic
    c. Hospital setting

APPENDIX B: PERCEIVED HEALTH STATUS

1. In general, would you say your health is…?
   1 = Poor
   2 = Fair
   3 = Good
   4 = Very Good
   5 = Excellent

2. Compared to others your age, would you say your health is…?
   1 = Poor
   2 = Fair
   3 = Good
   4 = Very Good
   5 = Excellent

APPENDIX C: PHYSICAL ACTIVITY ASSESSMENT TOOL

Physical Activity Assessment Tool

Moderate physical activity is any activity that is *somewhat hard*
and makes you feel like you do when you walk *fast* (3–4 mph).

Circle activities you did *during the last 7 days* at a *MODERATE* LEVEL nonstop for at least 10 minutes:

Examples of activities that can be done at a MODERATE LEVEL:

Walking fast, with a purpose	*Walking downstairs*	Rowing, sailing
Aerobics, low impact	Gardening: planting, raking, weeding	Skateboarding
Baseball, softball	Golf	Tai chi, qigong
Bicycling (less than 12 mph)	Gymnastics	Vigorous stretching
Bowling	Horseback riding	Volleyball
Calisthenics, light	Housework: mopping, sweeping, vacuuming	Yoga
Carpentry	Lifting or carrying moderate loads (5 to 15 lb)	Washing car
Dancing	Mowing lawn, power mower	Water aerobics
Fishing, standing	Ping-pong	Weight lifting
Frisbee	Playing with children: kneeling, lifting	Working on car

***During the last 7 days*, on how many days did you do a *Moderate* physical activity nonstop for at least 10 minutes at a time?** _____ **Days**

***On those days*, how much time did you spend on average doing *Moderate* physical activities?** _____ **Minutes/Day**

Vigorous physical activity is any activity that is *hard*
and makes you feel like you do when you run or jog.

Circle activities you did *during the last 7 days* at a *VIGOROUS* LEVEL for at least 10 minutes at a time without stopping:

Examples of activities that can be done at a VIGOROUS LEVEL:

Jogging, running	*Walking upstairs*	Soccer
Aerobics, high impact (Jazzercise)	Carrying heavy loads	Ski machine (Nordic Track)
Basketball	Jumping rope	Stair climbing (StairMaster)
Bicycling, fast (more than 12 mph)	Judo, karate, kickboxing	Swimming laps
Calisthenics, vigorous	Roller skating, rollerblading	Tennis, racquetball

***During the last 7 days*, on how many days did you do a *Vigorous* physical activity nonstop for at least 10 minutes at a time?** _____ **Days**

***On those days*, how much time did you spend on average doing *Vigorous* physical activities?** _____ **Minutes/Day**

Compared with your Usual Physical Activity over the last 3 months, was the last seven days' activity:
_____ **More**
_____ **Less**
_____ **About the same**

continued

Physical Activity Assessment Tool *(continued)*

Medical Problems

Please answer the next 7 questions by circling *"Y" for "Yes" and "N" for "No".*

Y N 1. Has your doctor ever said that you have a heart condition and that you should only do physical activity recommended by a doctor?
Y N 2. Do you feel pain in your chest when you do physical activity?
Y N 3. In the past month, have you had chest pain when you were not doing physical activity?
Y N 4. Do you lose your balance because of dizziness, or do you ever lose consciousness?
Y N 5. Do you have a bone or joint problem that could be made worse by a change in your physical activity?
Y N 6. Is your doctor currently prescribing drugs (for example, water pills) for your blood pressure or heart condition?
Y N 7. Do you know of any other reason why you should not do physical activity?

Physical Activity Plans

Please check the ONE answer that best describes your physical activity plans for the next 6 months:

___ A. I do not plan to become physically active in the next 6 months.
___ B. I am thinking about becoming more physically active.
___ C. I intend to become more physically active in the next 6 months.
___ D. I have been regularly physically active for the last 1–5 months.
___ E. I have been regularly physically active for the past 6 months or more.

Benefits of Physical Activity Important to You

Please circle the 3 *benefits* of physical activity that are *Most Important to You:*

1. For my health
2. Control my weight
3. Look better
4. Feel better
5. Feel good about taking care of myself
6. Set a good example for my family or friends
7. Get my partner, child, friend to be more active with me
8. Teach my family, friends the importance of physical activity
9. Have time for me
10. Lower my stress
11. Improve my fitness
12. Lower my risk of heart disease
13. Lower my blood pressure
14. Lower my cholesterol
15. Control my diabetes
16. Other: _____

Getting Help from Others

Is there someone who would encourage you or help you with some of your responsibilities so you could get regular physical activity? Yes No

Who is that? _____ How could they help? _____

Helping Others

Is there a friend or family member you think should get more physical activity? Yes No

Who is that? _____ How could you help them? _____

Confidence

How confident are you that you could increase your physical activity if you decided to do so?
(Circle the best answer)

Very Confident Fairly Confident A Little Confident Not at all Confident

APPENDIX D: PHYSICAL ACTIVITY COUNSELING

Stage	Question	Response rating
Assess	1. Did your doctor ask you how important physical activity is to you?	Yes, No
	2. Did your doctor ask you about how confident you are in your ability to engage in physical activity or change your activity level?	Yes, No
	3. My doctor was effective in the way that they asked about my physical activity behavior.	4-point Likert scale
Advise	4. Did your doctor discuss making changes to your physical activity level?	Yes, No
	5. Did your doctor discuss how your physical activity level compares to national guidelines (e.g., 150 minutes per week of moderate intensity physical activity)?	Yes, No
	6. My doctor was effective in the way that they advised me on my physical activity behavior.	4-point Likert Scale
Agree	7. Did your doctor help you set goals (make specific plans) to exercise more?	Yes, No
	8. How much were you involved in setting these goals?	4-point Likert scale
	9. How realistic do you think it is that you'll meet these goals?	4-point Likert scale
	10. My doctor was effective in the way that they helped me establish a plan and included me in the conversation.	4-point Likert scale
Assist	11. Did your doctor talk with you about how to deal with the kinds of things like stress, temptation, or finding time that might make it hard to engage in physical activity?	Yes, No
	12. My doctor was effective in that way that they considered and discussed unique barriers that I might experience when trying to engage in physical activity.	4-point Likert scale
Arrange	13. Did your doctor tell you when he/she wanted to see you again for follow-up?	Yes, No
	14. Did your doctor provide you with referrals, such as for an exercise program?	Yes, No
	15. My doctor was effective in establishing and communicating a plan for follow-up.	4-point Likert scale

Note. 4-point Likert scale = not at all (1), only a little (2), somewhat (3), and very (4).

APPENDIX E: THE EXERCISE SELF-EFFICACY SCALE (ESES)

This scale instructs participants to answer on a 4-point rating scale how confident they are with regard to carrying out regular physical activities and exercise.

ESES Rating Scale:
1 = not always true
2 = rarely true
3 = moderately true
4 = always true

I am confident….	**Rating:**
1) that I can overcome barriers and challenges with regard to physical activity and exercise if I try hard enough	1 2 3 4
2) that I can find means and ways to be physically active and exercise	1 2 3 4
3) that I can accomplish my physical activity and exercise goals that I set	1 2 3 4
4) that when I am confronted with a barrier to physical activity or exercise I can find several solutions to overcome this barrier	1 2 3 4
5) that I can be physically active or exercise even when I am tired	1 2 3 4
6) that I can be physically active or exercise even when I am feeling depressed	1 2 3 4
7) that I can be physically active or exercise even without the support of my family or friends	1 2 3 4
8) that I can be physically active or exercise without the help of a therapist or trainer	1 2 3 4
9) that I can motivate myself to start being physically active or exercising again after I've stopped for a while	1 2 3 4
10) that I can be physically active or exercise even if I had no access to a gym, exercise, training or rehabilitation facility	1 2 3 4

Sum: _____

APPENDIX F: SCREENING CRITERIA QUESTIONS

1. How old are you? _____

2. Can you read and understand English well? Yes, No

3. Do you have a Primary Care Physician? Yes, No

4. When was the last time you visited your Primary Care Physician for a routine visit, such as a yearly physical (not for an acute illness or injury)? MM/DD/YYYY: __/__/____

5. Did you and your doctor discuss your physical activity/exercise level? Yes, No

APPENDIX G: PHYSICAL ACTIVITY MOTIVATION AND INTENTION

Motivation

How motivated are you to make changes related to your physical activity level?

4-point Likert scale; not at all (1), only a little (2), somewhat (3), and very (4)

Intention

How true of you is it that in the next month, you have a specific plan to get more exercise?

4-point Likert scale; not at all (1), only a little (2), somewhat (3), and very (4)

APPENDIX H: PERCEIVED CHANGE IN PHYSICAL ACTIVITY AND SELF-EFFICACY.

1. Did the visit lead to changes in your physical activity level? (yes/no)
    a. If yes: To what extent did you change your physical activity engagement? (short answer)

2. Did the visit lead to changes in your confidence in your ability to engage in physical activity? (yes/no)
    a. If yes: To what extent did your confidence in your ability to engage in physical activity change? (short answer)

APPENDIX I: QUESTIONS ADDRESSING THE POTENTIAL IMPACT OF COVID-19

1. Was this visit:
    a. In person
    b. Virtual (video)
    c. Other (please specify): _____
2. How does this interaction compare to previous visits with your primary care physician?
    a. Very similar
    b. Similar
    c. Different
    d. Very different
3. Briefly describe the differences (if none, please enter N/A):
4. Has the Coronavirus (COVID-19) pandemic and accompanying restrictions influenced your motivation to engage in physical activity?
    a. Yes
    b. No
5. (if yes on #4) How has your motivation changed?
    a. Increased
    b. Decreased
6. Did you discuss the Coronavirus (COVID-19) during this physician visit?
    a. Yes
    b. No
7. (if yes on #6) Do you feel as though it took time away from discussing physical activity with your primary care physician?
    a. Yes
    b. No
8. Please rate the extent to which you've been worrying about the consequences of the Coronavirus (COVID-19) for (response scale: not at all, only a little, somewhat, a lot)
    a. Your own health
    b. The health of your family
    c. Your job
    d. Your recreational activities
    e. The health of others
    f. The economy
    g. Your community
    h. The healthcare system's ability to handle the pandemic