

Research Article

The Role of Social Support, Self-Efficacy, and Motivation in the Exercise Behavior of Women

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ABSTRACT

Objectives: The purpose of the study was to explore factors related to exercise behavior (i.e., concrete physical social support, general social support, exercise social support, exercise self-efficacy and intrinsic/extrinsic motivation) to determine how these factors vary in relation to women's exercise behavior. Further, the study examined how exercise social support, exercise self-efficacy and intrinsic/extrinsic motivation relate to the stability of exercise behavior over time.

Methods: A community sample of 357 adult female participants, completed a baseline online survey. Participants were recruited online, by email, or by posters and were asked to participate in a study investigating women's daily activities. After three months, a total of 243 participants completed a follow-up online survey (68% response rate).

Results: At baseline, the study identified significant differences for all of the factors by stage of change except for concrete physical social support. Women reported differing levels of reliable alliance ($p < .001$), exercise social support ($p < .001$), exercise self-efficacy ($p < .001$), and extrinsic ($p < .001$) and intrinsic ($p < .001$) motivation by stage. When the factors were examined over a three month time frame, there were differences in reported exercise social support ($p < .001$), exercise self-efficacy ($p < .001$), and intrinsic ($p < .001$)/extrinsic ($p < .001$) motivation based on the stability of exercise behavior.

Conclusions: Overall, the findings from the current study suggest that there are a number of factors that could encourage the initiation and maintenance of exercise behavior, including social support, motivation and self-efficacy. An interesting finding in the current study was that having an actual partner for exercise did not have a significant influence on women's exercise behavior.

INTRODUCTION

Those who regularly exercise have lower levels of depression and lower risk for chronic disease [1]. Despite the health benefits of exercise, according to the Center for Disease Control and Prevention's (CDC) 2018 National Health Interview Survey, just over half of people over the age of 18 (53%) report that they participate in regular aerobic activity [2]. Women have lower aerobic activity levels compared to men (49.3% and 57.6% respectively) [2], and report more barriers to exercise [3]. The lower exercise rates of women put them at higher risk for both depression and metabolic syndrome, which increases chances for coronary disease,

stroke and Type 2 diabetes [1]. Further, physical inactivity over the age of 31 is the highest risk for heart disease for women [4] and research findings show that having lower physical activity levels increases the risk of death more in women than men [5]. Given the potential benefits of exercise and the significant risk of inactivity for women, it is important to understand the factors that influence women to both begin and continue to exercise.

Social Support

Research on both general social support and exercise specific social support consistently shows a positive relationship between perceived social support and exercise behavior [6-8] that relates both to the initiation of exercise for sedentary individuals [7] and assists in exercise maintenance [6,7,9]. Further, changes over time in exercise specific social support affect the level of physical activity in which an individual participates [10]. One barrier to exercise adherence reported

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by women is the lack of a work-out partner [11,12].

Given the relationship of social support to exercise behavior, it is important to understand how the components of general social support relate to physical activity. Weiss [13] identified a multidimensional construct with the following six provisions of general social support that may take place in a relationship: attachment, refers to emotional support; social integration, refers to feeling a sense of belonging within a group due to shared interests and goals; reassurance of worth, is support that comes in the form of increasing an individual's self-esteem; reliable alliance, refers to a sense of security; guidance which refers to informational support; and, nurturance, refers to an increase in personal competence.

The multiple provisions of social support as they relate to exercise were explored in several studies [14-16]. Each of these studies identified specific social support provisions that were related to exercise behavior. For women, reassurance of worth consistently appeared as a provision related to exercise behavior [14-16].

Extrinsic and Intrinsic Motivation to Exercise

Another exercise related factor identified in previous research is motivation which can be either intrinsic or extrinsic. Intrinsic motivation refers to completing an action because of the pleasure and satisfaction gained from performing the behavior [17-19]. Extrinsic motivation to perform an action refers to the carrying out of a behavior for reasons outside of the actual action, such as gaining praise from others or avoiding negative evaluations [17-19].

Extrinsic motivation has a positive relationship with exercise behavior [20] and intrinsic motivation shows a strong positive relationship with physical activity levels [21,22]. Men report higher intrinsic motivation for exercise compared to women [19]. Further, women are more likely than men to report exercising for the extrinsic reasons over internal drives: losing weight, shaping their bodies and improving physical appearance [23-25].

Motivation is also related to exercise behavior change. Specifically, people who begin to exercise report higher levels of extrinsic motivation [26], while those who maintain exercise regimens over time report higher levels of intrinsic motivation [21,27]. Further, intrinsic motivation increases with the initiation of an exercise program [28].

Exercise Self-efficacy

A consistent factor related to exercise behavior is exercise self-efficacy. Specifically, as a person's expression of exercise self-efficacy increases so too does the likelihood that that person will be participating in exercise behavior [8,29-32]. Self-efficacy levels are also related to adherence to an exercise program, such that higher levels of self-efficacy are related to an increase in adherent behavior [33,34]. As with motivation, gender differences also exist for self-efficacy. Specifically, men report higher levels of self-efficacy for

physical activity [35]

McNeil and colleagues [6] found a relationship with self-efficacy for physical activity and motivation to exercise. Specifically, they reported that higher levels of intrinsic motivation were related to higher levels of self-efficacy. The researchers hypothesize that having intrinsic reasons for exercising actually increases people's confidence in their ability to perform the activity.

Behavior Change

In the current study, it was of interest to determine the individual difference variables associated with exercise participation. The current study uses the transtheoretical model of change (TTM; hereafter referred to as the stages of change model)[37] to describe participants' exercise behavior. According to this model [37], there are five stages of change: precontemplation, contemplation, preparation, action, and maintenance. In precontemplation, an individual is not planning to make any changes in at least the next six months. During the contemplation stage, people are thinking about making a change, but feel a general sense of ambivalence about making the change. At the preparation stage, an individual has an interest in making a change in the immediate future. The action stage is where the change in behavior occurs. The final stage of maintenance is when the individual seeks to continue with the behavior change that was made in the action stage [37].

Despite some arguments against the use of the TTM as a stage model for complex behaviors like physical activity [38,39], the TTM is still considered a useful model to explore [40] and the TTM continues to be used in research to explore complex behaviors [41-43], which makes it an appropriate model to use in the current study.

Current Study

The current study builds on previous research findings by examining the relationship of the provisions of social support and stage of exercise behavior in women—in an era when exercise behavior is emphasized as essential to health and well-being— and provides a more comprehensive description of factors related to exercise behavior by including many of the factors that have been shown to be associated with one's participation in exercise (i.e., exercise self-efficacy, exercise social support, and intrinsic and extrinsic motivation). In addition, the current study seeks to inform a gap in the literature regarding the use of concrete physical social support. Specifically, the study explores typical exercise behavior to determine if women who report actually working out with at least one other person differ in their physical activity levels from those who work out alone.

Further, the current study examines factors that impact physical activity behavior over time. The stages of change model does not recognize a behavior as being in maintenance until it has been consistently performed for six months; however, research has shown that on average a be-

havior becomes a habit in 66 days [44]. The current study examines behavior at baseline and three months later, which would allow women time to develop, stop or maintain the habit of exercise behavior.

In summary, the current study expands on past research by combining in one study multiple factors that have been shown to be related to exercise behavior changes over time (i.e., intrinsic/extrinsic motivation, exercise self-efficacy, and exercise social support) and examines how they relate to exercise behavior change.

No studies have investigated the differences in social support components by the stages of change; therefore, the current study is exploratory, and the literature does not provide data to inform a hypothesis about which provisions of social support will be more important at the various stages. However, past research does suggest that there is a difference in overall social support for individuals who are sedentary and adherent, which leads to the current study's prediction that there would be differences in the social support provisions (i.e., attachment, social integration, reassurance of worth, reliable alliance, guidance and opportunity for nurturance) by current stage of change for women. Further, we expected that there would be differences in the level of exercise social support reported by stage. Specifically, we anticipated that women not regularly exercising (i.e., the lower stages of pre-contemplation, contemplation, and preparation) would express lower levels of exercise social support and women who were regularly exercising (i.e., the higher stages of action and maintenance) would report higher levels of exercise social support. For concrete physical social support, it was expected that women who had at least one work out partner, would be more likely to be exercising (i.e., action or maintenance stage) at the initial measurement because past research suggests that social support is related to adherence to exercise programs. We expected to find individuals in the earlier stages with more extrinsic motivation to exercise, while individuals in the later stages would express higher levels of intrinsic motivation to exercise. Further, it was anticipated that individuals' level of exercise self-efficacy would be lower in the earlier stages of change and would increase with the stages ending at its highest level in the maintenance stage.

For exercise behavior change over time, it was anticipated that when exercise behavior changed, there would be a shift in the exercise related factors to correspond with this change. Specifically, when women move from not exercising regularly to exercising regularly there would be an increase in the reporting of perceived exercise specific factors of social support, self-efficacy and intrinsic and extrinsic motivation. On the other hand, when women move from exercising regularly to not exercising regularly, they would show a decline in the exercise related factors of social support, self-efficacy and intrinsic and extrinsic motivation. Further, it was expected that the women who maintain exercise behavior would not show significant changes in the exercise related factors.

METHODS

Study Participants

357 adult female participants completed a survey at baseline and 243 participants completed the three month follow-up survey, a 68 percent response rate. Participants were recruited online, by email, or by posters in the Washington, DC area. All participants were located within the United States. The recruitment material stated that the study was investigating women's daily activities. The participants were enrolled in a lottery for a \$50 prize as compensation for taking part in the research study.

The number of participants enrolled provided sufficient power to test the hypotheses. To determine the effect size, a comprehensive review of similar past research studies was conducted which revealed medium to large effect sizes. No prior studies examined the relationship of the stages of change and social provisions; therefore, a medium effect size was assumed for the power calculation. The power analysis was conducted assuming an ANOVA with fixed effects, special, main effects and interactions. Using a medium effect size, a power of 0.80 and an alpha of 0.05, the power analysis predicted the need for 169 participants for the comparison of group differences [45]. This indicates the need for approximately 34 participants in each of the five groups. A larger sample was collected for two reasons: 1) to allow for any potential data that needed to be dropped prior to analysis due to incomplete data and 2) to ensure all of the groups had at least the 34 participants for the final analysis.

Measures

Stage of Change Questionnaire [30,46]. This measure captures information on participants' stage of change related to exercise. The measure defines regular exercise as 30 minutes of moderate activity over the course of the day every day or vigorous activity three times per week for 20 minutes. Participants' stages of change are defined as: pre-contemplation (no plans to start an exercise program); contemplation (plans to start to exercise within the next six months); preparation (some activity, but it did not meet the criteria for regular exercise); action (regular exercise for less than six months); and, maintenance (regular exercise for more than six months). Past research has shown concurrent validity with another measure of leisure time exercise [47,48].

Social Provisions Scale [49]. This scale assesses the social support provisions that Weiss [13] identified. Russell & Cutrona [49] conducted a confirmatory factor analyses which found that the six provisions held. Participants respond to how similar statements are to their current relationships (e.g., "There are people I can depend on to help me if I really need it") on a 4-point scale. Past research using the Social Provisions Scale had alpha coefficients ranging from 0.62 to 0.95 [49]. The internal consistency for the current study at baseline was $\alpha = 0.919$.

Social support for exercise [50]. This scale measures 13

ways in which social support for exercise might be provided by friends or family (e.g., “Discussed exercise with me”). The participants are asked to rate on a 5-point scale whether someone has provided this type of social support in the past three months. Past research using the social support for exercise scale had alpha coefficients ranging from 0.84 to 0.93 [51]. The internal consistency at baseline was $\alpha = 0.878$ and at three months was $\alpha = 0.872$.

Motivation for Physical Activity Measure (MPAM-R) [18]. The MPAM-R has 30 items which measure five different motivations for exercise. These five motivations are interest/enjoyment motivation, competence motivation, appearance motivation, fitness motivation, and social motivation. The items on the subscales of interest/enjoyment and competence represent intrinsic motivations for exercise (e.g. “Because it’s fun”) while appearance, fitness and social motivation represent extrinsic motivations for exercise (e.g., “Because I want to improve my appearance”). Participants answer on a seven-point scale how much each of the 30 items are like them. Past research has shown that the MPAM-R is a valid and reliable measure [17,18]. A previous study using the MPAM-R reported alpha coefficients ranging from 0.78 to 0.92 [18]. The internal consistency at baseline was $\alpha = 0.947$ and at three months was $\alpha = 0.943$.

Exercise Self-Efficacy Scale (ESES)[52,53]. The ESES is an 18 item scale that lists situations that could interfere with regular exercise behavior (e.g., “When I am feeling tired”). The participants are asked to rate how confident they are they could perform regular exercise, given each of the circumstances listed, on a scale of 0-100, ranging from zero, cannot do at all, to 100 certain can do it. A previous study using the ESES reported an alpha coefficient of 0.85 [54]. The internal consistency at baseline was $\alpha = 0.930$ and at three months was $\alpha = 0.887$.

Additional Exercise Behavior Measure. One question was developed specifically for the current study. Participants were asked with whom they were exercising (i.e., “When you exercise, are you more likely to work out with a partner, group, trainer or alone?”).

Procedure

The structure of the current study was a longitudinal, ob-

servational study with repeated measures where the participants completed the same surveys at baseline and three months later. Women, who lived in the United States, with access to a computer, who were able to read in English, were included in the study. The current study allowed for a wide age range of participants and some research suggests possible differences in motivations for exercise by age [55], while other research indicates that exercise behavior is highly stable over time [56]. However, the research findings are not consistent [57]; therefore, the current study did not exclude any age groups. No other exclusion criteria were included.

After receiving approval from the University IRB (protocol #11177), women were recruited for the study. Women expressed interest in the study by contacting an email address. An email was then sent to the interested participant asking her to provide an email contact for the follow-up surveys. She was also provided with an ID number and directed to a website which contained the informed consent and the study questionnaires. After consenting, participants were directed to the set of questionnaires about social support, motivation and exercise behavior. The questionnaires were completed in the same order by all participants. If participants had not completed the survey within approximately two weeks of receiving the first email, a reminder email was sent. Participants were contacted three months later by email and asked to complete the same set of questionnaires.

RESULTS

A community sample of 357 adult female participants who resided in the United States, ages 18 to 75, were recruited at baseline. Data from 18 participants were subsequently excluded from data analysis due to incomplete data. A total of 243 participants completed three month follow-up surveys, a 68 percent response rate. Two hundred and twenty eight participants completed both a baseline and a three month follow-up with sufficient data. Table 1 provides the demographics of participants at baseline and three months.

Women who responded to both the baseline and three month surveys (M=31.75, SD=14.23) were older than women who responded to only the baseline (M=25.93, SD=10.82; $t(317)=19.145$, $p < .001$). For racial/ethnicity distribution, there was a significant difference between those that only

Table 1. Demographics of Baseline and Three Month Participants

Demographics	Baseline (N=319)	Three Month (N=205)
Age (mean±SD)	30.01±13.55	32.59±14.36
Caucasian	230 (68%)	168 (74%)
Asian	25 (7%)	15 (7%)
Multi-racial	24 (7%)	21 (9%)
Hispanic/Latino	19 (6%)	6 (3%)
Black/African American	13 (4%)	9 (4%)
Other	5 (1%)	4 (2%)
Native Hawaiian or Other Pacific Islander	1 (<1%)	1 (<1%)
No response	22 (6%)	4 (2%)

Table 2. Demographics by Survey Completion

	Percentage of Baseline (N=95)	Percentage of Baseline & 3 Month (N=224)
Age (mean±SD)	25.93±10.82	31.75±14.23
Asian	10 (9%)	15 (7%)
Black/African American	4 (4%)	9 (4%)
Native Hawaiian or Other Pacific Islander	0 (0%)	1 (<1%)
Caucasian	62 (56%)	168 (74%)
Hispanic/Latino	13 (12%)	6 (3%)
Multi-racial	3 (3%)	21 (9%)
Other	1 (<1%)	4 (2%)
No response	18 (16%)	4 (2%)

Table 3. Mean Age by Stage of Change

Stage of change	N	Mean	SD
Contemplation	42	24.60	10.13
Preparation	115	28.20	13.22
Action	55	24.98	8.42
Maintenance	107	36.67	14.64

completed baseline and those that completed both surveys ($\chi^2(7, N = 339) = 44.481, p < .001$). While the majority of the sample was Caucasian regardless of survey completion, the proportion of Caucasian women was higher in those that completed both surveys (Baseline only 56%; Both surveys 74%). Two other groups showed a difference in the proportion of the survey respondents by survey completion. Specifically, the number of women who were Hispanic/Latino was higher among baseline only respondents (Baseline only 12%; Both 3%) and the percentage of women who were Multi-racial was higher for those completing both surveys (Baseline only 3%; Both 9%). Finally, the proportion of women who did not report a race/ethnicity was higher for women only completing a baseline survey (Baseline only 16%; Both 2%). Table 2 displays the demographic information of participants by survey completion.

The 339 participants included in the baseline data were first categorized into the stages of change for exercise behavior. No participants were in the precontemplation stage; therefore, it was eliminated from analyses and at baseline only four stages of change were compared: contemplation stage (N= 45, 13%), preparation stage (N=125, 37%), action stage (N= 57, 17%), and maintenance stage (N= 112, 33%). These 339 participants were used for all baseline data analyses.

Baseline Age

The baseline data were examined for age by stages of change (Table 3). The data for age and stage of change violated the assumptions for a one way ANOVA. Specifically, the data were skewed and the Levene’s test of homogeneity of variance was significant, $F(3, 315) = 14.377, p < .001$, which suggested the need for a nonparametric test. Findings from a Kruskal-Wallis test indicated that there were significant differences in age across the stages of change, $H(3) = 52.712, p < .001$. Using a Bonferroni correction and Mann Whitney U post hoc pairwise comparisons, significant differences between the maintenance and contemplation, $U=905.50, Z=-5.667, p < .006$, preparation, $U=3544, Z=-5.463, p < .006$, and action, $U=1333.5, Z=-5.698, p < .006$ stages were identified. In other words, the maintenance group had a higher average age than the participants in the contemplation, preparation, and action stages.

Baseline Study Hypotheses

When age was correlated with the dependent variable (i.e., social provision subscales of social integration, nurturance,

Table 4. Reported Social Support Provisions by Stage of Change

	N	Mean	SD
Attachment			
Contemplation	44	13.77	1.94
Preparation	125	13.96	2.00
Action	57	14.07	1.82
Maintenance	112	14.43	1.87
Social Integration			
Contemplation	41	13.10	2.18
Preparation	114	13.47	1.94
Action	55	13.64	1.83
Maintenance	107	14.31	1.78
Nurturance			
Contemplation	41	12.17	2.18
Preparation	114	12.60	2.31
Action	55	11.98	2.23
Maintenance	107	13.14	2.22
Reassurance of worth			
Contemplation	41	13.39	2.01
Preparation	115	13.40	2.07
Action	55	13.45	1.80
Maintenance	106	14.27	1.80
Reliable Alliance*			
Contemplation	43	14.33	1.77
Preparation	124	14.40	1.83
Action	56	14.89	1.51
Maintenance	112	15.32	1.19
Guidance			
Contemplation	44	14.16	
Preparation	123	14.27	
Action	57	14.74	
Maintenance	112	14.88	

Note. For each of the social support provisions the following will include information in this format --subscale name (mean, score range): attachment (14.11, 8-16); social integration (13.70, 8-16); nurturance (12.61, 6-16); reassurance of worth (13.72, 6-16); reliable alliance (14.78, 9-16); and guidance (14.54, 8-16). Kruskal-Wallis with Mann Whitney U * $p < .001$

reassurance of worth), age was used as a covariate. In some cases, the data were examined using a linear model (i.e., ANCOVA). However, if this was not possible, due to violations of assumptions for linear models, a nonparametric test (i.e., Kruskal-Wallis) was employed. In order to include age as a covariate in the nonparametric tests, first a regression was run for the dependent variable with age and the residuals were saved. The Kruskal-Wallis test was then run with these newly created residuals and the independent variable (i.e., stage of change). When significant differences were identified Mann Whitney U (nonparametric) Sidak (linear, ANCOVA), or Tukey (linear, ANCOVA) post hoc analyses were conducted to identify which groups were significantly different. If the Mann Whitney U post hoc analyses were conducted, a Bonferroni correction was applied to account for the number of comparisons conducted.

For hypothesis one, the Levene’s test of equality of error

Table 5. Reported Social Support for Exercise by Stage of Change

Social Support for Exercise	N	Mean	SD
Contemplation	45	22.42	6.48
Preparation	125	28.30	8.89
Action	57	33.11	9.15
Maintenance	112	33.28	11.04

Note. Average score = 29.97; Range of scores 8-60.

variances was not significant for most of the social support provisions. The Levene’s test of equality of variances was significant for reliable alliance, $F(3, 311)=16.912, p<.001$, and guidance, $F(3, 312)=6.910, p<.001$. The data were skewed for all of the provisions. Due to the violations of the assumptions for ANCOVAs, the Kruskal-Wallis test was performed for this analysis. The means by stages of change for each of the provisions are presented in Table 4. The results partially support the first hypothesis. Specifically, the provision of reliable alliance showed significant differences between stages, $H(3)=20.95, p<.001$. Mann Whitney U post hoc pairwise comparisons identified differences between the maintenance and contemplation, $U=1656.50, Z=-3.46, p<.006$ and preparation, $U=4973, Z=-4.19$ stages. Women reported higher levels of reliable alliance when in the maintenance stage compared to the preparation and contemplation stages. There were no significant differences between the action stage and other stages of change.

The next analysis focused on exercise social support. While the Levene’s test of equality of error variances was significant, $F(3, 315)=3.989, p=.008$, otherwise, the data met the assumption of normality. As a result, the four groups were compared using an ANOVA. The findings from this analysis supported the hypothesis, as significant differences were found among the four groups related to social support for exercise, $F(3, 335)=17.58, p<.001$ (Table 5). Tukey post-hoc analyses indicated significant differences between the contemplation stage and the other three stages ($p<.002$). Further the preparation stage was significantly different than the action ($p=.008$) and maintenance ($p<.001$) stages. These findings suggest that women in the contemplation stage had the lowest level of social support for exercise compared to the other stages. Further, women in the preparation stage reported significantly lower levels of social support for exercise compared to women in the action and maintenance stages. There was no difference in the amount of social support for exercise reported for those in the action and maintenance stages.

The third analysis was related to reported exercise support behavior (i.e., concrete physical social support). To explore this hypothesis, the women were divided into two groups: Exercisers (i.e., women in the action or maintenance stage) or Sedentary/Non-regular exercisers (i.e., contemplation and preparation). The Exercisers and Non-regular exercisers/Sedentary groups were compared using a chi-square test of independence to see if they were significantly different in terms of exercise partner behavior. The majority of participants reported working out alone (N

Table 6. Reported Intrinsic and Extrinsic Motivation by Stage of Change

	N	Mean	SD
<i>Extrinsic</i>			
Contemplation	45	59.40	18.14
Preparation	125	75.81	14.87
Action	57	78.61	14.93
Maintenance	112	82.63	14.51
<i>Intrinsic</i>			
Contemplation	45	41.24	21.85
Preparation	125	54.20	21.98
Action	57	60.26	17.48
Maintenance	112	73.00	18.10

Note. Extrinsic motivation average = 76.35, score range 16-111 and Intrinsic motivation average = 59.71, score range 14-98

= 219) regardless of their stage of change. The analysis of the data did not support the hypothesis, $\chi^2(1, N = 310) = 0.016, p=.901$. Regular exercisers reported exercising with others 29% of the time and exercising alone 71% of the time. Sedentary/non-regular exercisers reported exercising with others 29.7% of the time and exercising alone 70.3% of the time. People who exercised with others were not more likely to be in the maintenance or action stages.

For the fourth hypothesis, the Levene’s test of equality of error variances was significant for intrinsic motivation, $F(3, 315)=3.281, p=.021$. While there was a slight skew for both intrinsic and extrinsic motivation levels, overall the data appeared to meet the assumptions for a normal distribution. Given these findings, the ANCOVA data are presented. There were statistically significant differences for both extrinsic, $F(3, 335)=25.37, p<.001$, and intrinsic $F(3, 335)=32.35, p<.001$ motivation (Table 6).

Consistent with the hypothesis, participants in the later stages of change expressed higher levels of intrinsic motivation compared to those in the earlier stages. Specifically, post hoc analyses indicated significant differences between the contemplation stage and the preparation ($p=.001$), action ($p<.001$) and maintenance ($p<.001$) stages. There was also a significant difference identified between the maintenance stage and the preparation ($p<.001$) and action stages ($p=.001$). No other differences were indicated by post hoc analyses for intrinsic motivation. In other words, participants in the maintenance stage had higher levels of intrinsic motivation compared to all of the other stages. Also, those in the contemplation stage had lower levels of intrinsic motivation compared to the three higher level stages (preparation, action and maintenance).

Inconsistent with the hypothesis, those in the later stages of exercise also reported higher levels of extrinsic motivation compared to those in the earlier stages. Specifically, post hoc analyses indicated significant differences between the contemplation stage and the preparation ($p<.001$), action ($p<.001$) and maintenance ($p<.001$) stages. There was also a significant difference identified between the preparation stage and the maintenance stage ($p=.004$). No other differences for extrinsic motivation were found.

Table 7. Reported Exercise Self-efficacy by Stage of Change

Exercise Self-Efficacy	N	Mean	SD
Contemplation	42	539.76	243.60
Preparation	115	715.32	301.40
Action	55	958.47	287.14
Maintenance	106	1237.92	343.2

Note. Average = 905.69, score range 0-1800

Participants in the maintenance stage had higher levels of extrinsic motivation compared to participants in the preparation and contemplation stages, while participants in the contemplation stage had the lowest level of extrinsic motivation compared to participants in the other three stages.

For the final baseline analysis, the Levene’s test of homogeneity of variance was significant for self-efficacy, $F(3,314)=2.709$, $p=.045$, but the data met the assumption for normality; therefore, an ANCOVA was performed. Consistent with the hypothesis, there was a statistically significant difference in exercise self-efficacy scores, $F(3, 313)= 69.525$, $p<.001$ (Table 7). Sidak, post hoc analyses indicated significant differences between all stages, all $p < .01$. Exercise self-efficacy was associated with stage of change, such that each stage reported higher levels of exercise self-efficacy compared to the stages below it.

Three Month Stage of Change

Two hundred and twenty eight participants had sufficient baseline and three month data. All analyses examining change over time included these 228 participants. At three months the women reported their exercise stages of change as following: 20 (9%) contemplation; 73 (32%) preparation; 50 (22%) action; and 85 (37%) maintenance. Changes in exercise behavior were categorized based on changes in women’s reported exercise stage of change at baseline and three months. Women who stayed in the maintenance and/or action stages from baseline to three month were labeled as “stable exercisers.” Women who remained in the

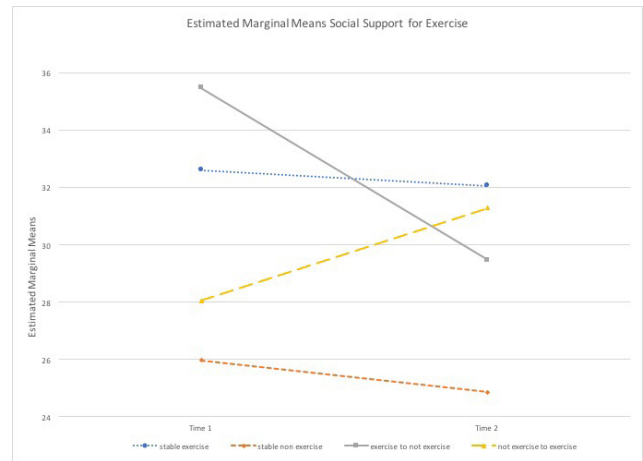


Figure 1. Social support for exercise by time and group

contemplation and/or preparation stages from baseline to three month were categorized as “stable non regular exercisers.” If a participant changed from maintenance and/or action stages to the contemplation and/or preparation stages, the women were labeled as “exercisers to non regular exercisers.” Women who moved into the action and/or maintenance stages from the contemplation and/or preparation stages were labeled as “non regular exercisers to exercisers.” The following is the change in exercise behavior reported over the three month period: 113 (50%) stable exercisers; 78 (34%) stable non regular exercisers; 15 (7%) exercisers to non regular exercisers; and 22 (10%) non regular exercisers to exercisers.

Three Month Analyses

A mixed between-within subjects ANOVA was conducted to examine three month hypotheses. When significant differences were identified post hoc analyses were conducted to identify which groups were significantly different.

For the social support for exercise measure, there was not a significant difference across the two time points, $F(1, 217) = 2.532$, $p = .113$. However, the between group difference,

Table 8. Results of Post-hoc Comparison for Perceived Social Support for Exercise by Group and Time

	Baseline M (SD)	Baseline Differences	Three Months M (SD)	Three month Differences
Stable exercisers vs. Stable non regular exercisers	32.59 (9.84) 25.96 (9.2)	$p<.001$	32.05 (9.91) 24.86 (8.25)	$p<.001$
Stable exercisers vs. Exercise to non-regular exercisers	32.59 (9.84) 35.47 (9.84)	N.S.	32.05 (9.91) 29.47 (8.37)	N.S.
Stable exercise vs. Non regular exercisers to exercisers	32.59 (9.84) 28.05 (9.48)	N.S.	32.05 (9.91) 31.27 (8.48)	N.S.
Stable non regular exercisers vs. Exercisers to non regular exercisers	25.96 (9.2) 35.47 (9.84)	$p=.003$	24.86 (8.25) 29.47 (8.37)	N.S.
Stable non regular exercisers vs. Non regular exercisers to exercisers	25.96 (9.2) 28.05 (9.48)	N.S.	24.86 (8.25) 31.27 (8.48)	$p=.025$
Exercise to not exercise group vs. Non regular exercisers to exercisers	35.47 (9.84) 28.05 (9.48)	N.S.	29.47 (8.37) 31.27 (8.48)	N.S.

Note. Mixed Between-Within Subjects ANOVA

Table 9. Results of Post-hoc Comparison for Perceived Self-Efficacy by Group and Time

	Baseline M (SD)	Baseline Differences	Three Months M (SD)	Three month Differences
Stable exercisers vs.	1199.53 (30.44)		1218.58 (27.9)	
Stable non regular exercisers	686.25 (36.62)	<i>p</i> <.001	673.26 (33.56)	<i>p</i> <.001
Stable exercisers vs.	1199.53 (30.44)		1218.58 (27.9)	
Exercise to non-regular exercisers	903.80 (82.43)	<i>p</i> =.005	717.47 (75.55)	<i>p</i> <.001
Stable exercise vs.	1199.53 (30.44)		1218.58 (27.9)	
Non regular exercisers to exercisers	759.09 (68.07)	<i>p</i> <.001	889.14 (62.38)	<i>p</i> <.001
Stable non regular exercisers vs.	686.25 (36.62)		673.26 (33.56)	
Exercisers to non regular exercisers	903.80 (82.43)	N.S.	717.47 (75.55)	N.S.
Stable non regular exercisers vs.	686.25 (36.62)		673.26 (33.56)	
Non regular exercisers to exercisers	759.09 (68.07)	N.S.	889.14 (62.38)	<i>p</i> =.016
Exercise to not exercise group vs.	903.80 (82.43)		717.47 (75.55)	
Non regular exercisers to exercisers	759.09 (68.07)	N.S.	889.14 (62.38)	N.S.

Note. Mixed Between-Within Subjects ANOVA

Table 10. Results of Post-hoc Comparison for Extrinsic Motivation by Group

	Baseline Mean (SD)	Three Months Mean (SD)	Significant Differences
Stable exercisers vs.	80.19 (1.48)	79.53 (1.42)	
Stable non regular exercisers	68.43 (1.85)	68.80 (1.77)	<i>p</i> <.001
Stable exercisers vs.	80.19 (1.48)	79.53 (1.42)	
Exercise to non-regular exercisers	79.43 (4.13)	73.21 (3.95)	N.S.
Stable exercise vs.	80.19 (1.48)	79.53 (1.42)	
Non regular exercisers to exercisers	75.75 (3.46)	77.95 (3.31)	N.S.
Stable non regular exercisers vs.	68.43 (1.85)	68.80 (1.77)	
Exercisers to non regular exercisers	79.43 (4.13)	73.21 (3.95)	N.S.
Stable non regular exercisers vs.	68.43 (1.85)	68.80 (1.77)	
Non regular exercisers to exercisers	75.75 (3.46)	77.95 (3.31)	N.S.
Exercise to not exercise group vs.	79.43 (4.13)	73.21 (3.95)	
Non regular exercisers to exercisers	75.75 (3.46)	77.95 (3.31)	N.S.

Note. Mixed Between-Within Subjects ANOVA

$F(3, 217)=10.255, p<.001$ and the interaction between time and group $F(3, 217) = 4.499, p=.004$ were significant (Figure 1). Post-hoc tests were used to examine the difference in social support for exercise based on the women’s exercise behavior over time (Table 8). The women who maintained a regular exercise habit (i.e., stable exercisers) consistently reported higher perceived social support for exercise than women who did not regularly exercise (i.e., stable non regular exercisers).

When women began to regularly exercise (i.e., non regular exercisers to exercisers), the perceived social support for exercise increased and became significantly different compared to stable non regular exercisers. Further, once women stopped exercising (i.e., exercisers to non regular exercisers), there was no longer a significant difference in perceived exercise social support compared to women who do not regularly exercise (i.e. stable non regular exercisers).

For the exercise self-efficacy measure, there was not a significant difference across the two time points, $F(1, 219) = .30, p = .584$. However, there was a significant between group difference, $F(3, 219)=57.708, p<.001$. Further, the interaction between time and group was significant $F(3,$

$219) = 5.011, p=.002$ (Figure 2). Post-hoc tests were used to examine the difference in exercise self-efficacy based on the women’s exercise behavior over time (Table 8). Stable exercisers consistently reported higher levels of exercise self-efficacy compared to all other groups. Further, when women

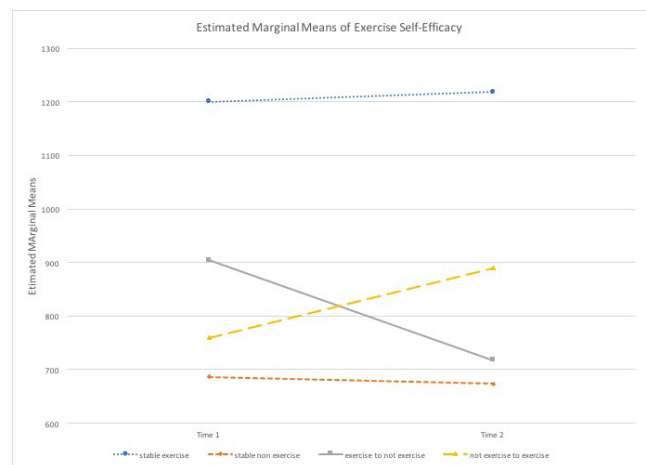


Figure 2. Exercise Self-efficacy by time and group

Table 11. Results of Post-hoc Comparison for Intrinsic Motivation by Group

	Baseline M (SD)	Three Months M (SD)	Significant Differences
Stable exercisers vs.	68.89 (1.93)	69.78 (1.81)	
Stable non regular exercisers	47.65 (2.38)	46.10 (2.23)	<i>p</i> <.001
Stable exercisers vs.	68.89 (1.93)	69.78 (1.81)	
Exercise to non-regular exercisers	60.36 (5.57)	58.77 (5.2)	N.S.
Stable exercise vs.	68.89 (1.93)	69.78 (1.81)	
Non regular exercisers to exercisers	56.81 (4.38)	61.38 (4.09)	N.S.
Stable non regular exercisers vs.	47.65 (2.38)	46.10 (2.23)	
Exercisers to non regular exercisers	60.36 (5.57)	58.77 (5.2)	N.S.
Stable non regular exercisers vs.	47.65 (2.38)	46.10 (2.23)	
Non regular exercisers to exercisers	56.81 (4.38)	61.38 (4.09)	<i>p</i> =.037
Exercise to not exercise group vs.	60.36 (5.57)	58.77 (5.2)	
Non regular exercisers to exercisers	56.81 (4.38)	61.38 (4.09)	N.S.

Note. Mixed Between-Within Subjects ANOVA

shifted from not regularly exercising to regularly exercising (i.e., non regular exercisers to exercisers), their exercise self-efficacy increased and became significantly different compared to the stable non exercisers (Table 9).

For the extrinsic motivation measure, there were no significant differences across the two time points, $F(1, 209) = 1.065, p = .303$ or for the interaction between time and group, $F(3, 209) = 1.825, p = .144$. However, there was a significant difference between groups, $F(3, 209) = 9.113, p < .001$. Post-hoc tests indicated that the women who were stable regular exercisers had significantly higher extrinsic motivation scores compared to those who were stable non-regular exercisers (Table 10).

For the intrinsic motivation measure, there were no significant differences across the two time points, $F(1, 209) = .197, p = .658$ or for the interaction between time and group, $F(3, 209) = 1.308, p = .273$. However, there was a significant difference between groups, $F(3, 209) = 21.722, p < .001$. Post-hoc tests were utilized to explore significant differences for reported intrinsic motivation between groups (Table 11). Findings indicated that women who were stable exercisers reported significantly higher intrinsic motivation compared to stable non regular exercisers. In addition, the women who began regularly exercising (i.e., non regular exercisers to exercisers) reported higher levels of intrinsic motivation than stable non regular exercisers.

DISCUSSION

Regular exercise is important for people to maintain healthy life styles. To better understand what influences individuals to begin or maintain an exercise routine, the current study examined factors related to exercise behavior. Key findings from the study inform an understanding of how factors differentiate women based on their exercise behavior.

The first set of key findings from the study identify the ways in which factors that are associated with exercise behavior (i.e., social support for exercise, self-efficacy, and motivation) change when exercise behavior is maintained or changed over time.

Women who made changes in their exercise behavior by

either beginning to regularly exercise or stopping exercise also showed changes in reported social support for exercise. Specifically, if women started to regularly exercise they reported an increase in exercise social support from baseline, while women who stopped regularly exercising reported a decrease in exercise social support over time. This is consistent with past research that identifies a link between perceived exercise social support and exercise behavior over time [10].

For exercise self-efficacy, the women who were stable exercisers over time had higher levels of exercise self-efficacy compared to all of the other groups of women. Further, women who began to regularly exercise showed an increase in exercise self-efficacy over time and at three months, these women's self-efficacy scores were significantly higher than the women who maintained a non-regular exercise status. Particularly interesting to note is the differentiation in self-efficacy scores between women who were exercising at baseline and either remained regular exercisers or stopped exercising. While both sets of women were exercising regularly, the group that eventually stopped exercising reported lower levels of self-efficacy at baseline. It is possible that this difference could identify people at risk for discontinuing their exercise behavior. Overall, the findings are consistent with past research that finds that as participants' physical activity level increases, so does their self-efficacy related to exercise [31] and indicates that self-efficacy levels are also related to adherence to an exercise program [33,34].

For extrinsic motivation, the women who maintained regular exercise over the three month period reported higher levels of extrinsic motivation compared to those who remained non-regular exercisers. This same pattern held for intrinsic motivation, with women who were stable regular exercisers reporting higher levels of intrinsic motivation compared to women who did not regularly exercise. The women who shifted from not regularly exercising to regularly exercising over the three month period also reported higher levels of intrinsic motivation compared to stable non regular exercisers. These findings are consistent with past research which shows the importance of intrinsic and extrinsic

motivation in the maintenance [21,27] of exercise behavior. Further these results are consistent with past findings which show an increase in intrinsic motivation when a person becomes more active [28].

Another key finding involves the relationship of extrinsic and intrinsic motivation to exercise behavior at baseline. Consistent with previous research, individuals in the active stages reported higher levels of intrinsic motivation. Specifically, the contemplation group had significantly lower reported intrinsic motivation compared to the other higher level of exercise behavior stages (preparation, action and maintenance). Further, the maintenance group had significantly higher levels of intrinsic motivation compared to other stages. Inconsistent with the hypothesis for the current study, participants in the higher level of exercise behavior stages also reported higher levels of extrinsic motivation. Participants in the contemplation stage reported lower extrinsic motivation compared to all of the higher level of exercise behavior stages and those in the preparation stage also had lower reported extrinsic motivation when compared to the maintenance stage. These findings indicate that women in the action stages, and particularly maintenance stage, were more likely to report higher overall motivation – both intrinsic and extrinsic. While only partially consistent with the current study hypotheses, these findings are similar to the research by Buckworth and colleagues [37], who found that individuals in the maintenance stage had higher levels of extrinsic and intrinsic motivation compared to the other stages of change. It is possible that in order to maintain exercise behavior women need to have both external and internal driving factors. Past research has shown that individuals with high extrinsic motivation are likely to start an exercise regimen, while those who maintain an exercise regimen have higher levels of intrinsic motivation [17]. Perhaps when an individual has one motivation alone, she has more difficulty maintaining an exercise regimen. Past research [17,27] coupled with the current study findings lead to the hypothesis that in order to maintain an exercise behavior after the initiation of the exercise routine, it might be helpful to work to increase intrinsic motivation while also maintaining extrinsic motivation.

An additional key finding included only identifying a significant difference in one component of general social support by stage--that individuals reported higher levels of reliable alliance when in the maintenance stage compared to the preparation and contemplation stages. The lack of association between the other social support provisions and stages of change is surprising given the consistent research findings that general social support is related to exercise behavior [6]. It is possible that the social support provisions do not capture the components of general social support that are directly related to exercise behavior. Further research should be conducted to identify which components of general social support are relevant to the difference in exercise behavior.

Finally, the last key finding involves the lack of association between exercise behavior and concrete physical support.

Overall, the majority of the respondents indicated that they worked out alone regardless of the stage of change. It is possible that the women who were able to maintain their exercise programs in the current study used social support in other ways rather than actually exercising with others. It is also possible that the women who would benefit from having an exercise partner are not the ones who are able to maintain exercise regimens on their own and that if women in the preparation and contemplation stage were provided with exercise partners they might move into the action and maintenance stages. This explanation is supported by previous research which suggests that women report not having an exercise partner as a barrier to exercising regularly [11,12].

CONCLUSIONS

The findings from the current study highlight the dynamic nature of women's perception for multiple factors related to the exercise behavior of women. Specifically, the study findings suggest that women with higher levels of intrinsic and extrinsic motivation, perceived social support for exercise and self-efficacy for exercise are more likely to report exercising regularly. Further, the findings from the study imply that perceived exercise social support and exercise self-efficacy change when women make a shift in exercise behavior. This suggests that if you want to help encourage women to become active it would be important to work to increase women's perceived social support for exercise behavior and exercise self-efficacy. In addition, to encouraging women to start exercising, the findings from the study provide insight on how one might provide support to women to maintain a regular exercise regimen. Specifically, a woman's self-efficacy level appears to be an important factor. Women who are regularly exercising and then stopped had lower exercise self-efficacy levels compared to the women who maintained their exercise behavior. This suggests that not only do we need to build up the factors in order to help women begin to exercise, but there needs to be ways in which women continue to view exercise as in their self-interest and these ways should be defined and supported.

An interesting finding in the current study was the lack of concrete physical social support related to exercise behavior for all women. This finding warrants further exploration in future research and raises several new questions. Would providing concrete physical social support (i.e., a work out partner) help the women who are not regular exercisers? Not having a work out partner has been linked to adherence [11], which suggests that those who are not able to maintain exercise would benefit from concrete physical support. A question from the present findings for future exploration is that once the women have maintained exercise behavior, and have higher levels of perceived support- both exercise and general social support, self-efficacy, and motivation do they no longer need the concrete physical social support?

One limitation is there could be an influence of social desirability in the self-report responses to the questionnaires.

All of the questionnaires were given in a similar order and from the outset it was clear that the questions were focused on exercise behavior, which might have resulted in responses which inflate exercise ability and activity levels due to exercise being seen as an ideal in current society.

One important factor to keep in mind when examining these data as compared to previous research is the general atmosphere in society currently compared to in the past. Recently, a large emphasis has been placed on the importance of exercise behavior. This emphasis may impact how much influence these exercise related factors have on exercise behavior, which might result in findings inconsistent with past literature. Future research should attempt to account for this shift in ideology when comparing findings related to exercise related factors and exercise behavior to past research.

The current study provides insight into what perceptions and beliefs might need to be improved for each stage of change to encourage women's maintenance of exercise behavior. Women in the contemplation stage have the lowest level of social support, self-efficacy and intrinsic/extrinsic motivation; therefore, it would be important to work on increasing all of these factors. The same can be said for the preparation stage. While women endorse higher levels of these factors as compared to women in the contemplation stage, they all still need to be improved to move toward maintenance exercise behavior. In the action stage, women have similar social support and extrinsic motivation compared to women in the maintenance stage. However, women in the action stages need to increase their intrinsic motivation and self-efficacy to move toward those in the maintenance group.

Overall, the findings from the current study provide evidence of the dynamic relationship between several factors – exercise social support, intrinsic and extrinsic motivation, and exercise self-efficacy and exercise behavior maintenance and changes. It suggests that these factors not only are related to exercise behavior, but might be key factors in the stability of exercise over time (e.g., lower levels of self-efficacy at baseline for women who do not maintain exercise behavior). The study identifies new questions related to the role concrete physical support and general social support plays on initiation of and maintenance of exercise behavior.

Conflicts of Interest

The authors declare no conflict of interest.

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