Can Physical Activity Interventions Change Perceived Exercise Benefits and Barriers?

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Abstract: This study examined changes in physical activity and perceived exercise benefits, barriers, and benefit-to-barrier differences in mothers and daughters who participated in 12-week home-based (HB) and university-based (UB) physical activity interventions. Two (group) by two (time) repeated measures ANOVAs and effect sizes showed an increase in physical activity in both groups. Mothers in both groups reported a significant decrease in exercise barriers ($\underline{p}$ = .01, ES = .41). Exercise benefits and barriers did not change for daughters, nor did exercise benefits change for mothers. These two interventions were successful at increasing physical activity, but changes in EBBS scales differed by age and point in time measures were taken. This information can be used to plan better interventions for girls and women.

A physically active lifestyle has many benefits, including reduced risk of coronary heart disease, hypertension, obesity, and osteoporosis; psychological benefits include reduced stress and depression and increased emotional well-being, energy level, self-confidence, and satisfaction with social activities (USDHHS, 2000). Despite the well-documented health benefits of physical activity, only 65% of high school youth and 23% of adults engage in vigorous physical activity that promotes cardiorespiratory fitness (e.g., 3 or more days per week for 20 minutes or more per session). Additionally, only 25.5% of high school youth and 15% of adults engage in health-enhancing moderate physical activity (e.g., at least 30 minutes on 5 or more days per week) (USDHHS, 2000).

Aggregate findings don't accurately represent *gender-specific* trends in physical activity level. Hidden in these overall statistics is the fact that females are less physically active than males. Additionally, although exercise levels decrease with age, the decline in activity is greater for females than for males. While in ninth grade, the percentages of males and females participating in recommended amounts of moderate physical activity are similar (27% vs. 26%, respectively); By the twelfth grade, female participation drops to 22% and male participation remains stable at 27% (USDHHS, 2000). Perhaps the more significant change in physical activity patterns occurs in vigorous physical activity. While male participation decreases 11% from ninth to twelfth grade (77% to 66%), female participation in vigorous activity starts 10% lower and decreases at a rate twice that of males (67% to 45%) (USDHHS, 2000).

Following the trend established during adolescence, adult women (18 y and older) continue to decrease their participation in physical activity (USDHHS, 2000). Only 20% engage in cardiorespiratory system-enhancing vigorous physical activity, and only 13% engage in health-enhancing levels of mod-

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erate physical activity as defined above. A large proportion of adult women (43%) report that they never engage in physical activity during leisure time (USDHHS, 2000).

Given these gender differences in physical activity participation, it is likely that mediators of behavior change are related to gender (Bauman, Sallis, Dzewaltowski, & Owen, 2002). Specifically, gender-related benefits and barriers of exercise have been suggested as significant mediators for physical activity behavior change (Nahas & Goldfine, 2003). Individuals who perceive more exercise benefits and fewer exercise barriers are typically more active than those who report high perceived barriers and low perceived benefits (Nahas & Goldfine, 2003). Johnson and Heller (1998) and Jones and Nies (1996) have proposed the use of a *difference* score whereby aggregate exercise barrier score is subtracted from aggregate exercise benefit score.

More recently, scholars have concluded that low perceived barriers are a *more important* predictor of physical activity behavior than high perceived benefits (Nahas & Goldfine, 1998; Taylor, Sallis, Dowda, et al., 2002; Trost, Pate, Dowda, et al., 1996). The importance of minimizing exercise barriers concurs with the findings of Janz and Becker (1984) who reviewed over 50 studies related to health behavior change and found that perceived barriers were the single most powerful predictors of health behavior.

Given the important role that perceived barriers play in health behavior change, it is surprising that they have not been studied more extensively relative to exercise behavior. Furthermore, studies have tended to exclude women, even though women are typically less active than men (Scharff, Homan, Kreuter, & Brennan, 1999). When women have been studied, the barriers to exercise most frequently mentioned in cross-sectional studies include multiple role expectations, fear of safety, fear of pain, lack of time, lack of access to facilities, poor instruction, threat of embarrassment, lack of family encouragement, overweight status, older age, poverty status, single parenthood, and cost (Ebrahim & Rowland, 1996; Heesch, Brown, & Blanton, 2000; Johnson, Corrigan, Dubbert, & Gramling, 1990; Jones & Nies, 1996; Kennedy, DeVoe, Skov, & Short-DeGraff, 1998; Ransdell, Vener, & Sell, 2004; Scharff et al., 1999; Verhoef & Love, 1992; Verhoef & Love, 1994). Among Hispanic women, language can act as a barrier to exercise (Kennedy et al., 1998).

Adolescent girls have many of the same barriers as adult women, however, they also have age-specific barriers such as lack of transportation and opportunities, lack of physical education programming that meets their needs, and low perceived competence (Sallis, Prochaska, and Taylor, 1999; Trost et al., 1996; Verhoef & Love, 1992). Taylor and colleagues (2002) examined activity patterns of youth by gender and weight status. They concluded that compared to normal weight girls, overweight girls perceived more barriers to exercise, less peer support, fewer physical activity choices, less athletic coordination, and less enjoyment of physical activity.

Perceived benefits of exercise, although not as influential as barriers to exercise, are potentially another important mediator of physical activity behavior change. Mostly, perceived benefits of exercise have been examined cross-sectionally. Benefits of exercise that women and girls mention most often include social interaction, decreased stress, and improved physical appearance, physical abilities, and psychological/emotional outlook (Brown, Brown, Miller, & Hansen, 2001; Hall, 1998; Jaffe, Lutter, Rex, et al., 1999; Kennedy et al., 1998; Sleap & Wormald, 2001).

Although relatively few studies have noted benefits and barriers to exercise in women using cross-sectional designs, even fewer studies have examined changes in benefits and barriers to exercise as a result of participating in a physical activity intervention. In the only experimental study we could locate, Kennedy and colleagues (1998) compared changes in exercise benefits and barriers in Mexican-American women who participated in a 9-month intervention to changes in non-active control groups of Mexican-American and Caucasian women. They found that compared to control group participants, Mexican-American women in the experimental group experienced significant and positive changes in benefits and barriers related to exercise.

Another problem with this literature is that little data are available related to differences between benefits and barriers to exercise for women *across the lifespan* (Scharff et al., 1999). Furthermore, few researchers have studied differences in exercise benefits and barriers based on the *location* of exercise (e.g., in the home versus in the community).

As physical activity intervention specialists, it is necessary to identify age- and location- specific benefits and barriers. Then, professionals can delineate ways to increase benefits and decrease barriers, and physical activity interventions may be more successful. Given the potential impact that increasing benefit to barrier difference can have on an individual's predisposition to exercise, this study was designed to compare the effects of home- and university-based physical activity interventions on exercise benefits, barriers, and the difference score between benefits and barriers. This study is part of a larger study designed to examine changes in physical activity in a mother-daughter physical activity intervention (Ransdell, Taylor, Oakland, et al., 2003).

METHODS

Participants. Twenty mother-daughter pairs (N = 40) were recruited for the intervention using newspaper articles and local Girl Scout troop announcements. Both mother and daughter were required to be apparently healthy and irregularly active or inactive as determined by their answer to one question from the Behavioral Risk Factor Surveillance Survey (BRFSS, 1995). This question asked mothers and daughters about their participation in physical activity for the 3 months prior to the study. If they indicated that they participated in regular physical activity (3 or more times per week during the past 3 months), they were disqualified from the study. Once eligibility was confirmed, paired mothers and daughters were randomly assigned to either the UB or HB intervention. The intervention convened in February, 2001 and ended in April, 2001. Approval of the research methods was obtained from the local university institutional review board.

Demographics. Daughters were between 14 and 17 years of age (M = 15.41 $\pm$ 1.33 y) and mothers were between 31 and 60 years of age (M = 45.18 $\pm$ 7.49 y). There were no significant differences between demographic characteristics of participants in each group. The majority of the participants were white (93%), non-smokers (91%) with household incomes larger than $50,000 (82%). Sixty-three percent of the participants rated their overall health as good or excellent. Most mothers were well-educated (100% had some college or college degrees) and married or living in a committed relationship (82%).

Intervention Description. Procedures for developing the intervention and intervention components are described elsewhere and are available upon request from the lead author (Ransdell et al., 2003). Mother-daughter pairs were randomly assigned to a university-based (UB) or home-based (HB) condition. Participants in the UB group met three times per week. They participated in group fitness activities twice a week, in a facility located on the campus of a large, public southwestern university. Fitness activity days typically consisted of a 5-minute warm-up, 20 minutes of aerobic activity, 20 minutes of weight training, and 5-10 minutes of stretching and abdominal exercises. In addition, they participated in lifetime activities or sports once a week. Lifetime activities included *recreational activities* such as cross-country skiing, indoor rock climbing, and hiking, and *sports*, included basketball, soccer, racquetball, and volleyball. The UB group also attended two 1-hour sessions that were designed to increase participants' physical activity levels. These sessions included information about busting exercise barriers and increasing exercise benefits, and other information about setting goals, learning self-regulation skills, appropriate amounts of physical activity, calculating energy expenditure of various activities, and positive self-talk.

The HB group attended two instructional sessions, identical in length and content to those for the university-based program. Participants in the HB group received a detailed packet containing a calendar of recommended activities, pictures of various stretches and strength training activities (using household items), and tips for overcoming barriers. Recommended activities for the HB group were very similar to those completed by the UB group. The only difference between groups was that the HB group was not *required* to participate in recreational or sports activities. Research coordinators instead recommended that participants stay consistent with participation in fitness activities by completing 3 days a week of aerobic, muscular strength, and flexibility activities.

Questionnaire Measures. Questionnaire data for this 12-week study were collected at baseline and upon completion. A *Demographic and Health History Questionnaire* was used to screen participants for participation and ascertain information such as age, ethnicity, and health history.

The *Fitnessgram Physical Activity Questionnaire* was used to detect any changes in physical activity level that resulted from the intervention. This three-item questionnaire, which contains questions from the Youth Risk Behavioral Surveillance Survey (YRBSS), has been deemed reliable and valid in a number of populations (Cooper Institute, 1999). Specifically, it asks participants to report the number of days that they participated in aerobic, resistance training, and flexibility exercises during the past week.

The *Exercise Benefits and Barriers Scale (EBBS)* (Sechrist, Walker, & Pender, 1987) was used to assess changes in benefits ($EBBS_{ben}$), barriers ($EBBS_{bar}$), and the benefits-to-barriers difference score ($EBBS_{diff}$) as a result of our physical activity intervention. Reliability was established using Cronbach's alpha (r = .95 for benefits scale and .89 for the barriers scale) (Sechrist et al., 1987). Construct validity was established by conducting a literature review of benefits and barriers related to exercise, developing a questionnaire using those factors, and asking a panel of 4 nursing researchers familiar with the literature to provide feedback about questionnaire content, format, and scoring procedures

(Sechrist et al., 1987).

In addition to calculating the $EBBS_{ben}$, $EBBS_{bar}$, and $EBBS_{diff}$ scores (see Tables 1 & 2 for description of calculations), we also wanted to examine changes in the various subscales of the EBBS. Specifically, benefits on the EBBS scale were divided into five areas: life enhancement, psychological outlook, physical performance, social interaction, and preventive health. The life enhancement benefits subscale was obtained by calculating the mean of 9 items related to disposition, sleep, fatigue, self-concept, mental alertness, carrying out normal activities, quality of work, overall body functioning, and stamina. The physical performance benefits subscale was obtained by calculating the mean of 7 items related to muscular strength, physical fitness, muscle tone, cardiovascular functioning, flexibility, and endurance. The psychological outlook benefits subscale was obtained by calculating the mean of 6 items related to exercise enjoyment, personal accomplishment, mental health, relaxation, and well-being. The social interaction benefits subscale was obtained by calculating the mean of 4 items related to contact with friends, meeting people, entertainment, and increased acceptance by others. The preventive health benefits subscale was obtained by calculating the mean of 3 items related to prevention of heart attacks, high blood pressure, and longevity.

Barriers were divided into three areas: exercise milieu, time expenditure, and physical exertion. The exercise milieu barriers subscale was obtained by calculating the mean of 6 items from the original scale related to location, cost, prevalence of exercise facilities, and embarrassment about activity. Two new items were added relative to safety and cultural appropriateness of activities. The time expenditure barriers subscale was obtained by calculating the mean of 2 questions related to taking time away from the family or work responsibilities (or school responsibilities in the case of the daughters). The physical exertion barriers subscale was obtained by calculating the mean of 3 items from the original scale related to exercise difficulty and 1 new item related to the difficulty of exercising because health is poor.

Data Analysis. All data were analyzed using SPSS for Windows (Version 10.1). At baseline and post-intervention, researchers assessed changes in physical activity participation (days/week, aerobic, muscular strength, and flexibility), $EBBS_{ben}$, $EBBS_{bar}$, and $EBBS_{diff.}$ Two (exercise setting) x two (time) repeated measures ANOVAs were performed to assess changes in the aforementioned variables. Data from mothers and daughters were analyzed separately, based on results from a previous study that concluded that results were age-specific (Ransdell, Dratt, Kennedy, et al., 2001). Changes in EBBS subscale scores were compared using simple t-tests. Bonferoni corrections were applied to prevent excessive Type I error that can occur with multiple t-tests. To assess the magnitude of the intervention effect, effect sizes (eta-squared) were computed for changes in physical activity participation (days/week), $EBBS_{ben}$, $EBBS_{bar}$, and $EBBS_{diff}$. To ascertain internal consistency, Cronbach's alpha was calculated for $EBBS_{ben}$, $EBBS_{bar}$, and each of the aforementioned subscales.

RESULTS

Adherence. Of the 20 sedentary mother/daughter pairs ($N = 40$) who entered the study, 17 pairs (85%) completed the posttesting. All of the dropouts ($n = 3$ mother/daughter pairs) were from the home-based group, they were not demographically or physically different from those who finished the study, and they cited time constraints and sickness as the primary reasons for discontinuing the study. Adherence was satisfactory for both groups as the UB group attended 77% of the exercise sessions offered and the HB group completed 70% of the recommended exercise sessions. Mothers and daughters in the UB group exercised together every session. Pairs in the HB group exercised together an average of 59% of the time, although only one pair exercised together less than half of the time.

Physical Activity Levels. As a result of participating in this intervention, mothers significantly increased the number of days per week that they participated in aerobic activity (1.00 ± 1.05 d/wk to 4.40 ± .97 d/wk for UB mothers and .57 ± .79 d/wk to 3.0 ± 2.0 d/wk for HB mothers, $p = .001$). Mothers also increased $days \cdot wk^{-1}$ of participation in muscular strength activity (.60 ± 1.58 to 2.0 ± 1.33 d/wk for UB mothers and .28 ± .76 to 2.00 ± 1.60 d/wk for HB mothers, $p = .001$) and flexibility activities (.80 ± 1.55 to 3.20 ± 1.69 d/wk for UB mothers and .14 ± .38 to 2.57 ± 1.81 d/wk for HB mothers, $p = .000$). Effect sizes for time-related increases in the physical activity of mothers were very large (ES = .53 to .78).

Daughters also significantly increased the number of days per week that they participated in aerobic activity (2.25 ± 1.62 to 4.30 ± 1.16 d/wk for UB daughters and 2.00 ± 1.82 to 2.71 ± 1.88 d/wk for HB daughters, $p = .02$). Additionally, daughters increased the days per week that they participated in muscular strength building activity (.95 ± 1.12 to 2.40 ± 1.27 d/wk for UB daughters and 1.29 ± 1.80 to 3.21 ± 1.86 for HB daughters, $p = .001$), and flexibility activities (2.15 ± 2.33 to 4.00 ± 1.76 d/wk for UB daughters and 1.00 ± 1.15 to 4.86 ± 1.22 d/wk for HB daughters, $p = .000$). The treatment effects for daughters' increases in physical activity were large (ES = .33 to .58). None of the interactions were significant for mothers or daughters, indicating that UB and HB groups similarly increased their participation in all types of physical activity from pre- to posttesting.

Exercise Benefits and Barriers Scale. Table 1 presents pre- to posttest changes in $EBBS_{ben}$, $EBBS_{bar}$, and $EBBS_{diff}$ that occurred in mothers. Mothers in both groups significantly decreased their $EBBS_{bar}$ scores (p = .01), and the effect size was large (ES = .41). There were no significant changes in the $EBBS_{ben}$ and $EBBS_{diff}$ scales, nor were any of these interactions significant.

Table 1 also presents pre- to posttest changes in the subscales of the EBBS for mothers in the study. There were no statistically significant changes in any of the subscales of the EBBS. The highest mean benefit score for mothers in both groups before and after the intervention was life enhancement. This indicates that the most important perceived benefits of exercise for mothers included things like better sleep, less fatigue, more mental alertness, and improved self-concept. The highest mean barrier scores for mothers in both groups pre- and post-intervention were time expenditure and physical exertion.

Table 2 presents changes in the daughters' $EBBS_{ben}$, $EBBS_{bar}$, and $EBBS_{diff}$ scores as a result of the intervention. None of the time-related changes in any of these scores were statistically significant, nor were any of the interactions. There were significant differences in the group scores, indicating that the UB group had higher baseline $EBBS_{ben}$, and $EBBS_{diff}$ scores and lower $EBBS_{bar}$ scores compared to the HB group.

Table 2 also presents pre- to posttest changes in the subscales of the EBBS for daughters in the study. There were no statistically significant changes in any of the subscales of the EBBS. The highest mean pretest benefit scores for daughters in this intervention differed by exercise setting and by point in the intervention. Daughters in the UB group had the highest mean pretest scores for preventive health and daughters in the HB group had the highest mean pretest score for improved psychological outlook. At posttest, daughters in both groups had the highest mean scores for improved physical performance as a benefit of physical activity.

The highest mean barrier score for daughters in both groups at pretest was physical exertion. At posttest, the highest mean barrier scores for UB daughters was still for physical exertion and the highest mean barrier scores for HB daughters was time expenditure.

The EBBS scale demonstrated acceptable reliability when utilized with this population. Cronbach's alphas were $\geq$ .80 for $EBBS_{ben}$ and $EBBS_{bar}$ for both mothers and daughters. Relative to the subscale scores, Cronbach's alphas were $\geq$ .80 for all subscales except the barrier of physical exertion in the mothers and the benefit of social interaction and the barrier of physical exertion in the daughters.

DISCUSSION

The most important finding of this study is that university and home-based physical activity interventions facilitated significant increases in physical activity and decreases in mothers' perceived barriers relative to exercise ($EBBS_{bar}$). $EBBS_{ben}$ and $EBBS_{diff}$ did not change. Our results are consistent with those of Kennedy and colleagues (1998) who conducted the only other experimental study designed to examine changes in EBBS values as a result of a physical activity intervention. These authors conducted a 6-month physical activity intervention with Mexican-American women and examined pre- to posttest differences in EBBS and subscale values. Their $EBBS_{ben}$ values were much lower at baseline than in the present study, however, at posttest, their values were comparable. This may indicate that, prior to an exercise intervention, White women tend to perceive more benefits of exercise when compared to their Mexican-American counterparts. After a physical activity intervention, Mexican-American women may become more aware of the benefits of exercise.

Daughters did not report significant changes in $EBBS_{ben}$, $EBBS_{bar}$, and $EBBS_{diff}$. The fact that adolescent girls did not decrease their perceived barriers to exercise is consistent with the findings of Garcia and colleagues (1995) who noted that, compared to younger children, adolescents reported less social support for exercise and fewer role models. It may be that mothers felt they had more control over their lives whereas adolescent daughters felt "controlled" by their parents. Additionally, many adolescent daughters in this study were still too young to drive and they relied on their mothers quite a bit for transportation, money, and permission—which can be barriers to participation.

While baseline EBBS values for the UB and HB mothers were similar, baseline differences between $EBBS_{ben}$, $EBBS_{bar}$, and $EBBS_{diff}$ in UB and HB daughters were significant. UB daughters had higher $EBBS_{ben}$ and lower $EBBS_{bar}$, which may indicate that they had better skills and higher motivation than HB daughters coming into the program. This may impact the interpretation of results because despite randomization of group assignment, EBBS scores may not be as generalizable or comparable if they were not equal at baseline.

Table 1. Changes in benefits to barriers ratio and subscales for mothers in 12-week DAMET project

Variable	University-Based (n = 8) M + SD	Home-Based (n = 6) M + SD	F value or t- value	p-value	Eta-Squared
$EBBS_{ben}$ (CA=.95)					
Pre	95.00 ± 13.15	92.71 ± 8.30			
Post	103.43 ± 14.54	96.14 ± 12.81			
Group			.76	.40	.06[b]
Time			2.52	.14	.17[c]
Interaction			.45	.52	.04[a]
$EBBS_{ben}$ Subscales					
Life Enhancement (CA=.90)					
Pre	3.44 ± .44	3.46 ± .31	-1.74 (UB)	.12	
Post	3.70 ± .36	3.48 ± .50	-.07 (HB)	.95	
Physical Performance (CA=.83)					
Pre	3.29 ± .44	3.31 ± .32	-1.45 (UB)	.18	
Post	3.46 ± .36	3.35 ± .42	-.29 (HB)	.78	
Psychological Outlook (CA=.90)					
Pre	3.17 ± .43	3.07 ± .48	-2.08 (UB)	.07	
Post	3.55 ± .51	3.38 ± .52	-1.76 (HB)	.13	
Social Interaction (CA=.86)					
Pre	2.63 ± .40	2.57 ± .35	-2.96 (UB)	.02	
Post	3.25 ± .74	2.61 ± .38	-.17 (HB)	.87	
Preventive Health (CA=.94)					
Pre	3.23 ± .50	3.09 ± .16	-1.56 (UB)	.15	
Post	3.47 ± .59	3.19 ± .47	-.55 (HB)	.60	
$EBBS_{bar}$ (CA=.88)					
Pre	46.13 ± 8.41	50.17 ± 4.79			
Post	36.38 ± 11.07	48.33 ± 6.25			
Group			3.97	.07	.25[c]
Time			8.24	**.01****	.41[c]
Interaction			3.85	.07	.24[c]
$EBBS_{bar}$ Subscales					
Exercise Milieu (CA=.90)					
Pre	2.14 ± .47	2.17 ± .30	2.25 (UB)	.05	
Post	1.74 ± .56	2.29 ± .47	-.64 (HB)	.55	
Time Expenditure (CA=.90)					
Pre	2.45 ± .80	3.00 ± .02	2.71 (UB)	.02	
Post	1.85 ± .75	2.79 ± .57	1.00 (HB)	.36	
Physical Exertion (CA=.51)					
Pre	2.44 ± .49	2.77 ± .57	1.99 (UB)	.07	
Post	1.94 ± .59	2.34 ± .38	2.29 (HB)	.06	
$EBBS_{diff}$					
Pre	49.71 ± 17.35	44.17 ± 11.27			
Post	67.29 ± 21.73	45.00 ± 16.79			
Group			2.70	.13	.20[c]
Time			3.80	.08	.26[c]
Interaction			3.15	.10	.22[c]

Key. ** = $p \leq .01$
Notes.
Bonferoni Corrections Applied for Multiple Comparisons (.05 / 3 = .02)
Bonferoni Corrections for $EBBS_{ben}$ subscales (.05 / 5 = .01)
Bonferoni Corrections for $EBBS_{bar}$ subscales (.05 / 4 = .0125)

The EBBS scale contains 43 items scored on a 4-point Likert-type scale (strongly agree to strongly disagree). Higher $EBBS_{ben}$ (range = 29-116) and $EBBS_{bar}$ (range = 14-56) scores indicate more benefits or more barriers. Higher $EBBS_{diff}$ score ($EBBS_{bar}$ – $EBBS_{ben}$) indicates that benefits increased and barriers decreased.

Effect Sizes (Eta-Squared) from Cohen (1969) using f-values
[a]0.01 = small
[b]0.06 = medium
[c]0.14 = large

Table 2. Changes in benefits to barriers ratio and subscales for daughters in 12-week DAMET project.

Variable	University-Based (n = 10) M + SD	Home-Based (n = 7) M + SD	F value or t-value	p-value	Eta-Squared
$EBBS_{ben}$ (CA=.88)					
Pre	93.67 ± 8.85	85.40 ± 5.77			
Post	99.22 ± 9.32	87.80 ± 8.01			
Group			7.78	**.02***	.39[c]
Time			1.63	.23	.12[b]
Interaction			.26	.62	.02[a]
$EBBS_{ben}$ Subscales					
Lifetime Enhancement (CA=.84)					
Pre	3.26 ± .35	3.06 ± .27	-1.55 (UB)	.16	
Post	3.53 ± .32	3.17 ± .23	-.72 (HB)	.50	
Physical Performance (CA=.97)					
Pre	3.66 ± .36	3.24 ± .38	-.84 (UB)	.42	
Post	3.79 ± .32	3.29 ± .49	-.24 (HB)	.82	
Psychological Outlook (CA=.94)					
Pre	3.15 ± .66	3.29 ± .42	-1.18 (UB)	.27	
Post	3.41 ± .51	3.24 ± .47	.21 (HB)	.84	
Social Interaction (CA=.68)					
Pre	2.33 ± .26	2.58 ± .76	-3.16 (UB)	.03	
Post	2.50 ± .22	2.63 ± .56	-.36 (HB)	.72	
Preventive Health (CA=.92)					
Pre	3.70 ± .43	3.24 ± .4	2.00 (UB)	1.00	
Post	3.70 ± .48	3.29 ± .49	-.28 (HB)	.81	
$EBBS_{bar}$ (CA=.89)					
Pre	41.50 ± 4.69	45.86 ± 3.02			
Post	42.75 ± 7.01	48.00 ± 5.77			
Group			5.01	**.04***	.28[c]
Time			.92	.36	.07[b]
Interaction			.06	.81	.01[a]
$EBBS_{bar}$ Subscales					
Exercise Milieu (CA=.87)					
Pre	1.75 ± .31	2.02 ± .30	.27 (UB)	.79	
Post	1.71 ± .48	2.21 ± .42	-1.28 (HB)	.25	
Time Expenditure (CA=.81)					
Pre	1.80 ± .48	2.21 ± .27	.36 (UB)	.73	
Post	1.75 ± .35	2.50 ± .50	-2.83 (HB)	.03	
Physical Exertion (CA=.74)					
Pre	2.43 ± .41	2.50 ± .41	.00 (UB)	1.00	
Post	2.43 ± .58	2.46 ± .39	2.29 (HB)	.06	
$EBBS_{diff}$					
Pre	52.29 ± 10.99	38.00 ± 5.83			
Post	54.57 ± 13.11	38.20 ± 13.10			
Group			11.68	**.007****	.54[c]
Time			.06	.81	.01[a]
Interaction			.05	.84	.00[a]

Key. * = $p \leq .05$ ** = $p \leq .01$

Notes.

Bonferoni Corrections Applied for Multiple Comparisons (.05 / 3 = .02)

Bonferoni Corrections for $EBBS_{ben}$ subscales (.05 / 5 = .01)

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The EBBS scale contains 43 items scored on a 4-point Likert-type scale (strongly agree to strongly disagree). Higher $EBBS_{ben}$ (range = 29-116) and $EBBS_{bar}$ (range = 14-56) scores indicate more benefits or more barriers. Higher $EBBS_{diff}$ score ($EBBS_{bar}$ – $EBBS_{ben}$) indicates that benefits increased and barriers decreased.

Effect Sizes (Eta-Squared) from Cohen (1969) using f-values

[a]0.01 = small

[b]0.06 = medium

[c]0.14 = large

When mother's EBBS subscale values were examined, none changed significantly. It is noteworthy that the mothers' highest mean benefit score at pre- and posttest was for "life enhancement" which includes improved sleep, mental alertness, and self-concept. Our findings are in agreement with Jones and Nies (1996) who examined subscale scores of the EBBS cross-sectionally and found that the exercise benefit with the highest mean score for adult women was "life enhancement." In contrast, Mexican-American adult women, who typically have a disproportionate number of health problems compared to their White counterparts, considered "preventive health" and "social interaction" their top perceived benefits.

The mothers' highest mean barrier scores at pre- and posttest were for time expenditure and physical exertion. This is consistent with findings from Brown and colleagues (2001). Contrary to our findings, Kennedy and colleagues (1998) listed "access to and cost of facilities" and "lack of family support" as the most important barriers to exercise for Mexican-American adult women. Jones and Nies (1996) listed "access to and cost of facilities" as the most significant barrier to exercise for older African-American women.

To put this research into practice, intervention specialists may want to emphasize population-specific benefits and barriers. For example, programmers should focus on the "life enhancement" benefits of physical activity to encourage White women to participate in activity, however, the salient benefits of exercise may be different for women from different ethnic backgrounds. Further, if women feel that time is a barrier, making convenient home-based programming available may encourage them to increase their physical activity. If women feel that "physical exertion" is a barrier, health promotion specialists should emphasize physical activity progressions, such that fitness is developed slowly.

As was true for the mothers, EBBS subscale scores did not change for daughters. The highest mean benefit score for the daughters differed by exercise setting (e.g., HB or UB) and phase of the intervention (before or after). At pretest, the highest mean benefit score for girls in the UB group was for preventive health. The highest mean benefit score for girls in the HB group was for psychological outlook. At posttest, daughters from both groups had the highest mean benefit score for improved physical performance.

The highest mean barrier for UB and HB daughters at pretest was physical exertion. At posttest, UB daughters still gave physical exertion the highest mean barrier score, whereas HB girls gave time expenditure the highest mean barrier score. It is understandable that UB daughters gave physical exertion the highest mean score because as a group, they worked extremely hard to improve their fitness level. It may be that working out as a group motivated them to work harder than normal. It is also understandable that HB daughters gave time expenditure the highest mean barrier score because they probably were spending more time than usual with their mothers, and this physical activity program may have interfered with other things in their lives.

Clearly, a thorough examination of mean scores for subscale benefits and barriers is warranted so researchers can determine which benefits and barriers are most important based on age, exercise setting, and ethnicity. Although we did not report any statistically significant differences in subscale scores due to the stringent Bonferroni correction, it is worthwhile to consider the highest mean scores for specific benefits and barriers so more effective research studies and interventions can be developed.

Another important finding that has been reported previously (Ransdell et al., 2003) is that both UB and HB programs facilitated increased participation (d/wk) in aerobic, muscular strength, and flexibility activities in mothers and daughters. This increase in physical activity behavior occurred regardless of physical activity setting. This has implications for designing more cost-effective physical activity programs. If we can design home-based programs that result in comparable increases in physical activity, significant cost savings can be realized.

Despite our successes with this program, some limitations are worth mentioning. First, because this sample size was relatively small and homogeneous, the results may not be generalizable to others across the United States. Although effect sizes were medium to large for mothers' changes in overall $EBBS_{ben}$, $EBBS_{bar}$, and $EBBS_{diff}$ scores, these changes were not statistically significant. In contrast to large effect sizes for mothers' EBBS scores, effect sizes for changes in daughters scores were small to medium. Clearly, replication studies are warranted. Second, this study failed to use a "true" control group. Therefore, it is not completely clear that the positive decrease in mothers' barrier scores was a result of this intervention. A third limitation of the study is that mothers and daughters "self-selected" into the study. Therefore, results may not be as generalizable to those who are less motivated. Lastly, reported changes in physical activity were based on self-report questionnaire data. These findings may not be as accurate as those confirming changes in self-reported data with an objective measure such as pedometry or accelerometry. Although we report some limitations, the study is meritorious because there is a dearth of experimental research examining changes in treatment benefits and barriers—especially in girls and women. No one has previously examined changes related to exercise setting nor has anyone examined these changes relative to age.

CONCLUSIONS

This randomized trial examined the effects of two exercise settings on perceived benefits and barriers in mothers and daughters. It provides evidence that decreasing perceived exercise barriers in adult women may be related to increased physical activity participation. In adolescent girls, this relationship is much less clear. Paying attention to the highest mean benefit and barrier scores and how they differ by age and phase of an intervention may provide worthwhile information for individuals responsible for designing physical activity interventions.

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