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Facilitating reintegration among returning veterans by intervening on physical activity and community engagement

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**Facilitating reintegration among returning veterans by intervening on
physical activity and community engagement**

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Dedication

This dissertation is dedicated to Tyler; he believed in me (and this work) when I needed it most. Thank you for always inspiring me to be the best version of myself.

Facilitating reintegration among returning veterans by intervening on physical activity and community engagement

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There are a host of difficulties associated with transitioning from military to civilian life. This dissertation aims to provide an initial test of the feasibility and effectiveness of an integrated community-based intervention that targets vigorous-intensity exercise and social connection for facilitating reintegration among newly returned veterans - Physical Activity and Community Engagement (PACE). Chapter 1 briefly discusses the background and significance as well as the overall aims of the research. Chapter 2 describes the objective, methodology and findings of a systematic review of extant interventions for reintegration. Informed in part by the study and its findings discussed in Chapter 2, Chapter 3 describes the rationale for the study and the specific aims. Chapter 4 details the study methodology and Chapter 5 presents the results of the study. Finally, Chapter 6 is a general discussion summarizing the findings as well as clinical implications and future directions.

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CHAPTER 1. INTRODUCTION

1. Background and Significance

Since the attacks on September 11, 2001, there have been three large conflicts: Operation Enduring Freedom (OEF; October of 2001 to the present), Operation Iraqi Freedom (OIF; March of 2003 through August of 2010), and Operation New Dawn (OND; September of 2010 through December of 2011)- comprising the longest war that the United States has fought (Sayer, Carlson, & Frazier, 2014). Over 2 million soldiers have served in the OEF/OIF/OND conflicts with over 40% of soldiers deploying more than once (Siegel & Davis, 2013). Since 2008, there has been a significant increase in the number of soldiers who have spent at least 2 years (25 or more months) cumulatively deployed (Baiocchi, 2013). The current trend of deployment is unique in that there is an increase in the number of deployments coupled with shorter dwell time (i.e., time spent at home between deployments). As of 2015, approximately 1.5 million personnel were retired from active duty service (Department of Defense [DOD], 2015). Thus, there is an increasing number of veterans leaving the military with multiple (or longer) deployments compared to veterans of earlier conflicts.

Deployment is associated with a number of psychological stressors, which are often made worse with the experience of combat. While deployed, veterans are immersed in a high stress environment where they are often exposed to the continual anticipation of combat or threat, combat-related trauma, and separation from home and family (Spelman, Hunt, Seal, & Burgo-Black, 2012). Returning to civilian life represents a new stressor for many. Although the initial return home may be associated with a sense of pride and

excitement, veterans eventually face a host of new challenges acclimating to civilian life as they experience the emergence of difficult emotions (e.g., anxiety, hypervigilance, depression; Bowling & Sherman, 2008).

Many veterans report difficulties during the time that they transition from military to civilian life across a number of important life domains. Specifically, as many as 44% of post 9/11 veterans report that the readjustment to civilian life was difficult (Taylor et al., 2011). Sayer and colleagues (2010) examined reintegration difficulties in a sample of Iraq-Afghanistan combat veterans who made at least one visit to the VA. In this study, veterans described a number of difficulties including difficulty in social relations (e.g., getting along with family and friends upon return or confiding in others), not feeling connected to the community and as if they do not belong in civilian society, lacking a sense of purpose or meaning in life following the shift to civilian society, and that they are no longer able enjoy leisure time. Difficulty completing daily tasks or maintaining productivity at work were also listed as concerns. Compounding the concerns above, there is an increase among this population in alcohol and drug use as well as a decline in physical activity (Littman, Jacobson, Boyko, & Smith, 2015; Sayer et al., 2010). Given the broad scope of these difficulties, it is clear that intervention is needed for veterans during this vulnerable period.

2. Defining Reintegration

Reintegration is a multi-faceted construct involving different processes within the person (e.g., physical health, psychological health, employment) that occur across different levels (i.e., individual, interpersonal, community, and societal; Elnitsky et al.,

2017). Broadly, reintegration can be best understood as the resumption of life roles following the transition from military to civilian life. Yet, there is a general lack of discussion and consensus on the meaning of reintegration despite the surge in interest on the topic. Elnitsky and colleagues (2017) conducted a concept analysis in order to better define and understand reintegration. This work showed that there has been a substantial increase in research focusing on reintegration and related concepts since 2004, but that the bulk of studies either do not provide a definition or generate a limited conceptualization. Additionally, the term reintegration is often used interchangeably with terms such as “transition,” “readjustment,” and “community integration.” Despite the intermittent use of such terms in the literature, reintegration remains the common term used to describe the process of separation from the military. Thus, emergent work would benefit from a unified definition.

Reintegration may be best operationalized as the veteran’s “co-occurring psychological, social, health-related, and community-related modes of functioning with one’s immediate veteran friends, family, and larger social groups” (Elnitsky, Fisher, & Blevins, 2017). In an effort to develop a validated measure of community reintegration, Sayer and colleagues (2011) conceptualized community reintegration as a) interpersonal relationships with family, friends, and peers, b) productivity at work, school, or home, c) community participation, d) self-care, e) leisure, and f) perceived meaning in life. Given the broad definition of the construct, enhancing reintegration requires a multitude of strategies each with specific targets to be implemented across the various systems. This will require collaboration with different groups across various fields (e.g., legal system,

psychologists, social workers, employment agencies). In order to remain consistent with the definitions of reintegration described above, this dissertation will focus on the domains of reintegration which are targeted with psychological intervention.

3. Specific Aims

The overall aim of the proposed research is to develop and conduct an initial test of the feasibility and effectiveness of an integrated intervention for facilitating reintegration among newly returned veterans. To this end, we first conducted a systematic review of extant interventions for reintegration difficulties. The objectives, approach and findings of this review are described in Chapter 2. Building upon the review findings and consistent with the overall aim, we then describe the goals and structure of a community-based program and provide a rationale for augmenting that program with a vigorous-intensity exercise prescription (see Chapter 3). The specific aims and methodology of the proposed study are described in Chapter 4.

CHAPTER 2. INTERVENTIONS TARGETING REINTEGRATION FOR RETURNING VETERANS: A SYSTEMATIC REVIEW¹

1. Introduction and Objectives

The objective of this review is to 1) identify existing interventions designed to specifically target reintegration and to 2) examine the effectiveness of such interventions. We aimed to systematically review any initiatives targeting the facilitation of the transition process from military to civilian life for post- 9/11 veterans. This review has the potential to identify promising interventions and identify areas for improvement in future intervention development. Providing effective psychological interventions to veterans during this window of the deployment cycle can aid in preventing the development of mental health disorders and reducing the associated public health costs.

2. Methods

2.1. Overview

We conducted a systematic review of programs and interventions designed to facilitate the process of reintegration for post-9/11 veterans. We adhered to the PRISMA guidelines for conducting systematic reviews- a checklist which seeks to improve the

¹ Baird, S.O., Conroy, H.E., & Smits, J.A.J. (under review). Interventions targeting community reintegration for returning veterans: A systematic review. Contribution statement: The first author designed the research, conducted analyses, drafted the paper, and revised the paper. The second author conducted analyses and revised the paper. The third author designed the research, conducted analyses, drafted the paper, and revised the paper.

quality of these reviews by specifying the necessary components to include and report on when valuating health care interventions (Liberati et al., 2009; Moher, Liberati, & Altman, 2009).

2.2. Search Strategy

We conducted a comprehensive search using the following online databases: Cochrane Library; PsycINFO; and PubMed. The following terms were used to conduct the search: military OR veteran* AND reintegration*, transition*, adjustment, readjustment, integrat*, postdischarge; AND intervention, program, therapy, initiative, service.

Studies were required to meet the following criteria: a) have been developed in English for the United States military; b) have been implemented for veterans or soldiers of the OEF-OIF-OND era (i.e., post-9/11 veterans); c) have been developed specifically for the purpose of targeting the reintegration process; d) have been published between 2001 and March 31, 2017 (i.e., following the attacks on September 11th and until the end of data collection for this review). Programs were excluded if: a) the emphasis of the program fit into any domains better targeted with services provided outside of psychological intervention: employment, housing, financial, education, or legal; b) the program was developed solely for the veteran's spouse or child; c) the program was designed solely for individuals with a disorder (e.g., posttraumatic stress disorder [PTSD]) or injury (e.g., traumatic brain injury [TBI]). We included published randomized controlled trials (RCTs) as well as open label trials.

Results from each term combination and database were combined. Studies were screened initially based on title and abstract and duplicates were removed. Two

independent researchers then screened the remaining articles using the full-text. Studies that met any of our exclusion criteria were flagged to be removed from analyses.

Following the separate reviews, all 3 of the authors met to discuss discrepancies and reached consensus.

2.3. Outcome Measures

The primary outcome measure was the level of reintegration difficulties. Each study differed in the type of reintegration measure that was used as an outcome. Given that the field has only recently begun to devote attention as to how to best conceptualize and define reintegration, this is unsurprising. Keeping with the multi-dimensional definition of reintegration (Elnitsky, Blevins, et al., 2017; Sayer et al., 2011), we established 3 domains of interest, namely, (1) mental health difficulties, (2) psychological health, and (3) interpersonal relationships.

The mental health category captures difficulties related to depression, anxiety, PTSD, or substance abuse. This category also refers to emotional difficulties (e.g., anger or loneliness). The psychological health domain delineates psychological traits or strengths often correlated with positive well-being (e.g., resilience, self-efficacy, satisfaction with life). The interpersonal relationship domain taps relationship difficulties and conflict as well as perception of support or satisfaction with relationships. Finally, we examined data related to intervention acceptability and adherence. Table 2 lists the domains of reintegration measured in each study using our preset definitions.

3. Results

3.1. Study Selection and Inclusion

A total of 20,873 articles were identified across the three databases (see Figure 1). After studies were screened based on the title and abstract, 609 articles remained, of which 566 duplicates were removed. The final 43 articles were screened by two independent authors to ensure that the inclusion criteria were met. Articles were excluded for the following reasons: no program or initiative developed for the purpose of targeting the reintegration process ($n = 17$), no assessment of outcome ($n = 17$), and the study was developed for the veteran's spouse or child ($n = 1$). The remaining 8 articles were included in the review.

3.2. Study Characteristics

As can be seen in Table 1, studies ranged widely in terms of trial designs. It is noteworthy that there was only 1 randomized controlled trial (RCT; Sayer et al., 2015); the remaining designs were as follows: 1 quasi-RCT (Castro, Adler, McGurk, & Bliese, 2012), 3 pre-post (Blevins, Roca, & Spencer, 2011; Matthieu, Lawrence, & Robertson-Blackmore, 2017; Tenhula et al., 2014), 1 non-randomized (Sipos et al., 2014), and 2 retrospective reviews (Schneider et al., 2016; Sylvia et al., 2015). Across the 8 studies, a total of 4,015 participants were included.

Each branch of service was accounted for across 6 of the studies; however, there were 2 studies that did not specify which branch the participants were from. The time to implementation (relative to discharge date) was also variable. Five studies did not report on the timing of the intervention delivery. In these studies, there was no time restriction reported as part of the inclusion criteria for the intervention, and participants were simply

enrolled if they were serving/had served in the post 9/11 conflicts. Four studies included a veteran only sample, 3 involved active duty soldiers, and 1 had a combined sample.

The duration of the intervention varied from brief hour-long workshops to multi-week interventions. The majority of the interventions included in this analysis were brief in nature, with 2 studies defining the duration of the intervention as being between 1-2 hours (Blevins et al., 2011; Castro et al., 2012), 2 studies defining the duration as ranging from 2-5 days (Sayer et al., 2015; Schneider et al., 2016), and 2 studies describing programs occurring as weekly classes/modules over the course of 4 weeks (Sylvia et al., 2015; Tenhula et al., 2014). Conversely, Matthieu and colleagues (2017) reported on a civic service program spanning the course of 26 weeks. One study (Sipos et al., 2014) reported on a new “front-loaded” reintegration strategy beginning while soldiers were still deployed. The total time of the intervention relative to when the procedures actually began is unclear and a “not specified” was given. Similar to duration, the nature of the interventions was diverse, ranging from informal techniques to structured therapy protocols. Several of the programs were based on military initiatives.

Another critical component of the studies is the environment in which they were delivered. As mentioned above, studies differed in duration as well as in the nature of the intervention (e.g., workshop versus multiweek intervention). The nature of the intervention is due in large part due to the context in which it was delivered. Interventions delivered in the military context often have strict time constraints and limited assessment capability. In addition, most of these interventions are mandatory so adherence to these interventions is likely optimal. Thus, for each outcome, the interventions will be

described within either of the two contexts. Furthermore, it is important to note that while these interventions were delivered in the military (and sometimes to active duty service members), they were developed for the purposes of helping veterans to adjust to civilian life *outside* of the military. Out of the 8 studies, 4 were delivered in the military environment and 4 in civilian society.

3.3. Effect on Mental Health Difficulties

Eight studies reported on mental health difficulties.

Interventions Delivered in the Military Context

Four studies delivered interventions in the military context with the hope of reducing various mental health difficulties. Blevins and colleagues (2011) used a pre-post design to evaluate Life Guard, a community-based Acceptance and Commitment Therapy (ACT) workshop ($N = 148$), relative to a control group ($N = 137$). Randomization was not possible as group assignment was based on unit availability. Life Guard workshops were delivered to veterans within 9 months of their most recent deployment and were conducted by four professionals: a nurse, social worker, psychologist, and recreational therapist. Three skills were emphasized; namely, a) awareness: knowledge of the relationship between an individual and his/her private experiences, b) acceptance: willingness to non-judgmentally experience these private instances, c) value-based living: choosing and acting in a goal-directed fashion. Members of the 2-hour ACT workshop evidenced significant reductions in depression and PTSD while the control group showed no significant within-group differences. There was also a significant reduction in anxiety

symptoms for those in the intervention group. However, the only significant between-group effect was observed for the improvement in depressive symptoms.

Castro and colleagues (2012) also evaluated the effects of a brief mental health intervention, Battlemind Training, a mental health initiative implemented for soldiers in the U.S. Army 3-6 months following deployment. The trial was a quasi-RCT (i.e., randomization by platoon) conducted at a U.S. Army installation in which Battlemind training ($N = 804$) was compared to a survey-only control condition ($N = 841$). The Battlemind postdeployment training modules focused on normalizing transition difficulties. Skills are highlighted that were likely highly functional in combat, but that can serve to make the transition home more difficult if not updated (e.g., hypervigilance). The training describes how the skills should be adapted on the return home and also addresses myths of mental health and the importance of reducing stigma. Results showed that one hour of mental health training resulted in fewer symptoms of PTSD and depression at 6-month follow-up. Effect sizes were small (PTSD Checklist [PCL]: $d = 0.30$; Patient Health Questionnaire for Depression [PHQ-D]: $d = 0.23$).

While the above studies occurred over the course of 1-2 hours, the next intervention provided 2 travel days and 2 days of decompression. Schneider and colleagues (2016) conducted a retrospective review to evaluate the effectiveness of the United States Air Force Deployment Transition Center (DTC). Since soldiers were not randomly assigned to the DTC group, the paper compared those who have attended the DTC ($N = 1,573$) with a weighted control group ($N = 1,570$). Designed for soldiers with expected combat exposure and risk of mortality and morbidity, goals of the DTC include

1) easing the transition back into work and family, 2) decreasing stigma associated with mental health, 3) promoting resilience, rest, and recovery, and 4) providing reintegration resources. Results show that those who attended the DTC (relative to the weighted control group) had significantly lower rates of reported depressive symptoms, posttraumatic stress symptoms, and emotional difficulties. The DTC program significantly affected three of the four posttraumatic symptoms: nightmares/intrusive thoughts, hypervigilance, and detachment- with no significant effect on avoidance. Soldiers in this group were also less likely to request a referral or mental health assistance following the training.

Sipos and colleagues (2014) compared a front-loaded reintegration strategy, in which soldiers completed the majority of the standard reintegration tasks while in theater, to the standard reintegration protocol outlined by the U.S. Army. In an effort to reduce the length of the reintegration phase upon homecoming, soldiers in the front-loaded group ($N = 272$) were able to complete 46 of the 54 training requirements in theater while the standard group ($N = 121$) was only able to complete 13 of the 54. The authors found no effect of the front-loaded reintegration strategy on measures related to PTSD, alcohol misuse, or aggression.

Interventions Delivered outside of the Military

The other 4 interventions targeting mental health were delivered to veterans outside of the military.

Matthieu and colleagues (2017) investigated the impact of a 26-week civic service program on post-9/11 veterans using a pre-post design. Veterans ($N = 346$) were

completers of a health promotion intervention, the Fellowship Program, which asked participants to volunteer for 20 hours each week for a total of 26 weeks at a local nonprofit organization in their hometown. The Fellowship Program began with an orientation in which veterans are asked to complete leadership, networking, goal-setting, and autobiographical writing exercises geared toward professional development. Following orientation, a goal-setting curriculum was completed with peer mentorship in conjunction with the veteran's service at a non-profit organization. The authors included measures related to PTSD and depression. Results showed that the stronger effect in the mental health domain was the reduction in depressive symptoms at program completion. There was also a significant reduction in PTSD symptoms and a significant improvement in symptoms of loneliness.

Sayer and colleagues (2015) evaluated the therapeutic effects of 4 sessions of expressive writing on self-reported reintegration difficulties. Participants in the expressive writing arm were asked to write in detail about thoughts and emotions surrounding the transition to civilian life and its associated difficulties. Those participants in the factual writing condition were asked to write factually on the information needs of veterans (e.g., VA services, information that the public should have about veterans). Using a randomized controlled trial (RCT), the study compared expressive writing ($N = 508$) to factual writing ($N = 507$) or to no writing at all ($N = 277$). They found that expressive writing was more effective than the factual writing for reducing anger and psychological distress but not in reducing symptoms of PTSD. It was more effective than no writing at all across all three domains. Importantly, the study was able to show that the

effect for distress was stronger at the 6-month assessment than at the 3-month point, suggesting that the effects of expressive writing have the potential to last over time.

In a retrospective review, Sylvia and colleagues (2015) described a 4-session program called “Resilient Warrior,” a mind-body stress management and resilience program. The format consisted of four 2-hour weekly sessions. Content emphasized the teaching of relaxation response elicitation techniques relying on repetition (e.g. of sound, word, phrase, movement) and the subsequent setting aside of intrusive thoughts in order to return to this repetition. The program also teaches awareness of the stress response as well as how to generate adaptive thoughts and behaviors. Resilient Warrior was offered in the community as an educational resilience training program open to post-9/11 veterans. Three groups ($N = 15$) were included in the review; the first group took place at an Air Force base and the other two were conducted at a community college. Resilient Warrior participants experienced a reduction in depressive symptoms ($d = 0.60$) and perceived stress ($d = 0.62$) by the end of the program. Participants also evidenced a marginally significant reduction in anxiety symptoms from pre to post assessment.

Tenhula and colleagues (2014) described a resilience-focused psychosocial intervention piloted in the VA healthcare system from 2010-2012. “Moving Forward: A Problem-Solving Approach to Achieving Life’s Goals” was described to potential participants as a life skills program. The content utilizes specific tools modeled after contemporary Problem-Solving Therapy (Nezu et al., 2013). Three “toolkits” are taught: a) problem-solving multitasking: using externalization, visualization, or simplification in order to cope with the overload of stressful situations, b) the “Stop, Slow Down, Think,

and Act:” steps designed to help regulate negative emotional arousal and c) planful problem solving: defining problem and realistic goals, generating alternative solutions, decision making, and solution implementation. The authors used a pre-post design with data from 621 veterans across 155 different groups- 349 of these veterans served in the OEF/OIF/OND conflicts. Following the 4-session intervention, veterans showed a reduction in depressive symptoms ($d = 0.48$) and in overall symptoms of distress ($d = 0.45$). Following four sessions of this training, participants showed meaningful change in levels of distress (as evidenced by percentage of veterans with at least 5-point reductions on the Patient Health Questionnaire-9 [PHQ-9; 34.9%] and at least 10 points on the Outcomes Questionnaire-30 [OQ-30;44.7%]).

In sum, 6 of the 8 studies described yielded a reduction in depressive symptoms. Several of the studies also showed significant decreases in posttraumatic symptoms. Of the 6, the depressive symptom reduction was the stronger finding in 4 of the trials. Thus, it may be easier for these interventions to engage putative treatment targets associated with depression. However, it is important to note that the effects described were within-group effects and therefore provide no conclusive data about the efficacy of these interventions.

3.4. Effect on Psychological Health

Five studies reported on variables in the psychological health domain.

Interventions Delivered in the Military Context

Only Castro and colleagues (2012) assessed a variable related to psychological strength or health: satisfaction with life. They found that the Battlemind Training resulted in greater reported life satisfaction at 6-month follow-up.

Interventions Delivered outside of the Military

The veteran civic service program resulted in small effects on perceived self-efficacy ($d = -0.19$). All veterans in the study showed improvements across outcomes. Additionally, after controlling for current treatment, veterans with probable depression at baseline benefited the most with improvements in purpose in life. While still controlling for current treatment, those with probable PTSD showed significant improvements in self-efficacy by program completion (Matthieu et al., 2017).

Completion of the Resilient Warrior course (Sylvia et al., 2015) resulted in almost no change in resilience but in marginally significant improvements for self-efficacy ($p = 0.06$, $d = 0.65$). Expressive writing was not more effective than factual writing or no writing in increasing satisfaction with life (Sayer et al., 2015). Tenhula and colleagues (2014) observed statistically significant improvement on scores on the resilience scale after the 4-session problem-solving training.

In sum, only one study that was implemented in a military context reported on variables in the psychological health domain. The other four interventions were unable to engage this target or observed small effects.

3.5. Effect on Interpersonal Relationships

Six studies assessed outcomes in the interpersonal relationship domain.

Interventions Delivered in the Military Context

Blevins and colleagues (2011) showed that participants in the ACT group reported greater increases in relationship satisfaction compared to the delayed intervention control group. Relationship satisfaction improvements were one of only two significant between group differences (the other being depression). Levels of interpersonal conflict showed almost no change. The participants who attended the DTC (Air Force Deployment Transition Center; (Schneider et al., 2016), relative to the weighted control group, reported lower relationship conflict following deployment (9.5% in the DTC group and 17.4% in the weighted control group). In line with the mental health findings of this program, there were no differences in marital satisfaction based on the type of reintegration strategy (front-loaded versus standard reintegration; Sipos et al., 2014).

Interventions Delivered outside of the Military

The increase in perceived availability of social support was one of the larger effects of the civic service program for participants ($d = -0.25$; Matthieu et al., 2017). Veterans who participated in the Moving Forward problem-solving program evidenced learning in social problem-solving skills. The improvement placed the veterans' average scores in the "average" range of skill level for their age cohort (Tenhula et al., 2014). Again, consistent with the previous domains, expressive writing findings were mixed. The intervention was not more effective than factual writing in increasing perceived social support. It was, however, more effective than no writing in increasing levels of perceived social support (Sayer et al., 2015).

In sum, 4 of the 6 studies reported clear improvements in the interpersonal domain. While the variables differed slightly, the results indicate that interpersonal relationships may be an amenable treatment target and could be among the initial treatment benefits conferred to participants.

3.6. Intervention Acceptability

Only one study assessed intervention acceptability.

Interventions Delivered in the Military Context

The acceptability of the Battlemind Training program was evaluated in terms of the program utility, goals, and atmosphere (Castro et al., 2012). At the end of the training, 80.1% of soldiers agreed or strongly agreed that “Training made clear that deployment reactions and emotions were normal.” Much of the program objectives listed on the measure were related to being able to identify other soldiers in need and to understanding how to access available resources. For example, 67.4% of participants agreed that they learned specific actions to take when transitioning home and 61.4% reported learning useful things about transitioning home.

Participants’ perceptions of the intervention can guide future treatment development. Although limited in scope, the data from this trial suggest that veterans could benefit from educational resources.

3.7. Adherence to Intervention

Interventions Delivered in the Military Context

These interventions were mandatory and thus attendance was not reported.

Interventions Delivered outside of the Military

Sayer and colleagues (2015) provided data on the number of sessions completed for the expressive writing intervention. The intervention was comprised of four writing sessions: expressive writers completed an average of 2.54 sessions ($SD = 1.63$) while factual writers completed an average of 2.84 sessions ($SD = 1.55$). Tenhula and colleagues (2014) found that, of the 349 OEF/OIF/OND veterans, 270 completed the four sessions- resulting in a completion rate of about 77% (Tenhula et al., 2014).

The small amount of data hinders the ability to make any generalizable conclusions. However, the available data suggest that veterans may be willing to engage and comply with a postdeployment intervention.

4. Discussion

There is a large infrastructure in place to support veterans' mental health needs. However, a sizable portion of veterans still experience reintegration difficulties (Sayer et al., 2014, 2010; Taylor et al., 2011). There are a number of potential explanations that may account for this gap. For example, there are many barriers to care, such as the stigma associated with seeking help, practical obstacles to actually receiving such help (e.g., lack of financial resources or transportation), and soldiers' perceptions of mental illness as a problem that can be handled without intervention (Hoge et al., 2004; Zinzow, Britt, McFadden, Burnette, & Gillispie, 2012). Alternatively, the difficulties associated with the transition period may be the result of a deficit in existent interventions.

This study sought to evaluate the effectiveness of psychological interventions designed to facilitate reintegration. A systematic review of 17 years of research reveals

several important findings. First, there is a surprising paucity of intervention evaluation research in the reintegration domain. An extensive search of the literature yielded only 8 studies that aimed to test the effects of an intervention on psychological reintegration difficulties. It may be that such interventions are developed by those in the community and thus, not readily published in academic research. Furthermore, we excluded interventions which were designed specifically to target a mental health disorder (e.g., PTSD). This was in an effort to include those veterans who are having difficulties but may not meet criteria for a mental health diagnosis. It could be that research is not representative of this group as they may not feel they are at a threshold at which it is necessary to seek help. Finally, it is important to note that there are likely existent empirically supported treatments which would result in an improvement in reintegration difficulties. However, these interventions are not reaching the target demographic and as such, treatment dissemination may be an ideal route for future reintegration research.

Second, the quality of extant research leaves room for improvement. Specifically, the gold standard research design for evaluating health interventions, a randomized controlled trial (RCT), was employed in only one of the studies in this review. We had considered using the Cochrane Risk of Bias Assessment Tool (Higgins et al., 2011) to rate quality and rigor of studies, but realized that it was inappropriate given the lack of RCTs. We did note that studies generally omitted other methodological features that help to remove bias from the estimates of intervention effects (e.g., blinding, appropriate handling of missing data in analyses), and there was a general lack of data on adherence to the interventions. Finally, while the studies included in this review were specifically

designed to target the reintegration difficulties, there are few psychometrically-sound measures of this construct and as a result, the interventions only assessed a limited number of symptoms important to successful reintegration. These findings, collectively, suggest that any interpretations we make with respect to the effects of certain interventions should be interpreted with caution.

Third, interventions ranged in terms of intensity and focus (e.g., ACT, problem-solving, expressive writing). Of the 8 interventions included in this review, several showed promise as they demonstrated initial effects on several aspects of reintegration. For instance, the ACT workshop (Blevins et al., 2011) was effective in reducing depression, PTSD symptoms, and in increasing relationship satisfaction. The civic service program (Matthieu et al., 2017) improved depression, PTSD, and perceived availability of social support with smaller effects on increasing life's purpose and meaning as well as self-efficacy. The Moving Forward Problem-solving program also resulted in a reduction in depression and distress with improvements in social problem-solving skills (Tenhula et al., 2014). Finally, the Battlemind training (Castro et al., 2012) showed effects with depression and PTSD as well as greater life satisfaction. Most other studies showed effects, but they were generally smaller.

Fourth, considering the content of interventions that showed promise, it appears that facilitating reintegration may require the teaching of specific skills (e.g., moving toward value-based living or implementing problem-solving techniques) which help the veteran engage in a more proactive approach toward life. Indeed, interventions which helped veterans move forward in civilian life (either through becoming active in their

community or learning how to modify learned military skills to achieve new goals) appeared to be effective in comparison to interventions focused on education and providing resources. Through teaching concrete behavioral skills, current reintegration interventions appeared to improve depressive symptoms and variables associated with positive interpersonal relationships.

We hope that our findings may provide some directions for future research. We join the authors of many of the studies included in this review by recommending that interventions that have shown initial effects are studied using a more rigorous methodological approach. While we recognize that an RCT may not be feasible in the military context, this design can be employed in many community settings. Researchers may also consider tailoring the timing of the interventions relative to discharge. Previous work has shown that, despite initial screening efforts immediately following deployment, there is an emergence of mental health difficulties within months of returning home (Milliken, Auchterlonie, & Hoge, 2007; Thomas et al., 2010). Providing access to effective interventions within the first year of discharge from the military may help to mitigate mental health symptoms as they arise. With respect to intervention strategies, it may be fruitful to adopt other behavioral interventions that have been shown to be effective for mental health care specifically for veterans needing help with reintegration. For example, behavioral activation, which increases activation and engagement with meaningful activities, has been shown to be as effective as antidepressant medication for depressed individuals (Dimidjian et al., 2006; Hopko, Lejuez, Ruggiero, & Eifert, 2003) and may therefore emerge as a useful intervention for this specific application. Finally,

the study of reintegration in general and certainly on interventions aimed at facilitating reintegration would benefit from conformity with respect to outcome measures. As recent work has focused on how to best conceptualize and define reintegration (Elnitsky, Blevins, et al., 2017), hopefully research on assessment strategies will follow, which will help to aid in this effort.

Overall, the findings of this systematic review suggest that the research focusing on the evaluation of interventions aimed at facilitating reintegration is limited in scope and quality. Though still at the earliest stages, the available data suggest that interventions that focus on providing goal-directed behavioral tools may improve certain aspects important to the reintegration process, such as depressive symptoms and social support. This review suggests that additional research in this domain seeking to build upon this initial promising work is crucial. Indeed, making available effective interventions for the transitioning veteran has the potential to prevent veterans from developing a mental health disorder and requiring VA care.

CHAPTER 3. STUDY RATIONALE

1. Introduction

Since 9/11, there has been an increase in literature examining the reintegration period, or the period in which veterans transition from military to civilian life. A brief scan of the literature on this topic will yield a variety of terms. Elnitsky and colleagues (2017) conducted a review of the reintegration literature and found that reintegration is the most frequented term for separation from the military or return from deployment. However, it has been used inconsistently to describe a number of dimensions (e.g., psychological health, physical health, employment, education, legal). The construct can refer to physical rehabilitation, use of employment programs, readiness to redeploy, or healthy functioning in community life (for review see Elnitsky, Fisher, & Blevins, 2017). Community reintegration, which broadly refers to the level of functioning and role resumption within the veteran (Sayer et al., 2011), warrants attention as the construct is relevant to all veterans, not just those who are injured. Sayer and colleagues (2011) identified the following domains as relevant to community reintegration: (1) interpersonal relationships with family, friends, and peers, (2) productivity at work, school, or home, (3) community participation, (4) self-care, (5) leisure, and (6) perceived meaning in life. In this study, we will focus on the construct of reintegration with an emphasis on the psychological processes affecting a veteran's functioning both internally as well as within the community.

Most research focusing on reintegration has been descriptive with the intent to document the prevalence and correlates of reintegration difficulties. Yet, only a small

body of research has been dedicated to establishing interventions which may work to improve these difficulties. In a recent review of the intervention literature, our group identified 8 interventions aimed at facilitating reintegration for post-9/11 veterans (Baird, Conroy, & Smits, under review). Included interventions emphasized components of well-established protocols for psychological disorders (e.g., Acceptance and Commitment Therapy, Problem-Solving Therapy) or military-mandated training initiatives. However, of these interventions, only one (Sayer et al., 2015) was evaluated using a randomized controlled trial (RCT) design, the gold standard for examining efficacy and effectiveness. Though limited by the quantity and quality of the studies, cumulative evidence suggests that depressive symptoms and interpersonal relationship difficulties may be amendable domains of reintegration. Also, interventions which teach veterans goal-directed behavioral tools (e.g., problem-solving techniques or participation in value-based activities) appear to show promise.

Aiding this effort to develop interventions that facilitate reintegration, we developed a program that integrates an existing community-based program with a vigorous-intensity exercise prescription. In this chapter, we will (1) describe the objectives and structure of the community-based program and (2) provide the rationale for adding a vigorous-intensity prescription.

2. Team Red, White, and Blue

Originating in 2010, Team Red White and Blue (RWB) is a non-profit organization that aims to enrich the lives of veterans by enhancing their connection to their community through physical and social activity. The organization's ethos is based

on six principles: (1) passion – caring and working harder, (2) commitment – dedication to each other and the community, (3) people – veterans and community driving action, (4) camaraderie – improving lives through genuine, personal relationships, (5) positivity – not ignoring challenges but staying positive and attacking them, and (6) community – building a community at every level. Team RWB encourages both veterans and civilians to join regardless of connection to the military. Once an individual has joined the organization, chapter leadership encourages the veteran to participate in various recurring events. For example, a Team RWB member may start attending a Monday night run/walk or a Sunday brunch with fellow members. At such activities, Team RWB leaders are encouraged to get to know each veteran and to help to welcome all new members to the group. Leaders will also utilize various social media platforms (e.g., Facebook) to share a picture of the activity with the purpose being to facilitate participation among new members.

Team RWB started as a running group where veterans and civilians would meet to exercise together. Over the last decade or so, it has evolved to include a variety of different types of exercise (e.g., running, CrossFit, biking, yoga). Regardless, each veteran is out in the community forging new social relationships and networks. Additionally, the organization also includes a number of activities outside of exercise which may facilitate social connection. Such events could be purely social in nature (e.g., happy hour or bowling) or volunteer or outreach events. The type of activity can take various forms including introducing veterans to new social connections, promoting civic

engagement and other forms of volunteering, and increasing interactions between generations.

The focus on physical and social activity as vehicles for aiding the transition from military to civilian life is grounded in empirical research. Specifically, the mental health benefits of physical activity are well documented. Aerobic exercise has been extensively studied as an intervention for mental health disorders over the last several decades. Much of the initial research focused on the relation between exercise and depression. The literature supports the use of exercise as a treatment alternative or adjunct for depression, with effect sizes rivaling those of other established interventions (Kvam, Kleppe, Nordhus, & Hovland, 2016; Schuch et al., 2018; Stathopoulou, Powers, Berry, Smits, & Otto, 2006). Later research examined the effect of exercise on anxiety and documented that exercise can also lead to reductions in anxiety and related symptoms (Asmundson, Fetzner, DeBoer, Powers, Otto, & Smits, 2013; Guskowska, 2004; Jayakody, Gunadasa, & Hosker, 2014). There is also evidence to suggest that exercise may function as a preventive intervention for the development of mood or anxiety disorders (De Moor, Beem, Stubbe, Boomsma, & De Geus, 2006; Schuch et al., 2018).

There are multiple plausible mechanisms of action of the antidepressant and anxiolytic effects of exercise. Like behavioral activation (Dimidjian et al., 2006; Hopko, Lejuez, Ruggiero, & Eifert, 2003), exercise can target withdrawal and avoidance which maintain depressive and anxious symptoms (Brosse, Sheets, Lett, & Blumenthal, 2002; Martinsen, 2008) and are central to difficulties with community reintegration (Sayer et al., 2011). By participating in physical activity, veterans also can increase their coping

self-efficacy or confidence about their ability to control a stressful situation and regulate their response (Craft, 2005), which in turn enhances their well-being (Burke and Utley, 2013). Other potential mechanisms of the effects of physical activity for decreasing reintegration difficulties include distraction, cognitive dissonance, and increased social interaction (Brosse et al., 2002; Guskowska, 2004; Paluska & Schwenk, 2000).

Encouraging social activity (outside of group-based physical activity) with civilians as a target for facilitating reintegration is an effort central to team RWB that aims to directly address the growing divide between military and civilian culture (Doyle & Peterson, 2005; Elliott, Gonzalez, & Larsen, 2011; Osborne, 2014). Many returning service members report feeling as if they do not belong in civilian society and that they are “outsiders” or “aliens” in this world (Bowling & Sherman, 2008). They also report difficulties connecting to or confiding in others (Sayer et al., 2010). As much as 84% of post-9/11 veterans report that the public does not understand the problems faced by those in the military or by their families (Taylor et al., 2011). Veterans also report missing the structure and camaraderie of the military (Bowling & Sherman, 2008). By engaging with others, including civilians in the community, veterans may experience greater social connectedness, which is a process associated with many benefits, all relevant to effective reintegration. For example, connections with friends and neighbors, workplace relationships, and civic engagement are all independently related to happiness and life satisfaction as are high levels of social trust, or the belief that others in your community can be trusted (Helliwell & Putnam, 2004). Similarly, social connectedness increases a person’s sense of “mattering” and belonging to a group, leading to a sense of personal

worth and an ability to handle adversity in an adaptive manner (Centers for Disease Control and Prevention [CDC], 2012). In fact, social connectedness has shown to serve as a buffer for adversity in life and is related to lower risk of suicidal behavior (Donald, Dower, Correa-Velez, & Jones, 2006). Extending this research, Duberstein and colleagues showed that the lack of social interaction confers risk of suicide even above the effects of mood disorders and occupational status (Duberstein et al., 2004), and Rubenowitz and colleagues found that hobbies and active engagement in organizations can serve as protective factors for suicide (Rubenowitz, Waern, Wilhelmson, & Allebeck, 2001). Related to the military, it has been shown that youth and parents who evidence social connectedness with peers and their neighborhood adjust better to the challenges associated with being in a military family. Specifically, families who experience greater connectedness were better equipped to deal with the potential adverse effects resulting from a move, parental deployment, and other rapid life change (Mmari, Bradshaw, Sudhinaraset, & Blum, 2010). Aside from facilitating resilience and overall life satisfaction (Pietrzak & Cook, 2013), encouraging social activity with civilians may help the veteran gain access to other important resources for prevention or intervention or organizations or groups that can help them with unmet needs (e.g., education, employment; Centers for Disease Control and Prevention, 2012).

There are several additional characteristics of Team RWB and its organization that promote the appeal of a Team RWB prescription for tackling reintegration difficulties among veterans early on in the transition process. First, Team RWB already has 204 chapters across the country and over 130,000 members, suggesting that a Team

RWB prescription during the standard transition assistance program offered to all separating service members can be “filled.” Second, the low cost (i.e., there is no joining fee) and low stigma have the potential to further stimulate uptake. Indeed, financial costs and stigma associated with seeking help are both commonly reported as barriers to care for returning veterans (Zinzow, Britt, McFadden, Burnette, & Gillispie, 2012). Third, attending to integrity (i.e., ensuring that the intervention is delivered as intended), which is particularly challenging for psychological interventions that are rolled out in the community, Team RWB has developed a leadership development program, training individuals to help chapters to be effective in engaging members in (social and physical) activity. As such, Team RWB has formed and maintained an infrastructure in order to help ensure that the organization meet its mission. Collectively, these observations show promise for the reach and effectiveness of Team RWB to complement existing efforts to facilitate reintegration. Findings from brief informal surveys conducted by the organization indicate that involvement in Team RWB may (1) increase connectivity; (2) help bridge the civilian/military divide; and (3) improve well-being and life satisfaction. It is unknown, however, whether a team RWB prescription or referral to veterans who are early in the transition process and endorse difficulties with reintegration (1) is feasible and acceptable (e.g., veteran uptake and regular adherence); and (2) can prevent an increase or ameliorate reintegration difficulties. The current study involves a pilot randomized controlled trial to gathering initial data on feasibility, accessibility and effectiveness.

3. Integrating Team RWB with a Vigorous-Intensity Exercise Prescription

It is important to note that Team RWB members are encouraged to take exercise at their own pace. The focus of the organization is on inclusion and attendance – not on ensuring that specific exercise guidelines are met. This may be a strength as it helps to draw veterans and reduce anxiety around engagement. However, as a result, many participating veterans may not be receiving the full benefits of physical activity participation. Because Team RWB promotes and provides the infrastructure for supporting programmed physical activity, integrating an additional specific exercise prescription is likely feasible.

Several observations led us to decide on prescribing vigorous-intensity aerobic exercise over moderate-intensity aerobic exercise or resistance training for targeting reintegration difficulties. First, the majority of studies testing the mental health effects of exercise have focused on aerobic as opposed to resistance training. Resistance training has acquired some interest over the last decade. While some of the studies do show promise, the limited number and quality of the trials leaves room for improvement (for review see O'Connor, Herring, & Carvalho, 2010). Conversely, the benefits of aerobic exercise are well established. There are many forms of aerobic exercise and, as a result, most well-conducted studies specify the training intensity of the prescribed exercise, sometimes allowing the activity (e.g., treadmill running, stationary bike) to vary depending on preference. Percentage of maximal heart rate (HR_{max} ; $220 - \text{age}$; American College of Sports Medicine, 2013) is commonly used to prescribe training intensity, with $55 < 70\%$ and $70 < 90\%$ as ranges for moderate-intensity and vigorous-intensity exercise,

respectively (Norton, Norton, & Sadgrove, 2010). A substantial body of work suggests that vigorous-intensity aerobic exercise is associated with increases in well-being, reductions in anxiety and depression, and improvements in overall quality of life in comparison to a moderate-intensity exercise regimen (Chu, Buckworth, Kirby, & Emery, 2009; Cox, Thomas, Hinton, Donahue, 2006; Gerber, Brand, Herrmann, Colledge, Holsboer-Trachsler, & Pühse, 2014; Ostman, Jewiss, & Smart, 2017). Heinrich and colleagues (2014) evaluated the effects of a high-intensity functional training (HIFT) program combining aerobic exercise with bouts of resistance training. Participants who engaged in the high-intensity workouts were able to spend less time exercising per week while also maintaining exercise enjoyment and engagement (Heinrich, Patel, O'Neal, & Heinrich, 2014). Overall, this work highlights the efficacy of vigorous-intensity exercise, justifying focusing on that intensity for the current clinical application.

Second, vigorous-intensity exercise is a routine part of life in the military and may align closely with veteran preferences. Each service branch mandates physical fitness standards for active service members (Littman, Jacobson, Boyko, & Smith, 2015). To this end, active military participate in weekly vigorous-intensity exercise training including running and climbing (Littman, Forsberg, & Koepsell, 2009). Notably, once discharged, physical activity tends to decline and many veterans experience a corresponding decrease in fitness and other indices of well-being (Buis, Kotagal, Porcari, Rauch, Krein, & Richardson, 2011; Littman, Jacobson, Boyko, Powell, & Smith, 2013; Washington et al., 2016). In a large sample of U.S. military personnel, Littman and colleagues (2015) showed that only about half of newly-transitioned veterans met guidelines for either

moderate- or vigorous-intensity exercise. The authors cite losing access to free exercise facilities, lack of structured time to exercise, or missing social support as potential explanations (Littman et al., 2015). Overall, little is known about the correlates of physical activity among veterans (Hoerster, Millstein, Hall, Gray, Reiber, Nelson, & Saelens, 2015); however, there is sufficient work to indicate that exercise preference and acceptability are important variables to consider when prescribing exercise (Ekkekakis, 2009; Williams, 2008). This may be especially true for the veteran population—many veterans are resistant to help-seeking or intervention (Hoge et al., 2004). Research shows that veterans prefer high-intensity exercise to other forms of physical activity (Haddock, Poston, Heinrich, Jahnke, & Kitnarin, 2016). Importantly, vigorous-intensity exercise parallels much of the activity done while in the military (Haddock et al., 2016), thus enabling veterans to feel connected to the military and previous episodes of regular exercise and comradery. Reintroducing exercise among veterans with acquired disability or psychological trauma appears to increase well-being, greater quality of life, and reduced PTSD symptomology, likely by, among other change mechanisms, improving inner strength, sense of achievement, and motivation for living (Caddick & Smith, 2014). Together, these observations justify selecting vigorous-intensity exercise in order to promote acceptability of an add-on exercise prescription.

In summary, the reintegration period is associated with a general loss of identity and sense of purpose or meaning following separation from military culture (Sayer et al., 2010). An easily-disseminable prescription that connects veterans with other veterans and civilians ensuring a combination of social activity and vigorous-intensity exercise may

facilitate forging a renewed sense of purpose outside of the military, thereby preventing or ameliorating reintegration difficulties.

4. Specific Aims and Hypotheses of the Proposed Study

We aim to test the feasibility, acceptability and effectiveness of a prescription combining vigorous-intensity exercise and community engagement for facilitating reintegration among veterans early in the transition process. The proposed study will consist of an 8-week protocol in which veterans will be randomly assigned to either: (1) 8-weeks of vigorous-intensity aerobic exercise in addition to participation Team RWB (PACE) or (2) 8-weeks of participation in Team RWB alone (TRWB) or (3) 8-weeks on a waitlist (WL). We propose the following aims: to (1) assess, in a randomized clinical trial, the feasibility and acceptability of the PACE program and (2) evaluate the effectiveness of the PACE program on the level of reintegration difficulties. Feasibility and acceptability data will be obtained using an acceptability interview measuring participant satisfaction with the program and also by tracking participant attendance to prescribed activities. The effectiveness of the PACE program on levels of reintegration difficulties will be assessed with the following primary outcome measure: Military to Civilian Questionnaire (M2C-Q; Sayer et al., 2011). We hypothesize that improvement in reintegration difficulties will be evident in the Team RWB group and to a greater degree in the PACE condition (but not in the waitlist condition). Although there are no data available to provide clear guidance on dosing, we recognize that an intervention of longer duration may possibly yield stronger effects. Balancing maximizing effectiveness with maximizing feasibility, we selected an 8-week intervention for this initial unfunded pilot project, acknowledging

that our data will only allow us to make inferences to early effects. The data collected have the potential to lend important insight into the effectiveness of vigorous-intensity exercise and community engagement for veterans during a vulnerable period of the deployment cycle, and as such can establish the foundation for building an accessible, appealing intervention for veterans that would be easily disseminable.

CHAPTER 4. STUDY METHODOLOGY²

1. Study Design

Sixty veterans discharged from the U.S. military were randomly assigned to: 1) Physical Activity and Community Engagement (PACE), which includes vigorous-intensity exercise counseling and monitoring in addition to participation in a community-based program (Team RWB) or (2) 8 participation in Team RWB alone or (3) waitlist. The project was a collaboration between the University of Texas at Austin (UT) and Team RWB. UT Austin conducted all research activities and referred participants to Team RWB activities. The primary outcome – reintegration difficulties – was assessed at baseline, biweekly during the intervention period, and after 8 weeks of the intervention. PACE and Team RWB aim to aid the development of long-term habits and thus are not time-limited. Hence, the current study reported on the early effects of these programs – i.e., during the first 8 weeks and 1-week following 8 weeks of participation.

2. Participants

²Baird, S. O., Metts, C., Conroy, H. E., Rosenfield, D., & Smits, J. A. (2018). Physical Activity and Community Engagement (PACE) to facilitate community reintegration among returning veterans: Study protocol for a randomized controlled trial. *Contemporary Clinical Trials Communications*, *11*, 136-141.

Contribution statement: The first author designed the research, drafted the paper, and revised the paper. The second author revised the paper. The third author revised the paper. The fourth author consulted on statistical plan and revised the paper. The fifth author designed the research, drafted the paper, and revised the paper.

Participants were 60 veterans who completed the discharge process within the last 5 years. Participants were veterans of the OEF/OIF/Operation New Dawn (OND) conflicts. The participants had to endorse at least moderate difficulty with reintegration. Moderate difficulty was defined using a two-pronged approach: participants must (1) score ≥ 1.5 on the M2C-Q, and (2) also endorse at least a “2” (i.e., “some difficulty”) on item 14 (feeling as if one belongs in civilian society). Other inclusion/exclusion criteria include: (1) Participants must have access to an Apple iPhone. This criterion was required due to the need to use the Apple Watch and the study App (Status/Post). Both components were required for data collection, (2) Participants must have participated in less than 75 minutes of vigorous-intensity exercise per week over the two weeks prior to screening, (3) Participants must be willing and able to comply with an 8-week protocol, (4) Participants must have sufficient command of the English language to use the study’s App and to fill out the study questionnaires, and (5) Participants must not have a condition or injury which would prevent vigorous-intensity exercise. Participants completed the Physical Activity Readiness Questionnaire (PAR-Q) as part of the screening procedure in order to check for any condition/injury which would render exercise harmful. Each participant also had undergone a routine physical with medical staff prior to discharge and thus had knowledge of a condition or injury. If such a risk was present, the participant was excluded from the study. If the participant was unsure of potential risk, medical clearance from a physician was required prior to enrollment.

3. Procedures

The Institutional Review Board of the University of Texas at Austin approved the study.

3.1. Recruitment

Participants were recruited from multiple cities: Austin, Killeen, Dallas/Fort Worth, Bryan, San Antonio, Houston, San Diego, Virginia Beach, and Tacoma. The study used brief text announcements on various online platforms (e.g., Facebook, Reddit, Craigslist). Research staff also attended various veteran community events in order to promote the study and highlight potential benefits.

3.2. Screening

Individuals interested in participating in the study were directed via various recruitment strategies to an Internet prescreen using Research Electronic Data Capture (REDCap). Each participant was required to read through an informed consent form and either agree/not agree to provide his/her information prior to beginning the survey. This online prescreen assessed basic eligibility criteria, and individuals who appeared potentially eligible were further assessed via a telephone prescreen. The prescreen procedure was the first point of contact for participants, and it allowed us to assess the potential participant's willingness and ability to commit to the intervention as well as ensure the assessment of inclusion/exclusion criteria. If eligible following the phone screen, participants were invited to schedule a baseline assessment.

3.3. Baseline/Enrollment

For individuals able to commute to the study site, the visit took place on campus at UT Austin. For those who were unable to come to the study site, the visit took place via videoconference (e.g., Facetime). Prior to any assessment, participants received an online informed consent form explaining the details of the study, potential benefits and risks of participation, and the procedures they will undergo if they choose to participate. After reading the informed consent, research staff was available to discuss any issues with the potential participant and to answer any questions he or she may have about the study and participation. If the individual chose to sign the informed consent, he/she then began the baseline visit.

During this visit, research staff first administered the baseline assessment (see Assessment Schedule). Upon completion of the measures, the researcher informed the veteran of the randomization assignment, provided the Apple Watch and instructions, and provided compensation (\$20). If the participant was not in Austin or the Fort Hood/Killeen area, the watch was shipped and the session took place via video conference once the watch was received.

Each participant was provided with an Apple Watch to wear for the duration of the study. Participants were asked to sign a contract indicating that they were aware that the equipment belongs to UT. However, should the participant complete the follow up and at least two of the additional biweekly surveys, he/she would be given the watch. Research staff used the Apple Watch to monitor the participant's activity level. In addition, each participant was sent a brief automated survey via REDCap each day which took no more than 1-2 minutes to complete using the Status/Post app installed on their

Apple iPhone for the purpose of the study. The survey asked whether the participant has completed exercise that day, and if so, it asks to enter the type of exercise, number of minutes exercised, average heart rate, and perceived exertion.

3.4. Intervention Modules

Team RWB

Participants assigned to the Team RWB arm were prescribed 1 Team RWB event per week for the 8-week duration of the study. Participants were guided through the process of joining Team RWB. Research staff had the participant “Join the Team” on the organization’s site: <https://www.teamrwb.org/join/>. Research staff then connected the participant via email to the correct chapter representative based on which chapter the participant expresses interest in. In this way, research staff ensured that the participant was connected with the organization in a timely manner. Participants received a monthly calendar of Team RWB events upon assignment. They were asked to attend at least one Team RWB event. This could have been a weekly running group, social event, or community service project, among other activities. We did not discourage the use of exercise in this arm in order to optimize the ecological validity of the program.

Participants assigned to this condition also entered whether or not they attended a Team RWB event on the daily automated REDCap surveys. Participants were asked to not initiate an exercise program outside of the context of Team RWB for the duration of the study. However, if they did become involved in another fitness program, we asked that they report this to study staff. The staff would then save this information as a note to file and these data would be reported in the outcome report. In order to be able to

evaluate the effects of Team RWB as it is administered, research staff did not provide any guidance to participants or participate in trouble-shooting non-adherence.

Study staff scheduled a total of four online surveys to be distributed via REDCap every two weeks. The surveys took approximately 30 minutes to complete and participants were compensated \$20 per assessment.

PACE

Participants assigned to the integrated arm were prescribed the following for the course of 8 weeks: 1 session of exercise counseling, 3 weekly 25-minute sessions of vigorous-intensity aerobic exercise, and 1 weekly Team RWB event.

Research staff (SOB) completed a session of exercise counseling with the participant during the baseline visit and an exercise prescription form was provided to the participant once completed. The overall aim of the session was to set a predetermined goal of activities and to troubleshoot any barriers to activity. At this time, the participant also indicated an exercise preference. Exercise was limited to running, cycling, rowing, or elliptical workouts. By allowing participants to choose their preferred mode of exercise, we were able to tailor the intervention to the individual and likely increase exercise adherence as a result.

Following the exercise counseling session, participants were given a prescription form to remind them of their target heart rate during exercise sessions, exercise preference, and a schedule of planned exercise. The form also listed the goals that the participant identified during the exercise counseling session to serve as motivational reminders. Research staff then tracked the type of exercise the participant was completing (via the

daily REDCap surveys) and sent reminders if the participant failed to complete the weekly dose of exercise.

In accordance with the Centers for Disease Control and Prevention [CDC] guidelines, the exercise prescription was 3 separate 25-minute sessions of vigorous-intensity aerobic exercise (running, cycling, rowing, or elliptical workouts) per week (for a minimum of 75 minutes). In order to ensure that participants were completing the prescribed dose of vigorous-intensity aerobic exercise, participants were instructed to wear the Apple Watch during waking hours and activate the exercise app during exercise. Data collected included the number of minutes exercised as well as the heart rate level (77-85% maximum heart rate). Any exercise session of 25 minutes at an average $> 76\%$ of maximum heart rate was characterized as 1 completed session of vigorous intensity aerobic exercise. Furthermore, participants were asked to enter the type of activity, number of minutes exercised, average heart rate, and perceived exertion into the exercise log on REDCap through the brief automated survey sent daily.

Participants then completed the same procedure for joining Team RWB as participants in the Team RWB arm. Participants were told that they could complete (part of) the weekly exercise prescription during Team RWB activities as long as the exercise activity meets the criterion of at least 25 minutes of vigorous-intensity exercise. They entered attendance at Team RWB events on the daily REDCap surveys. If the participant has missed the set exercise goal, staff will follow-up with a text message or email to check in with the participant. If needed, staff scheduled a phone call to enhance motivation and troubleshoot barriers. Staff also provided feedback at the end of each

week in the form of a text or email for participants, in this condition only. The content informed the participant of progress toward his/her goal and provided encouragement as needed.

Waitlist

Participants assigned to the waitlist arm received no study intervention and only completed the scheduled assessments. Participants were asked to not initiate a new exercise program for the duration of the study. However, if they did become involved in a fitness program or attend a chapter event, we asked that they report this to study staff (i.e., on the automated surveys). The staff would then save this information as a note to file and these data would be reported in the outcome report. After completion of the follow-up assessment, participants in the waitlist arm were guided through the process of joining Team RWB.

3.5. Follow-Up Period

Participants were asked to complete a final assessment on REDCap one week following study completion (i.e., week 9), which served as the major endpoint for initial efficacy. Participants who met the survey requirements (i.e., follow up and at least 2 of the biweekly assessments) were able to keep the Apple watch. Those who did not were asked to return the Apple Watch within two weeks of the week 9 follow-up.

3.6. Randomization

The principal investigator (SOB) oversaw the randomization. Randomization was stratified by military rank (i.e., officer or enlisted status). Variable-sized permuted block

randomization were completed using Sealed Envelope to assign individuals to treatment condition (Sealed Envelope Ltd. 2017).

3.7. Assessments

All assessments were delivered to participants using Status/Post, a mobile application developed for iOS devices, which participants downloaded from the Apple App Store. Upon downloading the app, users entered their assigned username and password to gain access to our study in the app. Upon app initialization, the participant was prompted to give permission for the app to send notifications and collect heart rate data. After permission was given, the app would notify the participant of surveys needing completion at scheduled times and begin collecting heart rate data that the participant's Apple Watch has deposited in Apple's Health app.

All iOS apps are "sandboxed," meaning the other apps cannot gather data collected by the study app, and likewise, the study app cannot gather data from other apps. All data on the iPhone was encrypted, and collected data was not available to users of the iPhone. Collected data was sent to REDCap using the provided API, and this data transmission was encrypted with SSL. UT's REDCap installation provided HIPAA compliance for data stored in REDCap. Additional biweekly assessments were also sent via the application. If the participant did not complete the necessary number of assessments, he/she was instructed to reset the watch and restore to factory settings upon returning the equipment. In this way, researchers did not have access to any of the participant's data following the study.

The Apple Watch was shipped to participants who were unable to come to the lab for the baseline assessment, and a call was scheduled to ensure that they were given the same set up instructions. Participants then received information regarding study assignment and were asked to download the study application (Status/Post) in order to be able to complete assessments over the course of the study.

Screening and Baseline

Demographics. Participants were asked to provide standard demographic information (age, gender, race/ethnicity, level of education, marital status). We also assessed for participants' rank at the time of discharge, branch of service, discharge date, and number of deployments. Demographics were assessed during the prescreen and at the baseline assessment.

Physical Activity Readiness Questionnaire (PAR-Q; Thomas, Reading, & Shephard, 1992). This measure was used to assess the safety and potential risk of exercise. It asks about the individual's history, current symptoms, and risk factors. This measure has been adapted and is part of the American College of Sports Medicine (ACSM)'s guidelines for exercise testing.

Military to Civilian Questionnaire (M2C-Q). The measure is a 16-item self-report measure of post-deployment community reintegration difficulty. Participants rate each item on a 5-point Likert scale with the following responses: "0=No difficulty", "1= A little difficulty", "2= Some difficulty", "3= A lot of difficulty", and "4= Extreme difficulty". Scores on each item are then averaged for a total score. Item 14 asks the main target for the intervention (i.e., belonging in civilian society; Sayer et al., 2011). The

measure demonstrates high internal consistency (Cronbach's $\alpha = .95$). We chose a cut off of 1.5 in combination with a "2" on item 14 as a measure of moderate difficulty in adjusting to civilian life.

Primary Outcome

The primary outcome measure was the level of reintegration difficulties as evidenced on M2C-Q.

Vigorous-Intensity Exercise Adherence Prescription Integrity

Vigorous-Intensity Exercise Adherence. Participant adherence in the integrated study arm was assessed with the daily REDCap surveys and with the Apple Watch heart rate data. All participants were asked to enter the type of exercise and number of minutes exercised, transcribe the average heart rate for the exercise bout from the Apple Watch, and then enter their perceived exertion into the daily REDCap exercise adherence survey. For the individuals in the PACE condition who failed to complete the prescribed weekly dose, brief reminder texts were sent by the research staff. The texts were designed to: (1) foster motivation and impetus for behavioral change, and (2) troubleshoot potential barriers to physical activity.

Heart rate was monitored with the Apple Watch. Participants were asked to wear the Apple Watch for each session of exercise. The watch monitored the level of heart rate and provided the average heart rate for the session. Participants were asked to enter this information on the daily REDCap survey. In addition, Status/Post pulled the heart rate data from HealthKit on the Apple Watch and mobile device, allowing us to verify

transcribed data. A participant met the weekly prescription if they evidenced at least 75 minutes of at least 77% of maximum heart rate.

Team RWB Prescription Integrity

Participant adherence was assessed using the daily REDCap adherence surveys.

Acceptability

Acceptability Interview. This measure assessed participants' perceptions of the PACE program in terms of likelihood of future engagement, program likeability, and perceived benefits of the intervention (e.g., "Some people feel like other things going on in their lives have impacted their experience in this program. What, if any, things in your life outside of the program impacted your experience?" or "What did you like or find helpful about the PACE program; what benefits have you noticed?") The measure was administered at follow-up online via REDCap.

4. Data Analysis

As the project was designed to be a proof-of-concept, the primary aim was to gather information about acceptability as well as initial effect sizes of the PACE program. In this way, the data could help to guide treatment development and inform future efficacy studies. In order to examine the acceptability of the PACE program, we reported on intervention adherence (e.g., vigorous-intensity exercise adherence, Team RWB attendance) as well as items from the acceptability interview.

We initially examined baseline differences between groups on various demographic and the outcome variable (e.g., military rank, gender, reintegration difficulties) to ensure that there were no prior differences between groups. Any variables

on which the groups differed were to be used as covariates in subsequent analyses. A linear mixed effects model of group, time, and their interaction was used to test the hypothesis that PACE would be associated with better M2CQ outcomes compared to RWB and WL, with random intercepts to account for individual differences at baseline. The group-by-time interaction tested whether the rate of change across 9 weeks was significantly different between groups. A second model followed the same procedure with the addition of exercise minutes as a moderating variable. The group-by-time-by-exercise interaction tested whether the effect of group across time was dependent on the level of exercise. Significant interactions in these models were followed up with pairwise contrasts to examine group differences in reintegration change and at week 9. Between-group effect sizes (Cohen's d) were estimated using Feingold's (2013) adaptation of Cohen's d to mixed effects models. All analyses were conducted in R with the lme4 package.

4.1. Power Analyses

The primary objective during this developmental phase was to estimate the effect size of the PACE program. Thus, we recognize that the study is not powered to detect small statistical differences between the three groups. A post hoc power analysis (power=0.8, $\alpha=.05$) indicated that the final model, with the sample size of 60 participants, allowed us to detect a significant medium effect size of $f^2=.25$ for the between by within subject interaction test of the primary hypothesis.

CHAPTER 5. RESULTS

1. Sample Characteristics

Table 3 presents demographic characteristics, military status, and study entry scores for the primary outcome measure (M2C-Q). Randomization was balanced across groups: PACE ($n=20$), RWB ($n=20$), and WL ($n=20$). Because 1 participant (assigned to RWB) was in the National Guard and therefore not fully separated from the military, 59 participants were included in the final set of analyses. The mean age for participants was 35.15 ($SD = 7.62$). Self-identified ethnic/racial breakdown was: 62.7% ($n = 37$) White, 28.8% ($n = 17$) Black or African-American, 1.7% ($n = 1$) Asian, 1.7% ($n = 1$) Native Hawaiian or Pacific Islander, and 5.1% ($n = 3$) Other, with 32.2% ($n = 19$) reporting Hispanic ethnicity. Roughly half of the sample was married (47.5%, $n = 28$), while 23.7% ($n = 14$) reported being divorced and 8.5% ($n = 5$) was single. Almost half of the sample (47.5%; $n = 28$) attended some college and an additional 28.8% ($n = 17$) graduated college. A third of the sample was employed full-time (33.9%, $n = 20$) and 27.1% ($n = 16$) reported being either dependent on a spouse or being a student. Most participants were enlisted (94.9%, $n = 56$) with only 5.1% ($n = 3$) ranked as officers. The branch of service breakdown was: 76.3% ($n = 45$) Army, 8.5% ($n = 5$) Air Force, 8.5% ($n = 5$) Marine Corps, 5.1% ($n = 3$) Navy, and 1.7% ($n = 1$) National Guard. The sample was predominantly discharged between 2015 and 2018: 2015 (15.3%, $n = 9$), 2016 (22.0%, $n = 13$), 2017 (27.1%, $n = 16$), and 2018 (22.0%, $n = 13$). The mean M2C-Q score for the total sample at baseline was 2.17 ($SD = 0.72$), indicating we successfully enrolled the target demographic (i.e., those reporting at least moderate difficulty with reintegration).

There were no between-group differences on any of the demographic variables or the entry M2C-Q score.

2. Treatment Integrity

Table 4 reports on the variables that are relevant for making inferences with respect to the integrity of the prescriptions. Two participants (1 assigned to RWB and 1 assigned to WL) reported all continuous activity (e.g., walking throughout the day), resulting in an overestimation of self-reported exercise minutes. Hence, we excluded their data from the treatment integrity analyses focusing on exercise and subsequent analyses relating the changes in the outcome to self-reported exercise. Participants assigned to the PACE condition reported 784.45 ($SD = 463.53$) total minutes of exercise at an average of 77.45% ($SD = 6.28$) of the age-predicted maximum heart rate (HR_{max}) over the course of the 8-week intervention. Exercise participation was highly variable across weeks within and between PACE participants. Indeed, despite the high total minutes of exercise, the PACE condition adhered to the study exercise prescription (75 minutes of vigorous-intensity exercise per week) only for an average of 2.90 ($SD = 2.81$) weeks (i.e., 36% [2.90/8.00] adherence rate). Participants in this condition attended 2.45 ($SD = 3.56$) TRWB events over the course of the intervention period and adhered to the RWB prescription (1 event per week) for an average of 2.05 ($SD = 2.74$) weeks (i.e., 31% [2.45/8.00] adherence rate).

Participants assigned to the TRWB condition reported 389.72 ($SD = 399.62$) total minutes of exercise at an average of 66.35% ($SD = 14.83$) of the HR_{max} over the course of the 8-week intervention. Participants in this condition attended 3.17 ($SD = 3.19$) TRWB

events over the course of the intervention and adhered to the study prescription (1 TRWB event per week) for an average of 2.67 ($SD = 2.43$) weeks (i.e., 33% [2.67/8.00] adherence rate).

Finally, participants in the WL condition reported 179.47 ($SD = 477.51$) total minutes of exercise at an average of 59.99% ($SD = 10.86$) of the HR_{max} . Consistent with the prescription, participants in the PACE condition reported significantly more minutes of vigorous-intensity exercise relative to the RWB condition ($p = .0057$) and the WL condition ($p < .001$), respectively. The PACE and TRWB conditions did not differ significantly with respect to the mean number of TRWB events attended.

Participants received daily surveys that asked them to enter exercise and TRWB data. This involved transcribing HR data from the Apple Watch. In an effort to verify the integrity of these self-reported exercise data, we examined the continuous HR data collected by the watch, recognizing that this method may be limited by the fact that we could not ensure that participants wore the watch at all times. We computed total vigorous-intensity exercise minutes for the 8-week intervention by totaling the number of minutes that the participant's HR exceeded the 77% of their HR_{max} threshold. Minutes of vigorous-intensity exercise was 142.66 ($SD = 158.79$) for PACE, 27.04 ($SD = 50.28$) for TRWB and 6.25 ($SD = 12.32$) for WL. Based on the watch data, participants in the PACE condition did not evidence significantly more minutes of vigorous- intensity exercise relative to the RWB condition ($p = .073$), but the difference between PACE and WL was significant ($p = .0028$). In addition, participants self-reported exercise minutes were

moderately correlated with the number of minutes collected from the Apple Watch ($R = 0.39, p = .0087$).

Altogether, these data indicate that: (1) TRWB participation was modest in both the PACE and Team TRWB conditions; (2) TRWB participation resulted in an uptake of exercise; (3) The exercise counseling as part of the PACE intervention increased participation in vigorous-intensity exercise as intended, although adherence to the specific prescription of TRWB and vigorous-intensity was modest for the PACE prescription; (4) Apple Watch data collected in this protocol can be used to verify between-group differences in exercise participation.

3. Treatment Acceptability

Aside from adherence to the prescription, a sense of participants perceptions of the acceptability of the PACE intervention is important to treatment development research. Participant responses on the follow-up acceptability survey yielded both quantitative and qualitative data on the acceptability of the PACE intervention ($n = 19$). The following statements were assessed on a 1-10 scale. When asked how much participants liked the PACE program, the average score was an 8.63 (with 10 being indicative of “strongly liking” the program). When asked if they would participate again in the future, the average score was a 9.11 (with 10 being “would absolutely participate again”). We also asked if the time commitment was reasonable and the mean score across participants was 8.47 (with 10 being “very reasonable”). All 19 participants indicated that they would recommend the program to a friend.

Overall, most participants reported that the PACE intervention was beneficial to them. Several of the positive responses are highlighted below:

- My pace rep was great and kept in contact with me which encouraged me to keep going and improve my work out times and goals. I've lasted more than I originally wanted to and I have decided to keep this work out plan. I absolutely love this and I'm grateful to have participated. I feel a lot better and I don't have as much time to sit around feeling sorry for myself. I just make it happen. I lost that somewhat when I left the military.
- It helped create a sense of a safety net and self-accountability. I am social and happy again.
- The exercise has helped with my anxiety and stress level. I still do not like gyms, but I am working towards a healthier life.

There were several negative comments about logistical issues (e.g., application not working, surveys being long and repetitive). There was one negative comment about the exercise specifically:

- Because of the heart rate requirement, I was scared to start weight training because a low heart rate would count against my average.

There were also some issues with feasibility as it related to attending TRWB events.

Several of the negative responses are presented below:

- Only thing I disliked was how no one in my area would respond to emails to attend the Teams RWB. Several times I showed and no one else did, no one was

updating the cancelled events. I never received responses and the one time I did she wasn't very helpful, wasn't apologetic for not showing, or friendly.

- I have an extremely tough time feeling connected in or even getting to social events. This includes veteran lead or focused events like those put on by Team Red White and Blue and similar organizations.
- I didn't attend a RWB meeting. They were limited and I believe it should maybe be open to more groups.

Altogether, the data suggest that the PACE program was liked by the majority of participants. Participants most consistently reported that they liked the accountability aspect of the exercise prescription and several identified that they appreciated the focus that the exercise led them to have on their personal health.

4. Assessment Integrity

Participant flow is depicted in Figure 2. 55 participants completed the study, which was defined as having completed the week 9 follow-up assessment. We had one participant drop approximately halfway through the intervention for unknown reasons. Of the 55 completers, we excluded an additional 3 assessments as the surveys were completed outside of the assigned week. In total, 44 participants (74.6%) completed all 6 of the biweekly assessments within the correct timeframe.

5. Adverse Events

There were no adverse events.

6. Main Outcome Analysis

Results showed a main effect of group, $F(2, 77.2) = 0.66, p = 0.5207$, main effect of time, $F(1, 269.54) = 27, p < .001$, and a group-by-time interaction, $F(2, 269.54) = 9.78, p < .001$. The group-by-time interaction was driven by significant differences in the amount of reduction in M2C-Q scores across condition such that PACE showed a greater decrease compared to WL ($p < .001, d = 0.52$) and RWB showed a greater decrease compared to WL ($p = .002, d = 0.39$). However, the decrease in scores between PACE and RWB was not significant ($p = .308, d = 0.12$). Although there were no significant differences between groups in M2CQ total score at baseline (all p 's > 0.323), by the end of the intervention (week 9), the PACE group showed significantly lower scores relative to WL ($p = .032, d = 0.51$). However, no other differences were significant at week 9 (both p 's > 0.169). All model estimated means and standard errors are reported in Table 5.

In order to test whether the reduction in reintegration difficulties was driven by exercise participation, we reran the analysis with the addition of regular exercise as a moderating variable. There was a significant group x time x exercise interaction, $F(2,256.12) = 7.53, p < .001$, suggesting that the changes between groups across the eight-week intervention depended on the amount of exercise that participants engaged in (see Figure 4). Pairwise contrasts showed that at low levels of regular exercise (Figure 4A), PACE outperformed both conditions, resulting in significantly lower M2C-Q scores at week 9 (PACE - WL = -1.31, $SE = 0.38, p < 0.001$, PACE - RWB = -1.39, $SE = 0.42, p = 0.001$), whereas at the mean and high levels of regular exercises the groups were not

significantly different at week 9 (all p 's > .07). These results suggest that PACE intervention effects (or participation in vigorous-intensity exercise which is what set PACE apart from TRWB and WL) on reintegration difficulties depended on participants' engagement in exercise, with PACE outperforming both conditions, but only at lower levels of regular exercise.

CHAPTER 6. DISCUSSION

1. Summary of Findings

The current study examined whether a novel prescription combining vigorous-intensity exercise and community engagement (PACE) would help to alleviate reintegration difficulties in veterans transitioning out of the military. The aims were twofold; namely, (1) to assess the feasibility and acceptability of the PACE intervention and (2) to measure the effectiveness of the PACE intervention on reintegration difficulties.

Feasibility and Acceptability

Given that the stigma associated with mental health treatment is an important determinant of seeking care for the veteran population (Hoge et al, 2004; Kehle, Polusny, Murdoch, Erbes, Arbisi, Thuras, & Meis, 2010), the PACE program was designed to be low in stigma. It was also crucial that the program be easily implemented within the veteran's everyday life and accordingly, high in ecological validity. As such, examining the feasibility and acceptability of a protocol like this is critical for future dissemination. The PACE prescription involved two components: (1) vigorous-intensity exercise and (2) RWB participation. Overall, veterans were more likely to participate in the exercise component of the intervention. We found that the number of minutes exercised over the course of the eight-week intervention as reported by the veterans exceeded the study prescription by nearly 130%. Interestingly, underscoring variability between and within participants across the eight-week intervention, PACE only met the full exercise dose of the prescription (i.e., 75 minutes per week) for an average of three weeks across the

eight-week intervention. This suggests that one session of exercise counseling may increase initial uptake, but most individuals likely would require more than one session in order to facilitate routine maintenance and ensuring regular weekly vigorous-intensity exercise. Of note, data from the Apple Watch, although correlated with self-report and thus showing that it can be used to verify differences in exercise between participants or groups, indicated lower levels of (vigorous-intensity) exercise than what participants reported on the survey. We detail the possible reasons for this discrepancy in the limitations section.

Participation in TRWB was modest across both conditions as veterans in both groups met the prescribed dose 30-40% of the time. It may be that a portion of this population is skeptical of veteran organizations. There is also a lot of variability among chapters, so it is difficult for us to make a generalizable conclusion. Certain chapters offered a wide range of activities and had active leadership, which appeared to facilitate attendance based on anecdotal evidence from participants. However, other participants reported issues with finding activities to attend or difficult communication with leadership. This likely impacted attendance and, while it is very informative from a feasibility perspective, it precludes us from being able to study the effectiveness of an organization like TRWB. Interestingly, it does appear that being asked to participate in TRWB actually facilitated engagement with exercise. Without additional intervention, we saw veterans in the TRWB arm exercising at a higher rate than those in the WL condition. Overall, the effects of this organization need to be further studied. It may be that additional strategies could be implemented to augment the organization's effects. For

instance, having a representative available to chat with new members may be useful. In this way, the representative may be able to alleviate the skepticism or anxiety associated with attending an event by working to address misconceptions over the phone, much like what appeared to be effective for engaging participants in exercise in the PACE condition.

Effectiveness

Consistent with study hypotheses, participants in the PACE and RWB conditions evidenced greater reduction in reintegration difficulties compared to those in the WL condition, with effect sizes in the medium range (i.e., $d = 0.52$ and $d = 0.39$, respectively). However, there was not a meaningful difference between the PACE and RWB conditions ($d = .12$). Interestingly, moderator analyses indicated that among individuals who reported low levels of exercise over the course of the eight weeks, the PACE prescription (and thus presumably vigorous-intensity exercise and counseling) offered significantly greater benefits over TRWB (and WL). Between-group differences were not evident among individuals who exercised at mean and high levels. Together, these findings suggest that regular exercise in general may be helpful in improving the reintegration difficulties, while adding a vigorous-intensity prescription and counseling may be indicated for individuals who opt to keep their total minutes to a minimum. Thus, the PACE prescription may be ideal for an individual who is new to exercise and does not want to have to exercise for longer durations. This finding mirrors emergent work from the broader exercise for health literature, which promotes that an advantage of prescribing vigorous-intensity over moderate-intensity exercise is that one can achieve

benefits while spending less time exercising per week (Heinrich, Patel, O'Neal, & Heinrich, 2014).

2. Clinical Implications

The PACE intervention was developed with dissemination and uptake in mind. Initial findings suggest that a community-based exercise intervention has the potential to reduce daily reintegration difficulties. Importantly, the intervention was well-liked by veterans and most reported a number of benefits including increased confidence and improvement in health-related goals. While certain components of the intervention need to be further refined, the pilot data are useful in that they show that vigorous-intensity exercise may be an effective tool to prescribe to facilitate the goal of reintegration. Given that exercise is a low-cost, readily accessible intervention, it could be prescribed to veterans with a wide range of difficulties. Based on the acceptability survey, the most commonly cited benefit to the exercise component was the level of accountability from the surveys and PACE representative. A clinician could work with a veteran to develop and tailor an exercise routine and then serve as the representative to hold the veteran accountable. It would be beneficial for the clinician to receive training on the various types of exercise and strategies to instill motivation for physical activity (Marcus et al., 2007). Thus, this exercise intervention has the added advantage of not having to require training a clinician on an extended therapy protocol.

Importantly, the program could be easily integrated with current military discharge procedures. There are initiatives in place within each branch to facilitate the reintegration process. Most often, veterans are required to attend a post-

deployment/discharge workshop, and these programs occur prior to discharge while in the military context. Accordingly, a program like PACE could be a logical next step, whether in the form of a referral given at these workshops or, ideally, as an initiative offered on base.

3. Limitations and New Research Directions

Results of this study lend crucial insight into intervention development in the reintegration domain. Extant research focusing on the evaluation of interventions aimed at facilitating reintegration is limited in scope and quality (Baird et al., 2019). Further work in this area is crucial as making available effective interventions for the transitioning veteran has the potential to prevent the development of a mental health disorder. Here we present a few recommendations for research that can build upon the findings from this pilot work.

First, it would be worthwhile to expand with a larger sample and to put increased effort into geographically diverse recruitment. The sample size was small. This is standard for pilot trials and enabled us to achieve our initial study aims. However, it would be crucial to enroll a larger sample in order to be able to test for statistical significance and intervention mechanisms. Additionally, there are several limitations related to generalizability. The sample was primarily Army veterans, which makes sense given the close proximity of Fort Hood. It would be important to conduct this research in cities where there are high populations from other branches of service in order to be able to prescribe PACE as a military intervention. Similarly, the majority of our sample came from Texas. We did try to increase sample diversity by recruiting in several cities

nationwide, but this component of the study was added in the later stages of the recruitment process. Second, it would be important to have a longer follow-up period in order to better understand the trajectory of reintegration difficulties and the durability of improvement. Third, TRWB participation was modest in this intervention, but did yield some effects in terms of increasing exercise uptake. In order to better understand the role of TRWB (i.e., community engagement), it would be important to complete a study that also includes an exercise only condition. This would yield important insight into whether or not exercise works best individually or in combination with an organization such as TRWB. Finally, further research is needed in order to explore mechanisms for the improvement in reintegration difficulties. This was a pilot study and thus designed to detect initial effects on the main outcome, namely reintegration difficulties. With the design components listed above addressed, researchers could assess what might be driving the change.

Future research should also explore how to best optimize the dose of PACE. This study prescribed 75 minutes of vigorous-intensity aerobic activity over the course of eight weeks. We found that veterans were able to achieve this intensity, but oftentimes did not sustain the intensity for on a regular weekly basis. Rather than prescribing a continuous bout of vigorous-intensity exercise, it may make sense to prescribe the activity as high-intensity interval training (HIIT), a form of exercise which involves repeated short (<45seconds) to long (2-4 minutes) bouts of vigorous-intensity exercise in combination with recovery periods (Buchheit & Laursen, 2013). Bearing in mind the importance of exercise preference, HIIT was the leading trend in the fitness industry as recently as 2018

(Thompson, 2017) and is cited as being widely popular among the military population (Haddock, Poston, Heinrich, Jahnke, & Kitnarin, 2016). Additionally, it would be helpful to explore whether increasing the number of exercise counseling sessions or check ins would aid in exercise uptake and whether lengthening the duration of the training beyond eight weeks would offer additional benefits. We were able to see effects after one focused session of exercise counseling and thus would reasonably expect that increased attention in this area could facilitate adherence.

Continued research with the Apple Watch and other wearable devices is needed. This study functioned as an initial test of the feasibility of using the Apple Watch in combination with Status/Post to verify exercise intensity. We observed considerable discrepancy between the self-report exercise data and the Apple Watch exercise data. Access to and reliable functionality of Status/Post may account for much of this discrepancy. Indeed, many participants reported difficulties with downloads and installations as well as survey completion, which resulted in missing heart rate data. Additionally, participants were asked to wear the Apple Watch during each exercise session, but some reported hardware glitches or that they simply forgot to charge the battery or bring the watch, which also resulted in missing data. Another factor is that exercise sessions includes warm ups and cool downs, and thus average heart rate data transcribed for each exercise session differs from the target set for training. Modifying the instructions to complete the warm up or cool down outside of the recorded training session would aid the quality of the collected heart rate data for verifying exercise prescriptions. Despite these limitations, this initial test of feasibility for using the Apple

Watch in combination with the Status/Post app showed promise. Indeed, data collected from Apple Watch were correlated with self-report, and thus shows potential to serve as a method for exercise prescription verification. This is an important area for future work as heart rate measurement enables researchers and clinicians alike to ensure that individuals are meeting the correct exercise dose. Most wrist-worn devices are able to assess heart rate adequately in laboratory settings (Shcherbina et al., 2017), but additional community-based trials could lend insight into how these devices perform outside of a controlled setting. Additionally, wearable technology is a leading fitness trend (Thompson, 2017) and given this increased popularity, may be useful in helping to motivate exercise engagement through feedback. It would be important to explore this relationship and identify which type of feedback is most useful for consumers.

4. Overall Conclusions

This work lends support to the idea of prescribing a program that emphasizes vigorous-intensity exercise in combination with participation in TRWB as a means to reduce reintegration difficulties for returning veterans. Perhaps most importantly, the results suggest that a community-based program can be successfully implemented among veterans in terms of both feasibility and acceptability. As we observed initial meaningful effects on reintegration difficulty with modest adherence to the prescription, we hope that this work can serve as a call for further intervention development and refinement of PACE for newly returning veterans.

Table 1. Study Characteristics

Study	Design	<i>N</i>	Branch of Service	Time to Implementation	Veteran or Active Duty	Intervention Duration	Intervention	Outcome Measures
Blevins et al. (2011)	Pre-Post	148	National Guard	3-9 months following most recent deployment	Veteran	2-hour workshop	Acceptance and Commitment Therapy (ACT)	Mental Health Functioning (SF-12) Patient Health Questionnaire (PHQ-9) Dyadic Adjustment Scale (DAS) Conflict Tactics Scale (CTS) Generalized Anxiety Disorder scale (GAD-7) Panic Screen from Brief Patient Health Questionnaire (PD) PTSD Checklist-Civilian Version (PCL-C) Anger Subscale of Buss-Perry Aggression measures Alcohol Use Disorders Identification Test (AUDIT)

Castro et al. (2012)	Quasi-RCT	804	Army	4 months following deployment	Active Duty	40-79 minutes (depending on platoon size)	Battlemind Training program (developed by the Walter Reed Army Institute of Research for military personnel navigating the deployment cycle)	Postintervention Ratings of Utility, Goals, and Atmosphere Stigma Scale (from Hoge et al., 2004) PTSD Checklist (PCL) Patient Health Questionnaire for Depression (PHQ-D) Satisfaction with Life Scale (SWLS)
Matthieu et al. (2017)	Pre-Post	346	Not specified	Not specified	Veteran	26 weeks	Fellowship Program (a national civic service program)	Purpose in Life Scale (PIL) General Self Efficacy Scale (GSE) UCLA Loneliness Scale Interpersonal Support Evaluations List- short form (ISEL) Primary Care PTSD Screen (PC-PTSD) Patient Health Questionnaire-2 (PHQ-2)

Sayer et al. (2015)	RCT	508	Army Marines Navy Air Force	Not specified	Veteran	4 days	Expressive writing intervention	Military to Civilian Questionnaire (M2C-Q) Post Deployment Social Support Scale Satisfaction with Life Scale (SWLS) PTSD Checklist-Military Version (PCL-M) Brief Symptom Inventory (BSI-18) 5-item Hostility Scale (from 53-item BSI)
Schneider et al. (2016)	Retrospective Review	1,573	Air Force	Not specified	Active Duty	2 days	United States Air Force Deployment Transition Center (DTC) decompression program	Post-deployment Health Reassessment (PDHRA)
Sipos et al. (2014)	Non-randomized trial	272	Army	In theater	Active Duty	Not Specified	Front-loaded reintegration strategy	Post-Traumatic Stress Disorder Checklist (PCL) 8- risk items from Combat to Home Transition Scale Two-Item Conjoint Screen for Alcohol 4-item Aggressive Behavior scale Norton's Quality of Marriage Index (abbreviated)

Sylvia et al. (2015)	Retrospective Review	15	Army Air Force	Not specified	Veteran & Active Duty	4 weeks	“Resilient Warrior,” a military-based mind-body stress-management and resilience program	Perceived Stress Scale (PSS) General Self-Efficacy Scale Resilience Scale Patient Health Questionnaire-8 (PHQ-8) GAD-7
Tenhula et al. (2014)	Pre-Post	349	Not specified	Not specified	Veteran	4 weeks	“Moving Forward,” a VA program based on principles from contemporary Problem-solving therapy	Outcomes Questionnaire-30 (OQ-30) Brief Resilience Scale (BRS) Social Problem Solving Inventory-Revised (SPSI-R) Patient Health Questionnaire-9 (PHQ-9)

Table 2. Domains of Reintegration

Study	Mental Health Difficulties	Psychological Health	Interpersonal Relationships	Intervention Acceptability	Intervention Adherence
Blevins et al. (2011)	+	-	+	-	-
Castro et al. (2012)	+	+	-	+	-
Matthieu et al. (2017)	+	+	+	-	-
Sayer et al. (2015)	+	+	+	-	+
Schneider et al. (2016)	+	-	+	-	-
Sipos et al. (2014)	+	-	+	-	-
Sylvia et al. (2015)	+	+	-	-	-
Tenhula et al. (2014)	+	+	+	-	+

*Mental health difficulties include measures related to anxiety, depression, PTSD, or substance abuse; psychological health measures include variables related to general health and well-being (e.g., satisfaction in life, self-efficacy, sense of purpose); interpersonal relationships include measures related to relationships among family and friends; intervention acceptability denotes measures related to intervention evaluation.

Table 3. Baseline Demographics and Sample Characteristics

	PACE (n=20)			RWB (n=19)			Waitlist (n=20)			Total Sample (n= 59)		
	<i>N</i>	<i>M</i>	<i>SD</i>	<i>N</i>	<i>M</i>	<i>SD</i>	<i>N</i>	<i>M</i>	<i>SD</i>	<i>N</i>	<i>M</i>	<i>SD</i>
Age	20	37.35	7.49	19	33.68	7.54	20	34.35	7.69	59	35.15	7.62
M2C-Q	20	2.18	0.63	19	2.30	0.68	20	2.03	0.83	59	2.17	0.72
		<i>N</i>	%		<i>N</i>	%		<i>N</i>	%		<i>N</i>	%
Gender (Female)		9	45.0		8	42.1		3	15.0		20	33.9
Education (Some College)		9	45.0		8	42.1		11	55.0		28	47.5
Employment (Full-time)		6	30.0		9	47.4		5	25.0		20	33.9
Married		9	45.0		11	57.9		8	40.0		28	47.5
Ethnicity (Hispanic or Latino)		9	45.0		6	31.6		4	20.0		19	32.2
Race												
White		12	60.0		12	63.2		13	65.0		37	62.7
Black or African American		6	30.0		7	36.8		4	20.0		17	28.8
Asian		1	5.0		0	0.0		0	0.0		1	1.7
Native Hawaiian or Pacific Islander		0	0.0		0.	0.0		1	5.0		1	1.7
Other		1	5.0		0	0.0		2	10.0		3	5.1
Rank												
Officer		1	5.0		1	5.3		1	5.0		3	5.1
Enlisted		19	95.0		18	94.7		19	95.0		56	94.9

Table 3, Continued

Branch of Service									
Army	12	60.0	17	89.5	16	80.0	45	76.3	
Navy	1	5.0	1	5.3	1	5.0	3	5.1	
Air Force	2	10.0	1	5.3	2	10.0	5	8.5	
Marine Corps	4	20.0	0	0.0	1	5.0	5	8.5	
National Guard	1	5.0	0	0.0	0	0.0	1	1.7	
Year of Discharge									
2019	0	0.0	1	5.3	0	0.0	1	1.7	
2018	5	25.0	2	10.5	6	30.0	13	22.0	
2017	6	30.0	7	36.8	3	15.0	16	27.1	
2016	3	15.0	3	15.8	7	35.0	13	22.0	
2015	4	20.0	3	15.8	2	10.0	9	15.3	
2014	2	10.0	1	5.3	0	0.0	3	5.1	

Table 4. Treatment Integrity

	PACE			RWB			WL		
	N	M	SD	N	M	SD	N	M	SD
Self-reported Exercise Minutes (Total)	20	784.45	463.53	18	389.72	399.62	19	179.47	477.51
Transcribed % HRmax (Mean)	20	77.45	6.28	13	66.35	14.83	11	59.99	10.86
Number of weeks meeting the prescribed exercise dose	20	2.90	2.81	18	0.33	0.84	19	0.00	0.00
Total Number of TRWB events	20	2.45	3.56	18	3.17	3.19	-	-	-
Number of weeks meeting the prescribed TRWB dose	20	2.05	2.74	18	2.67	2.43	-	-	-
Total number of vigorous-intensity exercise minutes reported (Apple Watch)	15	142.66	158.79	15	27.04	50.28	15	6.25	12.32

Table 5. Main Outcome Analysis

	Baseline				Week 9				Change per Week					
	M	SE	p-value	Cohen's d	M	SE	p-value	Cohen's d	M	SE	p-value	Cohen's d		
PACE	2.16	0.17	-	-	1.48	0.16	-	-	-	0.08	0.01	<.001	0.67	
RWB	2.16	0.17	-	-	1.66	0.17	-	-	-	0.06	0.01	<.001	0.49	
WL	1.92	0.17	-	-	1.99	0.16	-	-	-	0.01	0.01	0.617	0.06	
PACE - WL	0.23	0.23	0.323	0.23	-0.5	0.23	0.032	0.51	-	0.08	0.02	<.001	0.52	
PACE - RWB	-	0.001	0.24	0.999	0.001	0.18	0.23	0.442	0.18	-	0.02	0.02	0.308	0.12
RWB - WL	0.23	0.24	0.327	0.22	-	0.32	0.23	0.169	0.32	-	0.06	0.02	0.002	0.39

Figure 1. Flow Diagram for Study Selection

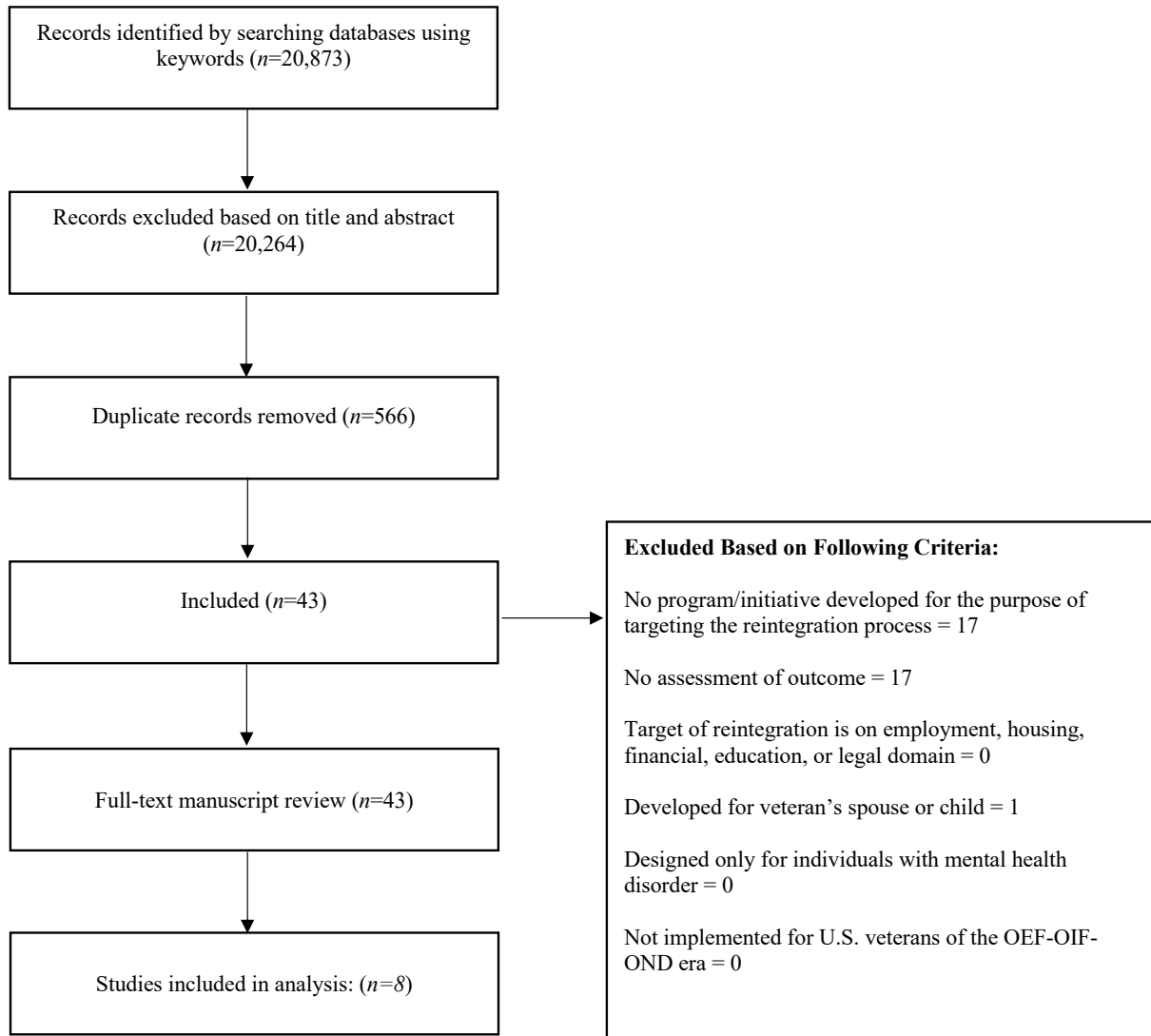


Figure 2. Consort Diagram

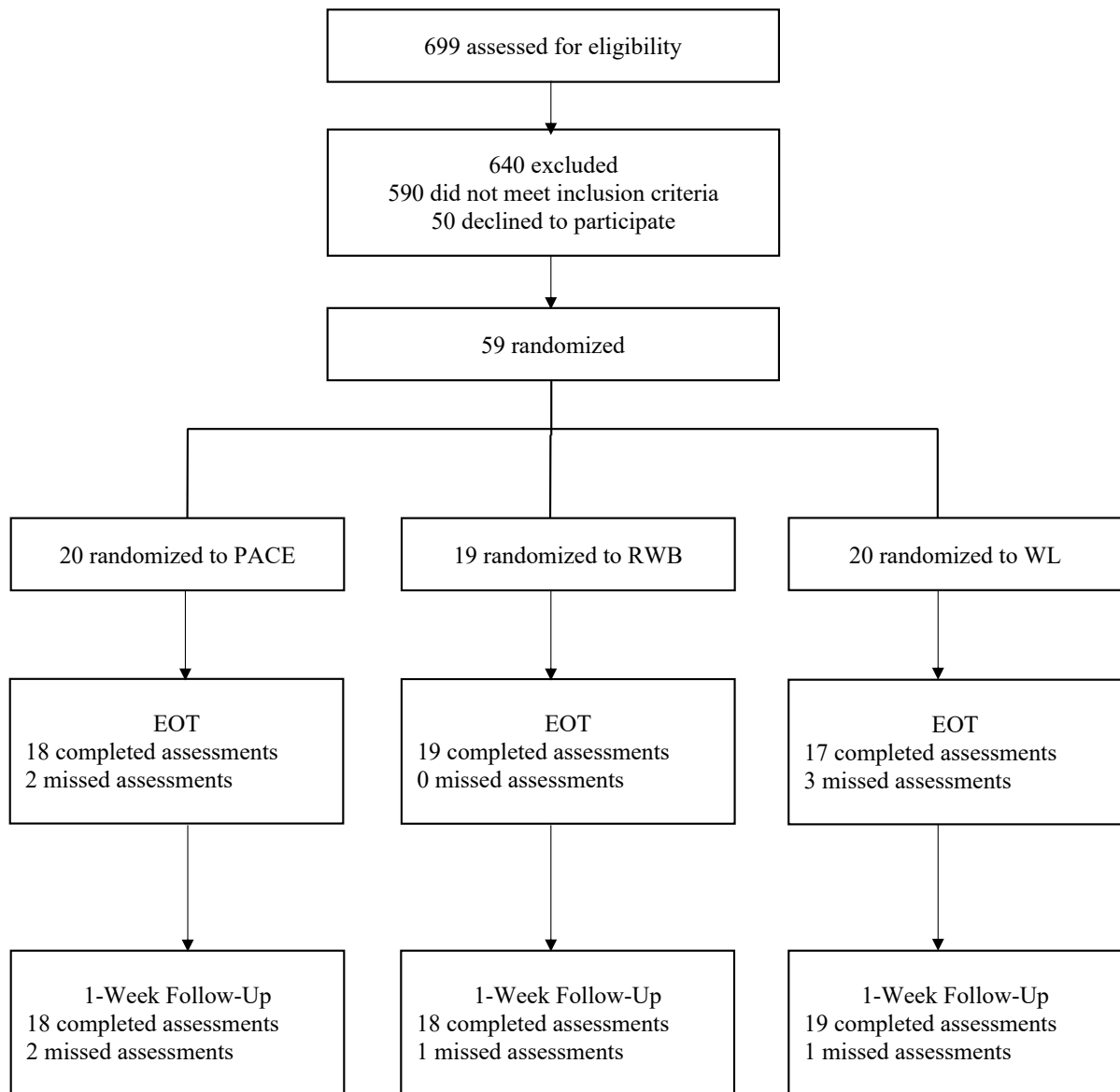


Figure 3. Changes in Reintegration Difficulties

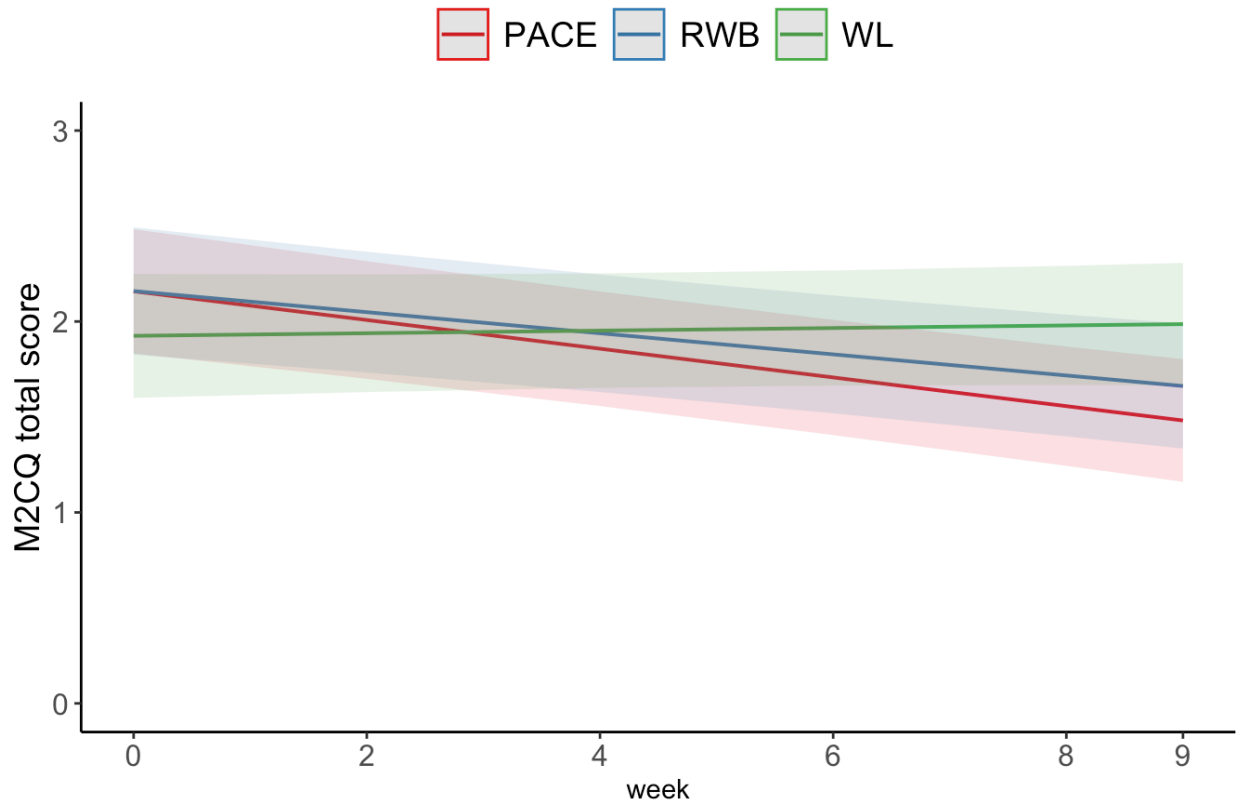
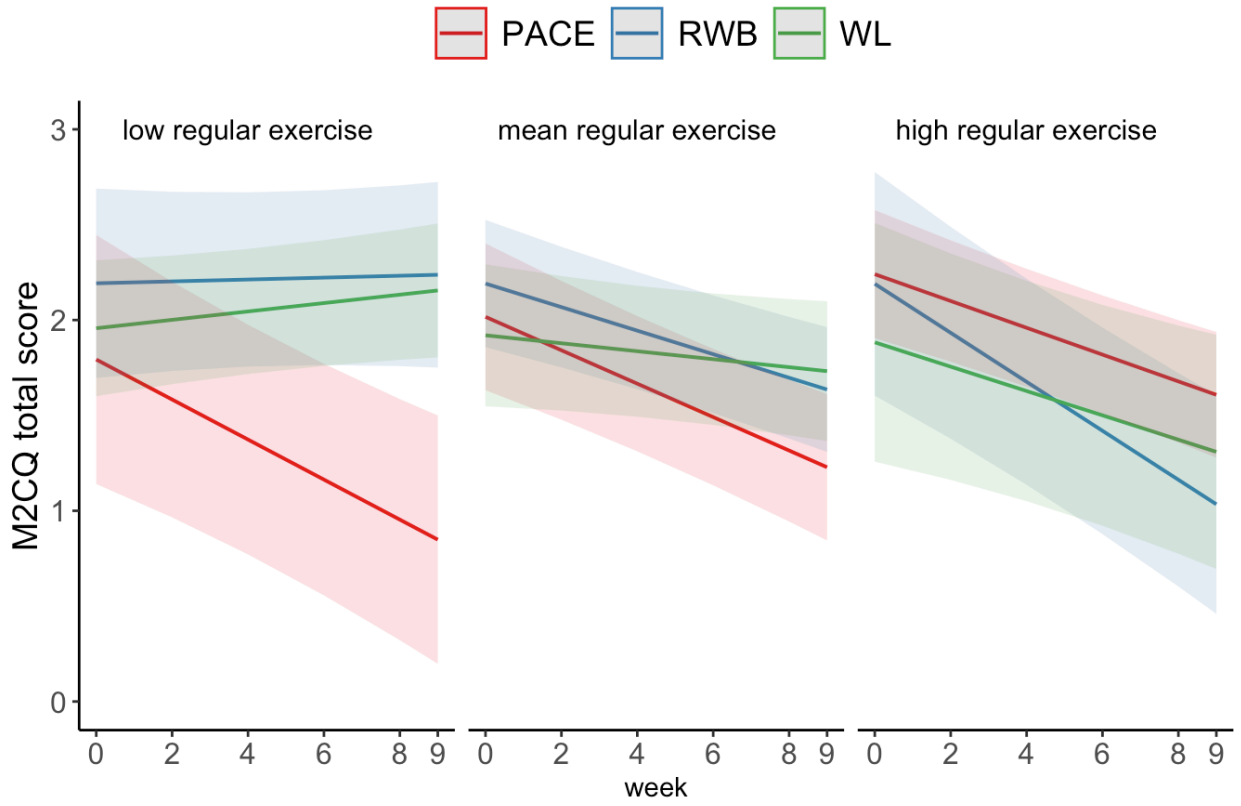


Figure 4. Moderator Analysis



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