Perceived Intrinsic Barriers to Physical Activity Among Rural Mothers

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Abstract

Background: The purpose of this study was to identify and determine the influence of perceived intrinsic barriers to physical activity among mothers living in rural areas.

Methods: Mothers were identified through a study of child-parent dyads in the predominantly rural states of New Hampshire and Vermont. Using a telephone interview, we asked mothers ($n = 1691$) about their level of physical activity and assessed eight potential barriers to physical activity. Data were analyzed using chi-square tests, t tests, and analysis of variance (ANOVA) comparisons for groups within each variable. We used multiple regression analysis to assess associations between perceived barriers to physical activity and self-reported levels of physical activity.

Results: Each barrier was inversely associated with physical activity. Multivariate models that included terms for all potential barriers and covariates identified three barriers associated with lower levels of physical activity: lack of self-discipline, lack of time, and lack of interest.

Conclusions: Rural mothers are less likely to be physically active if they identify lack of self-discipline, time, or interest as barriers, suggesting that they have difficulty prioritizing exercise for themselves. Interventions aimed at increasing physical activity for mothers should specifically consider these barriers. One possible solution may be to support infrastructure that facilitates active living as the default option, to remove the issue of having to purposefully engage in physical activity as a separate aspect of a mother's life.

Introduction

PHYSICAL ACTIVITY IS ONE OF THE key ingredients in maintaining a healthy lifestyle and in preventing excessive weight gain.¹ In spite of public health efforts to promote physical activity, as many as one in four women do not engage in any physical activity.² Women's most commonly perceived barriers to physical activity are lack of time,³⁻⁶ lack of support,⁷ and lack of willpower.⁷ One study suggested that mothers are at even higher risk for not getting enough activity than women without children because they have more barriers.⁸ Because mothers' level of exercise was not related to child age, number of children, employment, or marital status, that study suggested that motherhood itself might be a barrier to engaging in physical activity.⁸ Therefore, being a mother may be a risk factor for exercise deficiency. Although a few

studies have examined how self-report of barriers is related to actual physical activity levels,^{5,8,9} none have specifically examined this relationship for mothers.

Mothers living in rural areas may have the greatest risk of exercise deficiency. Women who live in rural areas are less likely to be physically active compared with women who live in suburban or urban areas.¹⁰⁻¹² Barriers to physical activity in rural areas include having fewer places where one can be physically active and exercise locations being located too far away.¹⁰ The high dependence on cars in rural areas makes active travel, such as walking and bicycling, a challenge. Some places are perceived as unsafe and a deterrent for active travel because of fast-moving vehicles, lack of sufficient road shoulders for safely walking or bicycling, and the greater likelihood of unleashed dogs compared to urban areas.¹³ In northern winter months, snow and ice often cover the limited

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sidewalks and shoulder areas, making active travel an even greater challenge. Overcoming these environmental barriers may require considerable motivation. Unfortunately, non-physically active women in rural areas have reported that they do not make exercise a priority.¹⁰ Although studies have examined differences in activity level among women in rural, suburban, and urban areas, to date, none have specifically addressed rural mothers.

From an ecological perspective, multiple factors play a role in health behaviors.¹⁴ These factors include intrapersonal factors, such as perceived intrinsic barriers to physical activity, and community-level factors, such as infrastructure that constrains or supports active living.¹⁴ The purpose of this study was to determine the prevalence of perceived intrinsic barriers to physical activity among rural mothers and to determine which perceived intrinsic barriers were most strongly associated with physical activity. Identifying these independent associations with physical activity from the intrapersonal perspective will inform future interventions to promote physical activity for rural mothers on an ecological level.

Materials and Methods

The data used for this analysis are from a longitudinal study of health behaviors in children and parents. The study was approved by the Committee for the Protection of Human Subjects at Dartmouth College.

Enrollment for the longitudinal study occurred between October 2002 and December 2003, during which time we identified 3,705 children aged 9–12 years through surveys administered in New Hampshire and Vermont public schools. We randomly selected schools from a list of all New Hampshire and Vermont schools containing grades 4–6 ($n = 559$ schools), stratified by state and number of students enrolled. Twenty-six schools from 25 different communities participated. One quarter ($n = 6$) of the communities had <2,500 residents, and 72% ($n = 18$) had <10,000 residents. The baseline survey had two components: a written survey self-administered at school and a telephone survey conducted an average of 2 (standard deviation [SD] 1.1) months later. In all but one school, passive consent was used, whereby parents received an advance letter informing them of the survey and instructing them to call the school if they did not want their child to participate. At one school, active consent was used whereby parents mailed in a signed consent form. For the telephone survey, verbal parental consent and verbal child assent were obtained before surveying adolescents and parents by phone.

Telephone surveys were administered by trained telephone interviewers using a computer-assisted telephone interviewing (CATI) system. The sample recruitment design and informed consent process have been described in further detail elsewhere.¹⁵ Subsequent to the in-school survey, we enrolled 2,566 of the children and one of their parents, preferentially their mother if possible ($n = 2,411$; 94.0% were mothers or stepmothers) in a longitudinal cohort study. Annual follow-up surveys of children and their mothers were administered by telephone. After obtaining parental consent at each wave, we surveyed adolescents individually, followed by one of their parents, usually the mother, individually. Data collection for round 4 began in February 2007 and ended in April

2008; the data for the current analysis are from round 4. The round 4 survey was the first to focus on physical activity and obesity-related behaviors.

For round 4, a total of 2,512 parents were still enrolled in the study. We had a low refusal rate (7.4%, 186 of 2,512). In addition, 475 parents were unavailable to complete the survey. A total of 1,851 parents completed round 4 surveys, of which 1,765 (95.4%) were mothers or stepmothers. For this analysis, we excluded participants if they had moved out of New Hampshire or Vermont or were missing data on household income, parent education, barriers, or the physical activity outcome variable. The final sample size for this analysis was 1,691.

Measures used

All measures reported were based on questions asked in the round 4 survey, unless noted.

Barriers to physical activity. We asked mothers about their barriers to physical activity based on the questions from the Twin Cities Walking Survey.¹⁶ We asked: How often do the following things prevent you from getting regular physical activity?: lack of interest in exercise or physical activity, lack of self-discipline, lack of time, lack of energy, lack of company, lack of enjoyment, lack of good weather, being self-conscious about how you look when you exercise. The response categories were never, rarely, sometimes, often.

Physical activity. We measured mothers' leisure and nonleisure physical activity by asking: On how many of the past 7 days were you physically active for a total of at least 60 minutes per day? Add up all the time you spend in any kind of physical activity that increases your heart rate and makes you breathe hard some of the time. The response range was 0–7 days. This question used the same wording as the child survey, which was based on the Youth Risk Behavior Surveillance System (YRBSS).¹⁷ Reliability of the YRBSS has been established.¹⁸

Sociodemographics. We used maternal age, annual household income, and highest level of education completed to characterize participants' sociodemographic status. For age, we asked: What is your age? Response categories were 20–29 years, 30–39 years, 40–49 years, 50–59 years, 60–69 years. Age was used two ways. For the bivariate comparisons, these categories were collapsed into 20–39, 40–49, 50 or older. For the multivariate analysis, the full response categories were used. For annual household income, we asked: Is your annual household income less than \$50,000? followed by: Which category best describes your annual household income? Based on responses to the first question, the response categories offered were either <\$10,000, \$10,001–15,000, \$15,001–25,000, \$25,001–35,000, \$35,001–50,000; or \$50,000–75,000, \$75,001–100,000, \$100,001–150,000, \$150,001 or more. Income was used two ways. For the categorical comparisons, responses were collapsed into three groups: \$35,000 or less, \$35,001–\$75,000, \$75,000 or more. For the multivariate analysis, the first two categories were collapsed to <\$15,000, and the remaining seven full response categories were used (eight groups total). For highest level of education, we asked: What is the highest level of education you completed? Response

categories were some high school or less; high school diploma or GED; associate's degree or some college; bachelor's degree; graduate degree. For the categorical comparisons, responses were collapsed into three groups: education up through high school diploma or GED; associate's degree or some college; bachelor's degree or higher. For the multivariate analysis, the full response categories were used.

Health condition that prevents exercising/being physically active. We asked: Do you have any health condition that prevents you from exercising or being physically active? The response categories were Yes or No.

Number of children. We asked mothers how many children they had and the ages of their children. These questions were asked in the baseline survey.

Work outside the home. We asked: Do you work outside your home? The response categories were Yes or No. For mothers who responded Yes, we asked how many hours they worked outside the home as an open-ended question.

Season. We categorized responses according to the time of year that mothers completed the survey. For seasonal cut-offs, we used a combination of school sports schedule transitions and weather unique to New Hampshire and Vermont: November 15–March 14 was coded as winter, March 15–May 31 was coded as spring, June 1–August 31 was coded as summer, and September 1–November 14 was coded as fall.

Population in town of residence. We used town population, based on 2007 estimates from the U.S. Census Bureau,¹⁹ as a measure of town size. The following town population cutoffs were used: $\leq 4,999$; 5,000–9,999; $\geq 10,000$ persons.

Statistical analysis

Categorical data were initially analyzed using chi-square tests; continuous data were initially analyzed using *t* tests, Spearman's rho correlations, and one-way analysis of variance (ANOVA) comparisons. The number of days on which mothers were physically active was expressed as a continuous variable and treated as the outcome variable in the multivariate analysis. We used least squares multiple linear regression analysis to examine associations between barriers and physical activity. We used several models to iteratively explore the relationship between barriers and physical activity. Initially, we assessed models where each barrier was entered separately (eight models) as a continuous measure. Then we conducted multivariate analysis using models with terms for all eight barriers and models that included all eight barriers as well as covariates. We assessed each barrier individually, assessing for covariates in each of the eight individual models. The covariates were health condition prevents exercising/being physically active, age, education, and household income. Finally, we included all eight barriers and covariates in the same model, with the addition of number of children and hours worked outside the home. Data were analyzed using SPSS version 16.0.1 (SPSS Inc., Chicago, IL) and R version 2.7.1. (R Foundation, Vienna, Austria). We also conducted a sensitivity analysis to control for possible clustering by town.

Results

General characteristics

Over half ($n = 1032$, 61.0%) of the mothers were in the age range 40–49. The mean number of people living in the household was 4.2 ($SD = 1.1$). Most ($n = 1420$, 84.0%) had a spouse or partner living with them at the time of the survey. About one third ($n = 592$, 35.0%) had a bachelor's or graduate degree. Most of our sample (72.8%) lived in rural areas ($< 10,000$ persons), which is consistent with the geographic makeup of New Hampshire and Vermont. More than one in three mothers ($n = 651$, 38.5%) lived in towns with a population of < 5000 . Most mothers were white ($n = 1556$, 92.3%; we did not have race data on 6 mothers). On average, mothers reported having 2.6 children at baseline. From baseline report and extrapolating 5 years to the follow-up survey, child ages ranged from 5 to 43 years. It is possible that in the 5 years between surveys, there may have been additional or younger children added to the family. Mothers who reported working outside the home worked an average of 37.1 hours per week.

Physical activity

Almost half ($n = 757$, 44.77%) of the mothers reported they were physically active for a total of at least 60 minutes per day for 4 or more days in the past week, and an additional one third ($n = 589$, 34.83%) were physically active for 1–3 days. Physical activity was significantly correlated with having a health condition that prevented exercising/being physically active (Spearman's $\rho = -0.08$, $p < 0.01$). Physical activity was not correlated with age, level of education, household income, number of children, hours worked outside the home each week, town population, or season interviewed.

Barriers to physical activity

Overall, the most commonly cited barriers were lack of time (83.1% reported sometimes or often), lack of self-discipline (73.9% reported sometimes or often), and lack of energy (70.4% reported sometimes or often). Lack of company (33.1% reported sometimes or often) and being self-conscious about how you look when you exercise (28.4% reported sometimes or often) were the least commonly cited barriers. Table 1 reports barriers according to demographic and other characteristics. There was a significant relationship between one or more individual barriers and each of the covariates, justifying the inclusion of the covariates in the multivariate model. Among the findings, mothers with the lowest levels of household income were significantly more likely to report that lack of enjoyment, lack of company, being self-conscious, and lack of energy were sometimes or often a barrier ($p < 0.05$) (Table 1) compared with mothers with higher levels of income. In contrast, mothers with the highest levels of household income were significantly more likely to say that lack of time was a barrier to physical activity compared with mothers with the lowest levels of household income. Having a health condition that prevented exercise/being physically active was significantly related to six of the eight perceived barriers. Mothers with more children were significantly less likely to report lack of energy as a barrier compared with mothers with fewer children. Compared with mothers who did not work outside the home, mothers who worked outside the home were significantly more likely to report lack

TABLE 1. BARRIERS TO PHYSICAL ACTIVITY BY SOCIODEMOGRAPHIC CHARACTERISTICS

Variable	<i>Barrier to physical activity: sometimes or often</i>								
	<i>n</i>	<i>Lack of interest</i>	<i>Lack of self-discipline</i>	<i>Lack of time</i>	<i>Lack of enjoyment</i>	<i>Lack of company</i>	<i>Lack of good weather</i>	<i>Being self-conscious</i>	<i>Lack of energy</i>
Age, years									
20–39	431	53.8%	75.4%	81.7%	43.4%	36.9%	65.4%	36.4%	72.6%
40–49	1032	52.3%	73.1%	83.1%	39.0%	30.7%	62.7%	25.5%	69.8%
50 or older	228	52.6%	74.6%	85.5%	37.3%	36.4%	68.0%	26.8%	68.9%
Education									
High school diploma, GED, or less	492	**	58.5%	72.8%	81.5%	**	66.1%	**	**
Associate's degree or some college	607	55.7%	77.1%	83.7%	38.7%	35.1%	64.9%	31.0%	71.3%
Bachelor's or graduate degree	592	44.9%	71.5%	82.3%	35.5%	26.7%	61.7%	15.5%	64.7%
Household income									
≤\$35,000	287	56.8%	72.1%	*	**	**	66.2%	**	*
\$35,001–\$75,000	678	54.4%	76.1%	83.9%	39.1%	33.5%	66.2%	30.8%	72.0%
≥\$75,001	726	49.6%	72.5%	84.7%	36.8%	29.8%	61.3%	20.4%	67.2%
Health condition that prevents exercising/being physically active									
No	1438	*	*	82.8%	*	*	63.9%	*	**
Yes	253	58.9%	79.8%	84.6%	45.5%	40.3%	65.2%	34.8%	88.1%
Season									
Summer	398	52.8%	73.9%	81.4%	37.9%	*	**	30.7%	67.8%
Fall	318	48.7%	75.2%	86.2%	39.0%	28.3%	56.3%	25.5%	72.3%
Winter	627	55.3%	75.1%	82.0%	41.9%	36.5%	67.6%	28.7%	71.1%
Spring	348	51.7%	70.4%	84.2%	39.1%	34.5%	73.0%	28.2%	70.1%
Number of children									
1	173	56.1%	77.5%	81.5%	43.9%	28.3%	62.4%	27.2%	*
2	790	52.5%	74.1%	83.0%	39.2%	33.3%	67.0%	27.5%	72.5%
3 or more	714	52.7%	73.1%	83.8%	39.9%	34.2%	61.5%	30.0%	67.4%
Mother works outside the home									
No	257	54.5%	*	**	69.6%	38.9%	64.6%	**	71.6%
Yes	1433	52.5%	75.2%	85.5%	40.1%	32.4%	64.0%	27.1%	70.1%
Town population									
≤5,000	651	50.8%	75.9%	84.5%	38.1%	34.3%	**	**	**
5,000–9,999	579	51.3%	71.3%	82.9%	42.1%	29.9%	66.1%	25.2%	67.7%
≥10,000	459	57.5%	74.5%	81.5%	39.7%	35.5%	58.0%	34.0%	75.8%

* $p < 0.05$; ** $p < 0.01$.

of self-discipline and lack of time as barriers, whereas they were less likely to report being self-conscious as a barrier.

We found significant relationships between barriers and physical activity. Individually, each of the eight barriers was inversely associated with physical activity (Table 2). For any given barrier, the greater the frequency of the reported barrier, the less physical activity the mother did. The fully adjusted multivariate models revealed three significant factors in relation to physical activity: lack of interest, lack of self-discipline, and lack of time (Table 2). For example, physical activity decreased by half a day ($\beta = -0.47$, standard error [SE] = 0.09, $p < 0.001$) for each 1-point increase in the response score for lack of time, even after taking all covariates into account. Adjusting for clustering by town or town population did not change the final multivariate model.

Discussion

This study examined self-reported perceived intrinsic barriers to physical activity in rural mothers. We found that all barriers we measured were inversely associated with physical activity; however, the barriers that were independently associated with physical activity were lack of self-discipline,

lack of time, and lack of interest. Our findings also suggest that being a mother may be a risk factor for exercise deficiency but that number of children does not play a role in a mother's level of physical activity, which is consistent with Verhoef et al.⁸

In this study, income was associated with certain barriers to physical activity. Specifically, lower-income women were more likely to report lack of enjoyment, lack of company, being self-conscious, and lack of energy as barriers to physical activity. Similar to Osuji et al.,⁹ we found that women in the lowest income category ($\leq \$35,000$) were more likely to report lack of company as a barrier and less likely to report lack of time as a barrier compared with women in higher income categories. Although we did not observe a direct association between income and physical activity, others have found that adults at lower income levels are less likely to meet recommendations for physical activity than those at higher income levels.¹¹

Our findings are consistent with other studies that have found lack of time to be a significant barrier for women.^{3–6} Previous work has shown that women living in rural areas cite environmental characteristics as barriers.¹⁰ Our findings suggest that rural mothers also attribute internal forces to their barriers to participation in physical activity. The barriers

TABLE 2. ASSOCIATION BETWEEN BARRIERS TO PHYSICAL ACTIVITY AND NUMBER OF DAYS PHYSICALLY ACTIVE IN PAST WEEK

Variable	Unadjusted		Each barrier modeled separately and adjusted for health condition, age, education, household income		Model includes all variables listed in table R ² = 0.14	
	β (SE)	p	β (SE)	p	β (SE)	p
Lack of interest	-0.71 (0.06)	<0.001	-0.71 (0.06)	<0.001	-0.25 (0.09)	0.004
Lack of self-discipline	-0.85 (0.06)	<0.001	-0.84 (0.06)	<0.001	-0.40 (0.09)	<0.001
Lack of time	-0.72 (0.07)	<0.001	-0.71 (0.07)	<0.001	-0.47 (0.09)	<0.001
Lack of enjoyment	-0.60 (0.07)	<0.001	-0.59 (0.07)	<0.001	-0.11 (0.09)	0.21
Lack of company	-0.42 (0.06)	<0.001	-0.42 (0.06)	<0.001	-0.04 (0.07)	0.58
Lack of good weather	-0.29 (0.07)	<0.001	-0.29 (0.07)	<0.001	0.09 (0.08)	0.25
Being self-conscious	-0.38 (0.06)	<0.001	-0.40 (0.06)	<0.001	-0.09 (0.07)	0.20
Lack of energy	-0.70 (0.07)	<0.001	-0.69 (0.08)	<0.001	-0.06 (0.10)	0.55
Health condition that prevents exercising/being physically active	-0.55 (0.17)	0.001			-0.43 (0.19)	0.02
Age	0.12 (0.10)	0.21			0.12 (0.11)	0.26
Education	0.02 (0.06)	0.73			-0.03 (0.07)	0.65
Household income	0.00 (0.04)	1.00			-0.03 (0.04)	0.54
Number of children	0.03 (0.05)	0.49			0.04 (0.05)	0.42
Hours worked outside the home	0.00 (0.01)	0.82			0.01 (0.01)	0.25

most salient to rural mothers—self-discipline, time, and interest—are all related to the notion of making physical activity a priority in one's life, which itself influences whether women exercise.¹⁰ Interventions aimed at increasing physical activity among mothers should specifically consider these barriers.

Mothers, as a primary influence in children's lives, are in a key position to serve as role models in encouraging families to be physically active. Children strongly bonded to exercising parents are significantly more likely to exercise themselves,²⁰ and girls who perceive their parents to be active are significantly more likely to be active themselves.²¹ Children who exercise are significantly more likely to exercise as adults.²² These studies suggest that being physically active not only benefits mothers but also has the potential to benefit their children as well.

This study was limited in that we had only measures of self-reported activity rather than measured activity levels. A systematic review of self-report vs. direct report assessments of physical activity in adults determined that relying on self-report of physical activity, rather than direct report, may result in discrepancies, but the discrepancies were inconsistent across studies.²³ Further, self-report is a widely used form of capturing physical activity levels, particularly for large population-based studies, where objective measures of physical activity are not feasible. We did not examine measures of extrinsic barriers, such as recreational or exercise facilities. Although we anticipate that these too would influence mothers' perceptions of barriers, our goal was to examine mothers' perceptions of internal barriers that would need to be addressed irrespective of the facilities available. It is possible that mothers of only very young children or only grown children would report different barriers than the mothers in this sample, who had at least one adolescent at home, with other children having a wide age range. It would be informative to examine how mothers' perceptions of barriers change as their children grow older. Finally, the physical ac-

tivity levels were higher than we anticipated. One possible explanation is that we asked about both leisure and non-leisure physical activity, which may have caused over-reporting of activity levels. The high levels of physical activity reported in this population may not be generalizable to similar populations in other parts of the country.

Conclusions

This study shows that the primary intrinsic barriers to physical activity for rural mothers are self-discipline, time, and interest. These barriers are all related to the issue of prioritizing physical activity. It is not surprising that mothers, who characteristically have multiple competing demands, may not be able to prioritize physical activity for themselves. With all the benefits that physical activity can offer—decreased stress, increased health, and positive role modeling for the family—it seems worthwhile to provide support enabling mothers to make physical activity a priority. Future interventions may need to be tailored across income levels. Because being a mother may be a risk factor for exercise deficiency, one possible area for future investigation is to determine if novel interventions could support activities mothers can do with their families, which also has the added benefit of supporting family activity. From an ecological perspective, there may be interventions on the community level that can overcome individual barriers. For example, Complete Streets initiatives,^{24,25} which support infrastructure to enable pedestrians and bicyclists of all ages and physical abilities to safely share the road with motor vehicles, can help rural residents overcome the challenges of having limited opportunities to engage in active travel. Future research should also investigate how Complete Streets initiatives could promote active travel patterns for rural mothers and their families, thereby supporting physical activity as the default option. Having physical activity as the default option through

community infrastructure potentially removes the barriers of self-discipline, time, and interest as something that mothers are currently forced to overcome.

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