HHS Public Access

Author manuscript

Ment Health Phys Act. Author manuscript; available in PMC 2018 October 01.

Published in final edited form as:

Ment Health Phys Act. 2017 October ; 13: 137–142. doi:10.1016/j.mhpa.2017.09.009.

Changes in Coping, Autonomous Motivation, and Beliefs about Exercise among Women in Early Recovery from Alcohol Participating in a Lifestyle Physical Activity Intervention

Claire E. Blevins, Ph.D.[a,b], **Marie A. Rapoport, B.S.**[a], **Cynthia L. Battle, Ph.D.**[a,b], **Michael D. Stein, M.D.**[a,b,c], and **Ana M. Abrantes, Ph.D.**[a,b]

[a]Butler Hospital, Providence, RI, USA

[b]Alpert Medical School of Brown University, Providence, RI, USA

[c]Boston University, Boston, MA, USA

Abstract

Women are particularly likely to drink alcohol for the purpose of coping with or alleviating negative affect. Engaging in physical activity has been posited as a potentially effective alternate coping strategy during early recovery for managing mood and cravings. Utilizing exercise to cope may be associated with more adaptive coping strategies in general. Additionally, an intrinsic (autonomous) motivational style and positive beliefs about exercise are associated with long-term adherence to physical activity. The current study evaluates changes in coping strategies, autonomous motivation, and beliefs about exercise among women engaged in a physical activity intervention during early recovery (N=20; mean age=39.53). General coping strategies, motivational style, and beliefs about exercise were examined before and after engaging in the 12-week intervention which aimed to help women utilize physical activity as a means to cope with negative affect and alcohol craving. We found that, by the end of the intervention, participants significantly increased utilization of adaptive coping strategies such as the use of emotional support from others. Additionally, participants increased autonomous motivation over time. There were no significant changes in beliefs about exercise. Changes in beliefs about benefits of exercise, autonomous motivation, and adaptive coping were related to use of exercise to cope. However, even though these changes were associated with how women in the intervention used exercise, they were not associated with exercising more. Results from this open pilot suggest that women in early recovery from alcohol who increase physical activity – specifically as a means to cope with negative affect and craving – also demonstrate other wider coping strategies, more positive beliefs, and autonomous motivation.

Physical inactivity is associated with a host of negative physical and mental health consequences, including heart disease, cancer, diabetes, depression, and psychological well-

Corresponding Author: Claire E. Blevins, Ph.D., Butler Hospital, 345 Blackstone Blvd., Providence, RI 02906, Tel: (401)455-0218, Claire_Blevins@Brown.edu.

being (Buman et al., 2010; Lee et al., 2012; Teychenne et al., 2010). Indeed, in the United States alone, it is estimated that 10.8% of all-cause mortality can be attributed to physical activity (Lee et al., 2012). It is recommended that adults engage in 150 minutes per week of moderate to vigorous physical activity (MVPA) per week (Haskell et al., 2007). Despite the well documented health consequences of physical inactivity, only 9.5% of men and 7% of women meet suggested physical activity guidelines when MVPA is objectively measured (Tucker et al., 2011). Individuals with mental health and substance use problems are at an even higher risk for inactivity (Allgöwer et al., 2001; Rhodes et al., 2012; Stein et al., 2013). Yet, the benefits of increasing physical activity in alcohol dependent populations specifically is significant and include improved cardiorespiratory fitness, decreased rates of depression, and reduced drinking outcomes (Abrantes et al., 2013; Brown et al., 2009, 2014; Hallgren et al., 2017).

Alcohol dependent women in particular may benefit from increased physical activity. Women are more likely to have negative health consequences as a result of AUD (Schenker, 1997), are more likely to report depression (Cornelius et al., 1995; Hartka et al., 1991; Kessler et al., 1997), have poor coping strategies for depression (Sanchez et al., 2014), and drink alcohol to cope with negative affect (Brienza and Stein, 2002; Lehavot et al., 2014). In contrast, regular physical activity engagement reduces depression (Kvam et al., 2016) and acute bouts of physical activity has been shown to reduce alcohol craving (Ussher et al., 2004) and reduce negative affect (Bartholomew et al., 2005; Petruzzello et al., 1991). Indeed, we have examined a lifestyle physical activity intervention focused on guiding depressed alcohol dependent women to use bouts of physical activity specifically as a coping strategy to manage negative mood and alcohol cravings (Abrantes et al., 2017). As women begin to use an adaptive coping strategy such as physical activity, it is possible that, in turn, they may increase other adaptive coping strategies such as reaching out for support from others or gaining acceptance, particularly as confidence in the ability to utilize the coping skills effectively strengthens. For example, the relationship between coping skills acquisition/utilization and self-efficacy has been previously demonstrated (Kadden and Litt, 2011; Larimer et al., 1999), and is likely cyclical. Additionally, coping skill acquisition has been shown to improve through an intervention designed to improve resilience (Steinhardt and Dolbier, 2008). In other words, as self-efficacy increases, effectively using coping strategies (such as physical activity to cope) may lead to an increased repertoire of other effective coping strategies. However, this has yet to be examined in existing studies.

It is also important to examine other factors that help promote and sustain physical activity in this vulnerable population. A variety of cognitive and behavioral factors, such as motivation orientation and beliefs about physical activity may help to explain engagement in physical activity. Self-Determination Theory (SDT; Ryan and Deci, 2000) is a framework in which these factors may be understood. SDT describes motivational factors that underlie behavior as being on a continuum from amotivation (which is representative of an impersonal locus of causality, where individuals perceive that they cannot affect change) to extrinsically motivated (which ranges from external to internal locus of causality) and finally intrinsically motivated (which represents an internal locus of causality) (Deci and Ryan, 2011). Although any form of motivation can impact behavior, SDT posits that internal, intrinsic motivation (i.e., autonomous motivation) leads to long-term changes in behavior.

Autonomous motivation occurs when an individual believes that they have the ability to engage in a behavior lies in their control, and that they are competent to engage in such behavior (i.e., if they possess self-efficacy). Autonomous motivation for physical activity can lead an individual to engage in exercise because it increases pleasant emotions and fosters a sense of accomplishment, rather than due to external factors such as to gain acceptance from others. Prior research has demonstrated that autonomous self-regulation is associated with maintenance of physical activity (Fortier et al., 2012; Hagger and Chatzisarantis, 2008; Ingledew et al., 1998; Pelletier et al., 2001; Ryan et al., 1997; Stephan et al., 2010; Teixeira, Carraça, et al., 2012). There is also evidence that autonomy-supportive counseling (Fortier et al., 2007) can lead to improved physical activity outcomes (Fortier et al., 2012). However, it is less certain if and how quickly autonomous motivation can change without being a direct target of a physical activity intervention.

Behavior change, including a change in physical activity, occurs more readily when an individual believes that a positive outcome will result from this change (Williams et al., 2005). A large body of research in various health behaviors has shown that perceptions of benefits (positive outcomes) as well as perceptions of barriers to behavior change are motivational factors that can drive behavior (Abraham and Sheeran, 2015). Perception of benefits and barriers to exercise are significantly associated with an individual's level of physical activity (Grubbs and Carter, 2002). Women who perceive more benefits from exercise and fewer barriers to exercise are more likely to be active than women who report greater perceived barriers and lower perceived benefits (Vaughn, 2009). Additionally, perceived barriers have a greater impact on behavior than perceived benefits (Janz and Becker, 1984; Nahas et al., 2003). Change in perception of benefits and barriers may result from an increase in engagement in physical activity. Previous research has established that as physical activity increases, perception of barriers reduce, but may not result in significant changes in perceived benefits (Ransdell et al., 2004). To date, little research exists on the perceived physical activity barriers and changes in these barriers over time among women with alcohol dependence.

The current study has two goals: (a) to evaluate changes in autonomous motivation, beliefs about exercise, and coping skills among depressed women in early recovery from AUD who are involved in a PA intervention and (b) to identify associations between changes in these constructs and changes in physical activity, including utilizing physical activity to cope. It is hypothesized that adaptive coping strategies, beliefs about benefits of exercise, and autonomous motivation will increase over the course of the intervention while beliefs about barriers to exercise will decrease. It is also hypothesized that these changes will be associated with changes in physical activity, but more specifically with changes in utilizing physical activity to cope with negative affect and alcohol craving.

Method

Participants and Procedures

Participants—Participants were recruited while attending the Alcohol and Drug Partial Hospitalization Program (ADP) at Butler Hospital, a private psychiatric hospital affiliated with Alpert Medical School of Brown University. ADP is a 5–10 day outpatient day program

that runs from 9am-3:30pm Monday to Friday. Patients receive individual and group counseling, medication management, and case management services. Eligibility criteria for this analysis included (a) being female, (b) between the ages of 18–65, (c) currently enrolled in ADP, (d) having elevated symptoms of depression (5+) as measured by the Patient Health Questionnaire (PHQ-9; (Kroenke et al., 2001), (e) engaging in less than 150 minutes per week of moderate to vigorous physical activity, (f) with access to the internet either via the computer or Fitbit-compatible smartphone. Women with a DSM-5 moderate to severe other substance use disorder, history of psychotic disorder, current suicidality/homicidality, current mania, current pregnancy, or physical or mental problems that would preclude them from engaging in physical activity were excluded from the study. See main outcome paper from the pilot project (Abrantes et al., 2017) for details on eligibility. A total of 20 women were recruited.

Recruitment—Research staff reviewed medical records of women currently enrolled in ADP to check for study eligibility. Potentially eligible participants were approached and given information about the study. Women who were interested were briefly screened (5–10 minutes) and, if they met physical activity and depression criteria, were scheduled for a more comprehensive baseline assessment, fitness test, and medical clearance (see Abrantes et al., 2017) for a more detailed description of procedures). Eligible and interested participants were then scheduled for an in-person orientation with a counselor.

Intervention—During the orientation session, participants were given information on (a) the link between physical activity, depression, and craving, (b) using physical activity in the moment to help alleviate symptoms of depression or craving, (c) ways to increase physical activity, and (d) use of the Fitbit activity monitor, which they were instructed to wear daily. Participants and counselors engaged in brief (approximately 30 minutes) phone counseling sessions at 6 points throughout the intervention: weeks 1, 2, 4, 6, 8, and 10. During sessions, physical activity progress was reviewed, step counts were evaluated, and barriers to activity were discussed. Each week focused on a different topic and adapted from prior work (Brown et al., 2009): using physical activity in the moment to cope with negative emotions and craving, getting and staying motivated, goal-setting and support-seeking, barriers to physical activity and how to overcome them, getting back on track after a lapse to inactivity, maintaining physical activity long-term. Counseling sessions were semi-structured, guided not only by the set topics, but also by participant responses and progress towards their goals. Participants completed assessment at baseline and at week 12, two weeks after the final counseling session.

Measures

Beliefs about Exercise—The Exercise Benefits and Barriers Scale (Sechrist et al., 1987) is a 43-item scale designed to assess for an individual's perceptions of exercise. They answer each item on a scale of 1 (strongly disagree) to 4 (strongly agree). The scale can be divided into a Benefits subscale and a Barriers subscale. The Benefits scale can range between 29 and 116, while the Barriers scale score can range between 14 and 56. Cronbach's alpha tests for this population revealed acceptable to excellent reliability at both baseline and 12-week timepoints: Benefits (α = 0.92–0.96), Barriers (α = 0.74–0.90).

Coping Strategies—The Brief COPE (Carver, 1997), given at baseline and 12-week timepoints, is a 28-item measure designed to assess a variety of coping strategies. Participants are asked how often they use each strategy on a scale of 1 (I haven't been doing this at all) to 4 (I've been doing this a lot). The Brief COPE results in 14 subscales of 2 items each. In lieu of a single coping score, the Brief COPE allows for and encourages subscale analyses. For the purposes of this study, we conceptualized adaptive coping as the average of the instrumental support, emotional support, and acceptance subscales (α ranged from 0.65–0.92) based on associations in related literature (Ivanova et al., 2015; Rackow et al., 2017) which have evaluated these coping strategies in the context of physical activity interventions.

Autonomous Motivation—The Exercise Regulations Questionnaire (BREQ-3; Markland and Tobin, 2004; Wilson et al., 2006) is a 24-item measure designed to assess a person's motivational style in regards to exercise. The BREQ-3 was adapted from previous versions to include integrated forms of motivation, and research has established that this adaptation did not compromise validity of the scale (Wilson et al., 2006). Participants answer on a scale of 0 (not true for me) to 4 (very true to me) the extent to which they relate to each question. Items represent different motivational styles along the continuum of amotivation to extrinsic motivation and finally intrinsic motivation: (1) Amotivation "*I really don't see why I have to exercise*;" (2) External "*I exercise because other people say that I should*;" (3) Introjected "*I feel guilty when I don't exercise*;" (4) Identified "*It's important for me to exercise regularly*;" (5) Integrated "*I exercise because it's consistent with my life goals*;" and (6) Intrinsic "*I exercise because it's fun*") and are weighted to create a Relative Autonomy Index. The BREQ-3 was given at both timepoints with good to excellent internal reliability (α = 0.89–0.90).

Physical Activity Duration and Using Physical Activity to Cope—For the purposes of this study, we utilized the Timeline Followback for Exercise (TLFB; Panza et al., 2012) as a self-reported measure of participants' physical activity. This procedure asks participants to indicate the days, of the previous 90, that they engaged in physical activity lasting 10 minutes or more in duration. The TLFB method uses a calendar and anchor dates to aid in participant recall. Additionally, for each day of reported physical activity, they were asked to rate the duration and rate of perceived exertion (RPE; Borg, 1970). Moderate to vigorous physical activity (MVPA) was defined as RPE ratings of 12 and above (MVPA) (Ritchie, 2012). Based on this information, we created two variables: average minutes per week of *all* physical activity and average minutes per week of *MVPA*. Participants also reported whether or not the physical activity that they engaged in each day was done so as a means to cope with either negative affect for alcohol cravings using the TLFB method.

Results

Participant Characteristics

Participants (N=20) were primarily Caucasian (85%), non-Latina (90%), with a mean age of 39.5 (SD=10.6). The majority of women held at least a college degree (55.0%) and most women (65%) were employed part-time or more. At baseline, participants reported heavy

alcohol use, consuming alcohol 52.6% or the prior 90 days with an average of 10.11 (SD=6.36) drinks per drinking day. Overall results from the parent open trial (Abrantes et al., 2017) found that women significantly increased physical activity (Cohen's d_z = 0.87) and rates of alcohol abstinence (Cohen's d_z=1.08) over the course of the 12-week intervention.

Descriptive Statistics and Change over Time

Descriptive statistics for variables of interest at the baseline and 12-week timepoints are presented in Table 1. Results from Shapiro-Wilk tests indicated that variables were normally distributed. Additionally, we present results from paired samples t-tests to evaluate change in variables over time. Notably, there were significant increases in adaptive coping (t=2.83, p=.01) and autonomous motivation (t=2.54, p=0.02) over time. Beliefs about exercise did not significantly change over time. Effect sizes (Cohen's d_z) are presented in Table 1.

Associations with Changes in Physical Activity

Bivariate correlations were utilized to evaluate cross-sectional relationships at baseline and 12-week timepoints. Analyses revealed significant associations between variables of interest at both the baseline assessment and the 12-week assessment (Table 2; baseline is below diagonal, 12-week is above diagonal). We present typical significance testing and testing that has been corrected for multiple comparisons.

We evaluated relationships between changes in benefits, barriers, autonomous motivation, and coping scales with changes in physical activity engagement utilizing regression techniques testing residualized change. In step 1 of the model, the baseline physical activity variable and baseline independent variable were entered into the equation predicting 12-week physical activity. In step 2, the variable of interest at 12-weeks was entered into the model. Table 3 presents standardized regression coefficients and significance values. Neither beliefs about exercise, coping strategies, nor autonomous motivation was associated with duration of actual physical activity when controlling for baseline levels (including all activity and MVPA; all ps>.05). However, changes in beliefs about the benefits of exercise was significantly and positively related to changes in participant's report in the daily timeline followback measure that they had used physical activity to cope (β=.90). Additionally, changes in autonomous motivation (β=.76) were positively and significantly associated with using physical activity to cope, as were changes in adaptive coping (β=1.00).

Discussion

Women in this open pilot of a lifestyle physical activity intervention reported significantly greater adaptive coping strategies and autonomous motivation over the course of the 12-week intervention. These changes were associated with changes in physical activity, but more specifically with changes in utilizing physical activity to cope with negative affect and alcohol craving.

The results of this study suggest that participating in a lifestyle physical activity intervention that guides women to use bouts of physical activity to manage negative affect and alcohol craving may lead to increases in autonomous motivation. It is possible that, due to

participating in this intervention, women began to view physical activity as something that could be engaged to benefit their sobriety and overall well-being (which is a more intrinsic goal than the goal of losing weight, for example). In doing so, it is possible that physical activity may have taken on a new meaning and role in their recovery. Perhaps it is not overall physical activity levels but rather *how* physical activity was being engaged in that plays an important role in increases in autonomous motivation. Previous research has established that autonomous motivation leads to the maintenance of behavior change (Teixeira, Silva, et al., 2012; Vancampfort et al., 2016). Because autonomous motivation emerges as one of the most important predictors of long-term physical activity engagement (Ingledew et al., 1998; Pelletier et al., 2001; Ryan et al., 1997; Stephan et al., 2010) this study's findings point toward the potential for women in early recovery to have a tool that they can engage in for the long-term. Given the chronic, relapsing nature of alcohol dependence (McLellan et al., 2000), engaging in physical activity can be an invaluable strategy for sustained positive alcohol outcomes.

The results of this study also point to a relationship between using physical activity to cope and increases in other adaptive coping strategies over the course of the 12-week intervention. This finding is consistent with previous research where an intervention designed to enhance coping strategies was associated with increases in many forms of adaptive coping strategies and other protective factors (e.g., Steinhardt and Dolbier, 2008). Thus, it is possible coping strategies tend to increase in conjunction with one another, potentially through increases in protective factors such as resilience, social support, or self-efficacy (Kadden and Litt, 2011; Steinhardt and Dolbier, 2008). By facilitating the use of physical activity to cope with negative affect and drinking urge to prevent a drinking relapse, participants' may have also increased their confidence for utilizing other adaptive coping strategies, as well (e.g., Kadden and Litt, 2011; Larimer et al., 1999). Future studies should examine the mediating role of self-efficacy on the relationship between utilizing PA to cope and overall adaptive coping. In addition, if current results can be replicated in future work, then the potential use of physical activity as a coping strategy may be extended beyond alcohol users with depression to other clinical populations that could benefit from increased adaptive coping skills, such as binge eaters and those with self-injurious behaviors.

There were no significant changes in beliefs about exercise. However, even at baseline, women reported high levels of the perceived benefits of exercise. These perceived benefits continued to exist post-intervention, as well. Therefore, it is possible that the benefits of exercise subscale had a ceiling effect, which may explain the lack of significant changes. Additionally, we may have lacked power to detect statistically-significant differences.

Several limitations should be noted. This was a small, open pilot study of a lifestyle physical activity intervention for alcohol dependent women who experience depression. Thus, results may not generalize to other non-clinical populations or to men. The small sample size may preclude us from detecting or missing significant differences. Additionally, given that we did not have an objective measure of physical activity at baseline, we rely on self-reported changes in physical activity in this study. Lastly, without a control condition, it is not possible to attribute findings directly to the physical activity intervention. Thus, future

randomized controlled trials with larger sample sizes are necessary to replicate these preliminary findings.

Despite these limitations, results from this open pilot suggest that women in early recovery from alcohol who increase physical activity – specifically as a means to cope with negative affect and craving – also demonstrate other improved coping strategies, have an increase in autonomous motivation, and have increases in beliefs about the benefits of physical activity.

References

Abraham, C., Sheeran, P. The health belief model. In: Conner, M., Norman, P., editors. Predicting and Changing Health Behavior. 3. McGraw-Hill: 2015.

Abrantes AM, Blevins CE, Battle C, Read JP, Gordon AL, Stein MD. Developing a Fitbit-Supported Lifestyle Physical Activity Intervention for Depressed Alcohol Dependent Women. Journal of Substance Abuse Treatment. 2017; 80:88–97. [PubMed: 28755778]

Abrantes, AM., Matsko, S., Wolfe, J., Brown, SA. Physical activity and alcohol and drug use disorders. In: Ekkekakis, P., editor. Handbook on physical activity and mental health. Book Section, New York: Routledge; 2013. p. 465-477.

Allgöwer, A., Wardle, J., Steptoe, A. Health Psychology. Vol. 20. American Psychological Association; 2001. Depressive symptoms, social support, and personal health behaviors in young men and women; p. 223

Bartholomew JB, Morrison D, Ciccolo JT. Effects of acute exercise on mood and wellbeing in patients with major depressive disorder. Medicine and Science in Sports and Exercise. 2005; 37(12):2032–2037. DOI: 10.1249/01.mss.0000178101.78322.dd [PubMed: 16331126]

Borg G. Perceived exertion as an indicator of somatic stress. Scandinavian Journal of Rehabilitation Medicine. 1970; 2(2):92–98. [PubMed: 5523831]

Brienza RS, Stein MD. Alcohol use disorders in primary care: do gender-specific differences exist? J Gen Intern Med. 2002; 17(5):387–397. [PubMed: 12047738]

Brown, RA., Abrantes, AM., Minami, H., Read, JP., Marcus, BH., Jakicic, JM., Strong, DR., et al. Journal of Substance Abuse Treatment. Vol. 47. Elsevier Inc.; 2014. A preliminary, randomized trial of aerobic exercise for alcohol dependence; p. 1-9.

Brown RA, Abrantes AM, Read JP, Marcus BH, Jakicic J, Strong DR, Oakley JR, et al. Aerobic exercise for alcohol Recovery: rationale, program description, and preliminary findings. Behavior Modification. 2009; 33:220–249. [PubMed: 19091721]

Buman, MP., Hekler, EB., Haskell, WL., Pruitt, L., Conway, TL., Cain, KL., Sallis, JF., et al. American Journal of Epidemiology. Vol. 172. Oxford University Press; 2010. Objective light-intensity physical activity associations with rated health in older adults; p. 1155-1165.

Carver CS. You want to Measure Coping But Your Protocol's Too Long: Consider the Brief COPE. International Journal of Behavioral Medicine. 1997; 4(1):92. [PubMed: 16250744]

Cornelius JR, Jarrett PJ, Thase ME, Fabrega H Jr, Haas GL, Jones-Barlock A, Mezzich JE, et al. Gender effects on the clinical presentation of alcoholics at a psychiatric hospital. Compr Psychiatry. 1995; 36(6):435–440. [PubMed: 8565448]

Deci, EL., Ryan, RM. Self-Determination Theory. In: Van Lange, PAM.Kruglanski, AW., Higgins, ET., editors. Handbook of Theories of Social Psychology. SAGE; 2011. p. 1144

Fortier MS, Duda JL, Guerin E, Teixeira PJ. Promoting physical activity: development and testing of self-determination theory-based interventions.(Review). The International Journal of Behavioral Nutrition and Physical Activity. 2012; 9:20.doi: 10.1186/1479-5868-9-20 [PubMed: 22385751]

Fortier MS, Hogg W, O TL, Blanchard C, Reid RD, Sigal RJ, Boulay P, et al. The physical activity counselling (PAC) randomized controlled trial: rationale, methods, and interventions. Appl. Physiol. Nutr. Metab. 2007; 32(August):1170–1185. DOI: 10.1139/H07-075 [PubMed: 18059592]

Grubbs, L., Carter, J. Family & community health. Vol. 25. United States; 2002. The relationship of perceived benefits and barriers to reported exercise behaviors in college undergraduates; p. 76-84.

Hagger M, Chatzisarantis N. Self-determination Theory and the psychology of exercise. International Review of Sport and Exercise Psychology. 2008; doi: 10.1080/17509840701827437

Hallgren M, Vancampfort D, Giesen ES, Lundin A, Stubbs B. Exercise as treatment for alcohol use disorders: systematic review and meta-analysis. British Journal of Sports Medicine. 2017; 51(14): 1058–1064. DOI: 10.1136/bjsports-2016-096814 [PubMed: 28087569]

Hartka E, Johnstone B, Leino EV, Motoyoshi M, Temple MT, Fillmore KM. A meta-analysis of depressive symptomatology and alcohol consumption over time. British Journal of Addiction. 1991; 86(10):1283–1298. [PubMed: 1836410]

Haskell WL, Lee IM, Pate RR, Powell KE, Blair SN, Franklin BA, MacEra CA, et al. Physical activity and public health: Updated recommendation for adults from the American College of Sports Medicine and the American Heart Association. Medicine and Science in Sports and Exercise. 2007; 39(8):1423–1434. DOI: 10.1249/mss.0b013e3180616b27 [PubMed: 17762377]

Ingledew DK, Markland D, Medley aR. Exercise Motives and Stages of Change. Journal of Health Psychology. 1998; 3(4):477–489. DOI: 10.1177/135910539800300403 [PubMed: 22021408]

Ivanova E, Jensen D, Cassoff J, Gu F, Knäuper B. Acceptance and commitment therapy improves exercise tolerance in sedentary women. Medicine and Science in Sports and Exercise. 2015; 47(6): 1251–1258. DOI: 10.1249/MSS.0000000000000536 [PubMed: 25290743]

Janz, NK., Becker, MH. Health education quarterly. Vol. 11. United States; 1984. The Health Belief Model: a decade later; p. 1-47.

Kadden RM, Litt MD. The role of self-efficacy in the treatment of substance use disorders. Addictive Behaviors. 2011; 36:1120–1126. [PubMed: 21849232]

Kessler RC, Crum RM, Warner LA, Nelson CB, Schulenberg J, Anthony JC. Lifetime co-occurrence of DSM-III-R alcohol abuse and dependence with other psychiatric disorders in the National Comorbidity Survey. Archives of General Psychiatry. 1997; 54(4):313–321. [PubMed: 9107147]

Kroenke K, Spitzer RL, Williams JBW. The PHQ-9. 2001; 46202:606–613.

Kvam S, Kleppe CL, Nordhus IH, Hovland A. Exercise as a treatment for depression: A meta-analysis. Journal of Affective Disorders. 2016; 15(202):67–86.

Larimer ME, Palmer RS, Marlatt GA. Relapse prevention: An overview of Marlatt's Cognitive-Cehavioral Model. Alcohol Research & Health. 1999; 23(2):151–60. DOI: 10.1186/1747-597X-6-17 [PubMed: 10890810]

Lee, I-M., Shiroma, EJ., Lobelo, F., Puska, P., Blair, SN., Katzmarzyk, PT. Lancet (London, England). Vol. 380. England; 2012. Effect of physical inactivity on major non-communicable diseases worldwide: an analysis of burden of disease and life expectancy; p. 219-229.

Lehavot K, Stappenbeck CA, Luterek JA, Kaysen D, Simpson TL. Gender differences in relationships among PTSD severity, drinking motives, and alcohol use in a comorbid alcohol dependence and PTSD sample. Psychology of Addictive Behaviors. 2014; 28(1):42–52. [PubMed: 23647151]

Markland, D., Tobin, V. Journal of Sport and Exercise Psychology. Vol. 26. Human Kinetics; 2004. A Modification to the Behavioural Regulation in Exercise Questionnaire to Include an Assessment of Amotivation; p. 191-196.

McLellan AT, Lewis DC, O'Brien CP, Kleber HD. Drug Dependence, a Chronic Medical Illness. Jama. 2000; 284(13):1689.doi: 10.1001/jama.284.13.1689 [PubMed: 11015800]

Nahas, M., Goldfine, B., Collins, M. Determinants of Physical Activity in Adolescents and Young Adults: The Basis for High School and College Physical Education to Promote Active Lifestyles. Faculty Publications. 2003. Retrieved from http://digitalcommons.kennesaw.edu/facpubs/2088

Panza, GA., Weinstock, J., Ash, GI., Pescatello, LS. Psychology of sport and exercise. Vol. 13. Netherlands; 2012. Psychometric Evaluation of the Timeline Followback for Exercise among College Students; p. 779-788.

Pelletier LG, Fortier MS, Vallerand RJ, Briere NM. Associations among perceived autonomy support, forms of self-regulation, and persistence: A prospective study. Motivation and Emotion. 2001; 25(4):279–306. DOI: 10.1023/A:1014805132406

Petruzzello SJ, Landers DM, Hatfield BD, Kubitz KAK, Salazar W. A meta-analysis on the anxiety-reducing effects of acute and chronic exercise. Outcomes and mechanisms. Sports Medicine. 1991; 11(3):143–182. DOI: 10.2165/00007256-199111030-00002 [PubMed: 1828608]

Rackow P, Berli C, Lüscher J, Luszczynska A, Scholz U. Emotional or instrumental support? Distinct effects on vigorous exercise and affect. Psychology of Sport and Exercise. 2017; 33:66–74. DOI: 10.1016/j.psychsport.2017.07.011

Ransdell LB, Detling N, Hildebrand K, Lau P. Can physical activity interventions change perceived exercise benefits and barriers? American Journal of Health Studies. 2004; 19(4):195.

Rhodes, RE., Mark, RS., Temmel, CP. American Journal of Preventive Medicine. Vol. 42. Elsevier Inc.; 2012. Adult sedentary behavior: A systematic review; p. e3-e28.

Ritchie C. Rating of Perceived Exertion (RPE). Journal of Physiotherapy. 2012; 58:62. [PubMed: 22341388]

Ryan RM, Deci EL. Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. The American psychologist. 2000; 55(1):68–78. DOI: 10.1037/0003-066X.55.1.68 [PubMed: 11392867]

Ryan RM, Fredrick CM, Lepes D, Rubio N, Sheldon KM. Intrinsic Motivation and Exercise Adherence. International Journal of Sport Psychology. 1997

Sanchez K, Walker R, Campbell AN, Greer TL, Hu MC, Grannemann BD, Nunes EV, et al. Depressive Symptoms and Associated Clinical Characteristics in Outpatients Seeking Community-based Treatment for Alcohol and Drug Problems. Subst Abus. 2014; 0. Journal Article. doi: 10.1080/08897077.2014.937845

Schenker S. Medical consequences of alcohol abuse: is gender a factor? Alcohol: Clinical and Experimental Research. 1997; 21(1):179–181.

Sechrist, KR., Walker, SN., Pender, NJ. Research in nursing & health. Vol. 10. United States; 1987. Development and psychometric evaluation of the exercise benefits/barriers scale; p. 357-365.

Stein M, Caviness C, Anderson B, Abrantes A. Sitting time, but not levels of physical activity, is associated with depression in methadone-maintained smokers. Mental Health and Physical Activity. 2013; 6(1):43–48. DOI: 10.1016/j.freeradbiomed.2008.10.025.The [PubMed: 23894252]

Steinhardt M, Dolbier C. Evaluation of a Resilience Intervention to Enhance Coping Strategies and Protective Factors and Decrease Symptomatology. Journal of American College Health. 2008; 56(4):445–453. DOI: 10.3200/JACH.56.44.445-454 [PubMed: 18316290]

Stephan Y, Boiché J, Scanff CL. Motivation and physical activity behaviors among older women: A self-determination perspective. Psychology of Women Quarterly. 2010; 34(3):339–348. Retrieved from http://dx.doi.org/10.1111/j.1471-6402.2010.01579.x.

Teixeira PJ, Carraça EV, Markland D, Silva MN, Ryan RM. Exercise, physical activity, and self-determination theory: A systematic review. International Journal of Behavioral Nutrition and Physical Activity. 2012; 9(1):78.doi: 10.1186/1479-5868-9-78 [PubMed: 22726453]

Teixeira, PJ., Silva, MN., Mata, J., Palmeira, AL., Markland, D. International Journal of Behavioral Nutrition and Physical Activity. Vol. 9. BioMed Central Ltd; 2012. Motivation, self-determination, and long-term weight control; p. 22

Teychenne, M., Ball, K., Salmon, J. International journal of behavioral medicine. Vol. 17. Springer; 2010. Sedentary behavior and depression among adults: a review; p. 246-254.

Tucker, JM., Welk, GJ., Beyler, NK. American Journal of Preventive Medicine. Vol. 40. Elsevier Inc.; 2011. Physical activity in U.S. adults: Compliance with the physical activity guidelines for Americans; p. 454-461.

Ussher M, Sampuran AK, Doshi R, West R, Drummond DC. Acute effect of a brief bout of exercise on alcohol urges. Addiction. 2004; 99(12):1542–1547. Journal Article. DOI: 10.1111/j.1360-0443.2004.00919.x [PubMed: 15585045]

Vancampfort, D., Moens, H., Madou, T., De Backer, T., Vallons, V., Bruyninx, P., Vanheuverzwijn, S., et al. Psychiatry Research. Vol. 240. Elsevier; 2016. Autonomous motivation is associated with the maintenance stage of behaviour change in people with affective disorders; p. 267-271.

Vaughn S. Factors influencing the participation of middle-aged and older Latin-American women in physical activity: a stroke-prevention behavior. Rehabilitation nursing : the official journal of the Association of Rehabilitation Nurses. 2009; 34(1):17–23. DOI: 10.1002/j.2048-7940.2009.tb00243.x [PubMed: 19160920]

Williams DM, Anderson ES, Winett RA. A review of the outcome expectancy construct in physical activity research. Annals of Behavioral Medicine. 2005; 29(1):70–79. DOI: 10.1207/s15324796abm2901_10 [PubMed: 15677303]

Wilson PM, Rodgers WM, Loitz CC, Scime G. "It's Who I Am … Really!' The Importance of Integrated Regulation in Exercise Contexts1. Journal of Applied Biobehavioral Research. 2006; 11(2):79–104. DOI: 10.1111/j.1751-9861.2006.tb00021.x

Author Manuscript

Author Manuscript

Author Manuscript

Adaptive coping, autonomous motivation increased after physical activity intervention

Changes were associated with using physical activity to cope

Women in early alcohol recovery benefitted from physical activity

Table 1

Descriptive statistics

	Baseline (n=20)	**12 Weeks (n=14)**	***t-test* (sig)**	**Cohen's d_z**
BBE				
Benefits	93.68(8.84)	96.78(11.21)	1.10 (p=0.29)	0.24
Barriers	25.63(4.34)	24.36(5.62)	−0.54 (p=0.60)	−0.11
Coping				
Adaptive Coping	4.98(1.13)	6.21(1.43)	2.83 (p=0.01)	0.89
Motivation				
Relative Autonomy	35.21(21.38)	48.64(22.66)	2.54 (p=0.02)	0.61

Note: Values in bold represent statistically significant changes from baseline to end-of-treatment using paired samples t-tests (n=14).

Table 2

Bivariate correlations between beliefs, autonomy, coping, and physical activity measures

	1.	2.	3.	4.	5.	6.	7.
1. Benefits	-	−.80 **+	.62 *	.85 **+	.10	−.05	.59 *
2. Barriers	−.68 **+	-	−.58 *	−.63 *	−.03	0.16	−.39
3. Adaptive	−.24	−0.18	-	.79 **+	.15	0.02	.58 *
4. Relative Autonomy	.26	−.61 **+	.24	-	.15	0.02	.76 **+
5. All exercise	−.13	−.32	.51 *	.24	-	.95 **+	−.04
6. MVPA	.03	−.24	.50 *	.21	.74 **+	-	−.23
7. Exercise to cope	−.09	−.23	−.39	−.11	.14	.09	-

Note: below the diagonal is baseline, above the diagonal is 12-weeks

** Correlation is significant at the 0.01 level (2-tailed)

* Correlation is significant at the 0.05 level (2-tailed)

+ Correlation is significant at the 0.05 level (2-tailed) using Bonferroni correction.

Table 3

Standardized regression coefficients of beliefs, coping skills, and autonomous motivation on physical activity

	All Exercise β	MVPA β	Exercise to Cope β
Benefits	.27	−.03	.90*
Barriers	.45	.59	−.76
Adaptive Coping	−.01	−.08	.76*
Relative Autonomy	.10	−.09	1.00**

Note: all analyses control for baseline levels of the outcome and variables of interest.

* $p < 0.05$

** $p < 0.01$