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Physical activity interventions and changes in perceived home and facility environments

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Abstract

Objective—To examine changes in environmental perceptions over time and associations between changes in perceptions and physical activity among participants in two physical activity interventions.

Methods—Two independent trials were examined. Project STRIDE (STRIDE) (N=239) was conducted from 2000–2004 in Rhode Island. Step into Motion (SIM) (N=249) was conducted from 2003–2006 in Rhode Island and Pennsylvania. Both trials tested various delivery channels for providing individually-tailored motivational materials to increase physical activity among sedentary adults. Neither intervention aimed to change perceptions of the environment. At baseline, 6, and 12 months, surveys assessed physical activity and perceived facility and home equipment availability.

Results—In both trials, perceived facility availability increased from baseline to 6 months. Significant increases continued from 6 to 12 months in SIM only. Increases were not significantly different by treatment group. Perceived home equipment availability also increased from baseline to 6 months in both trials and from 6 to 12 months in SIM only. In STRIDE, greater increases were observed for intervention compared to control participants. Increased facility and home equipment availability were associated with increased minutes of physical activity in both trials.

Conclusions—Perceived facility and home equipment availability improved during participation in two individual-level physical activity interventions.

Keywords

Physical activity; Intervention; Environment; Adults

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I. Introduction

The benefits of regular physical activity include a reduced risk of heart disease, obesity, hypertension, and certain cancers. The Centers for Disease Control recommends that adults participate in at least 150 minutes per week of at least moderate-intensity physical activity. Despite this, only 46.7% of women and 49.7% of men in the United States met the physical activity recommendations in 2005.

An emerging area in physical activity research is the impact of the environment on physical activity behavior. This research is informed by the social ecological perspective, which suggests that behavior results from an interaction of the individual and the environment. There is a large body of literature examining many environmental correlates of physical activity, such as mixed land use, sidewalk quality and access, residential density, transportation infrastructure, recreational facility availability, and aesthetics. While studies have identified associations between objective measures of these environmental characteristics and physical activity, many additional studies demonstrate associations between people's perceptions of their environment and physical activity. Some researchers suggest that perceptions may be just as predictive of physical activity as objective measures.

While relatively little is known about people's perceptions of the physical activity environment, it is clear that humans have strong emotional reactions to places and that this can affect decisions to use them for physical activity. Furthermore, studies indicate that there is little agreement between perceived and objective measures of the environment, which may result from people judging the environment according to their own beliefs, expectations, and desires. Besides a limited understanding of how perceptions are formed, we do not know how amenable perceptions are to change and whether improving perceptions increases physical activity.

This study uses data from two individual-level physical activity intervention trials to test our hypotheses that (1) environmental perceptions change during intervention participation and (2) changes in perceptions are associated with changes in physical activity.

II. Methods

Data came from two individually-tailored interventions that aimed to increase physical activity among sedentary and irregularly active (i.e., participating in moderate or vigorous physical activity for 90 minutes or less per week) adults. In Step into Motion (SIM) (2003–2006), 249 participants were randomized to motivationally-tailored Internet, motivationally-tailored print, or standard Internet. Participants in the tailored Internet arm received access to a Web site which provided educational and motivational materials and tailored feedback to monthly questionnaires. Participants in the tailored print arm received the same intervention delivered through the mail. Participants in the standard Internet arm received access to a Web page containing links to publicly-available physical activity Websites. In STRIDE (2000–2004), 239 participants were randomized to motivationally-tailored telephone, motivationally-tailored print, or contact-control. Participants in the tailored telephone arm received educational and motivational materials and tailored feedback to monthly questionnaires provided by a health educator. Those in the tailored print arm received the same intervention delivered through the mail. Contact-control participants received health information on non-physical activity oriented topics. All participants in both trials completed monthly or bi-monthly physical activity logs and questionnaires. Although neither intervention aimed to change environmental perceptions, information about local walking trails, mall walking hours, and purchasing walking shoes was provided to intervention arm participants in both studies. Detailed descriptions of both interventions are published elsewhere.

A. Measurements

Assessments for both trials were conducted at baseline, 6 months, and 12 months. Physical activity was assessed using the 7-day physical activity recall. Environmental perceptions were measured using the Convenient Facilities and Home Environment scales from the Environmental Access Questionnaire. The Convenient Facilities scale measures the presence of 18 facilities "on a frequently traveled route or within a 5-minute drive from your work or home." The Home Environment scale measures the presence of 15 pieces of physical activity equipment available in the home, yard, or apartment complex. Both scales have high test-retest reliabilities among younger adults.

B. Statistical analyses

Analyses were conducted using Stata 9. Paired t-tests were used to examine differences in environmental perceptions over time and by treatment group. Longitudinal regression analysis with Generalized Estimating Equations (GEE's) were used to examine associations between changes in the perceived environment and physical activity over time. GEE's account for the correlation between repeated observations over time. The dependent variable was weekly minutes of moderate to vigorous physical activity (MVPA). Covariates included age, gender, race, income, education, and treatment group. Models examining the Convenient Facilities and Home Environment scales were run separately to avoid multicollinearity.

III. Results

Participants in both trials were predominately female (83% for SIM, 82% for STRIDE), Caucasian (82% for SIM, 90% for STRIDE), middle-aged (M=45.4 years for SIM, 44.5 years for STRIDE), college educated (67% for SIM, 71% for STRIDE), and reported a total household income above $50,000 (56% for SIM, 61% for STRIDE).

In both trials (table 1), there were statistically significant increases in the Convenient Facilities scale from baseline to 6 months ($p \leq 0.05$ for SIM, $p \leq 0.001$ for STRIDE). From 6 months to 12 months, there were significant increases for SIM participants only ($p \leq 0.05$). Changes in perceived facility availability were not significantly different by treatment group. The Home Environment scale increased from baseline to 6 months in both trials ($p \leq 0.001$ for SIM, $p \leq 0.01$ for STRIDE). From 6 to 12 months, there were statistically significant increases for SIM participants only ($p \leq 0.01$). In SIM, changes in perceptions did not differ by treatment group. In STRIDE, the increase was significantly greater for intervention than control participants ($p \leq 0.01$).

For both trials (table 2), there were statistically significant associations between changes in the Convenient Facilities scale and MVPA. Specifically, a one-unit increase in available facilities from baseline was associated with a mean increase at 12 months of 5 minutes of weekly MVPA for SIM ($p \leq 0.01$) and 4 minutes of weekly MVPA for STRIDE ($p \leq 0.05$). There were also statistically significant associations between changes in the Home Environment scale and MVPA. A one-unit increase in physical activity-related equipment at home from baseline was associated with a mean increase at 12 months of 20 minutes of weekly MVPA for SIM ($p \leq 0.001$) and 10 minutes of weekly MVPA for STRIDE ($p \leq 0.001$).

IV. Discussion

Our analysis from these two physical activity trials showed increases in perceptions of available physical activity facilities during intervention participation for all treatment groups. There were also increases in perceptions of physical activity-related equipment at home. For STRIDE, these increases were greater for intervention than control participants. Increases in perceived facility and home equipment availability were associated with increases in minutes of MVPA at the end of treatment in both trials.

The results from both trials showing associations between increased perceived facility availability and increased physical activity are consistent with previous studies showing positive associations between facility availability and physical activity. This study adds novel results to the body of literature on the environment and physical activity by being the first to identify a change in perceived availability during intervention participation and to show that this change was associated with increased physical activity. However, we did not find differences by treatment group. This can be explained by a lack of control group in SIM, but the results for STRIDE are less clear. While the findings demonstrate that perceptions are amenable to change, they raise questions about how perceptions change. It appears that participating in a physical activity trial, regardless of treatment group, increases perceived facility availability. It is possible that completing physical activity logs and questionnaires, an activity performed by participants in all arms of both trials, could lead participants to become more aware of their environment. Such self-monitoring activities have been shown to increase physical activity, however, to our knowledge, studies have not examined their impact on environmental perceptions. Furthermore, participants in all arms increased their physical activity level, which may have changed perceptions by increasing exposure to neighborhood physical activity resources.

The findings related to the home environment are supported by previous studies showing associations between the availability of home exercise equipment and physical activity. It is not clear whether changes in the home environment were due to increased awareness of existing equipment or the purchase of new equipment. Our observation of greater increases for intervention than control participants in STRIDE suggests that this may result from purchasing equipment. Otherwise, we may have seen changes in perceptions due to increased awareness among all groups as with facility availability.

There are several limitations of this study. For one, there was no control group in one of the two trials. Secondly, the measures of environmental perceptions were simplistic. Third, the analysis does not indicate direction of effect and, therefore, we cannot conclude that improving perceptions leads to increased physical activity. It may be that increased physical activity contributed to improved perceptions. Finally, it is worth mentioning that, though environmental perceptions were associated with increased physical activity, the effect sizes were relatively small. Nonetheless, this study is, to our knowledge, the first to examine the role of the environment in individual-level physical activity interventions. Our finding that environmental perceptions improved during intervention participation adds to our understanding of perceptions and highlights the importance of conducting research to examine how perceptions are formed and what causes them to change. Another strength of this study is the inclusion of data from two intervention trials, with similar findings across trials.

V. Conclusions

Perceptions of facility and home equipment availability improved during participation in two individual-level physical activity interventions. Changes in perceptions were associated with increased physical activity. This suggests that individual-level physical activity interventions have the capacity to change people's perceptions of their environment, which are associated with increased physical activity.

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Table 1

Difference in perceived facility and home equipment availability at baseline, 6 months, and 12 months

Time		Mean	SD	Mean Diff	T(df)	p-value
Facility availability[1]						
Baseline:	SIM[†]	**9.92**	**4.34**	**−0.48**	**−2.07 (248)**	**p≤0.05**
	STRIDE[‡]	**9.75**	**4.24**	**−0.92**	**−4.20 (238)**	**p≤0.001**
6 months:	SIM	**10.4**	**4.27**	**−0.39**	**−2.04 (248)**	**p≤0.05**
	STRIDE	**10.6**	**4.19**	**0.17**	**0.82 (238)**	p=0.41
12 months:	SIM	**10.8**	**4.09**			
	STRIDE	10.5	4.25			
Home environment[2]						
Baseline:	SIM	**5.50**	**2.71**	**−0.70**	**−6.44 (248)**	**p≤0.001**
	STRIDE	**5.46**	**2.61**	**−0.35**	**−2.94 (238)**	**p≤0.01**
6 months:	SIM	**6.20**	**2.88**	**−0.27**	**−2.80 (248)**	**p≤0.01**
	STRIDE	**5.79**	**2.58**	**−0.18**	**−1.86 (238)**	p≤0.10
12 months:	SIM	**6.47**	**2.77**			
	STRIDE	5.97	2.64			

[1] Facility availability scale ranged from 0–18

[2] Home equipment availability scale ranged from 0–15

[†] SIM (N=249) was conducted in Rhode Island and Pennsylvania

[‡] STRIDE (N=239) was conducted in Rhode Island

Table 2

Associations between changes in perceived facility and home equipment availability and minutes of physical activity

Variable		Beta	SE	95% CI	p-value
Facility availability[1,2]:	SIM[†]	5.07	1.83	1.47–8.66	p≤0.01
	STRIDE[‡]	3.52	1.65	0.29–6.76	p≤0.05
Home environment[1,2]:	SIM	19.6	3.31	13.1–26.1	p≤0.001
	STRIDE	10.2	3.17	3.94–16.4	p≤0.001

[1] Controlled for age, gender, education, income, race/ethnicity, treatment group

[2] Longitudinal regression models with GEE were run separately for facility availability and home equipment availability

[†] SIM (N=249) was conducted in Rhode Island and Pennsylvania

[‡] STRIDE (N=239) was conducted in Rhode Island