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Research Article

Primary Care Provider's Consideration of Environmental Factors When Counseling Patients about Physical Activity

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Abbreviations PCP: Primary Care Provider; PEA-PA: PCP Environmental Awareness questionnaire for Physical Activity; ICC: Intraclass Correlation Coefficients; MD: Doctor of Medicine; DO: Doctor of Osteopathy; SEE: Standard Error of the Estimate

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Abstract

Objective: There is a paucity of research on the content of Primary Care Provider (PCP)-patient discussions regarding physical activity especially content on environmental factors related to physical activity. Variable coverage of environmental factors by PCPs could manifest as inconsistent patient behavioral responses which is what research has demonstrated. Knowing the extent to which PCPs discuss environmental factors would provide additional insight into designing more effective physical activity interventions for primary care settings. Therefore, we examined PCP's coverage of environmental factors when counseling patients about physical activity.

Methods: For this cross-sectional study, 22.1% (n=104) of the PCPs practicing in the urban core of a large, metropolitan area self-reported whether they addressed any of the following six environmental factors when counseling patients about physical activity: places for physical activity, presence/absence of sidewalks/trails/paths, traffic, home exercise equipment, safety from crime and aesthetics. In addition, they indicated the types of resources they used and needed to help convey information to patients about environmental factors. Multiple regression analysis was used to identify characteristics related to the number of environmental factors addressed.

Results: Twenty-five percent of the PCPs did not address any of the six environmental factors when counseling patients about physical activity. The regression analysis showed that being male, needing more resources (e.g., in-house staff) and a lighter patient load were significantly associated with addressing fewer environmental factors. **Conclusion:** Providing PCPs with adequate resources could help them convey information to patients about environmental factors and potentially improve behavioral- and health-related patient outcomes.

Introduction

In the past 15 years, there has been an exponential rise in studies looking at social determinants of health especially those in the neighborhood and built environments (i.e., environmental factors) that could affect physical activity. Findings suggest that individuals are relatively more physically active if living in areas with places to walk to, lower crime rates, exercise facilities, parks with amenities, and pedestrian friendly sidewalks/streets [1-3]. A few studies have produced evidence indicating the existence of dose-responses and casual effects [4-7]. For instance, physical activity induced caloric expenditure rises in parks in concordance with increases in physical activity amenities (e.g., ball fields) and installing walking paths leads to significantly higher physical activity levels among residents exposed to the new paths [6,7].

In general, patients make positive lifestyle changes when instructed to do so by their Primary Care Provider (PCP) [8-10]. Whether this is the case with physical activity is unclear. Systemic reviews indicate the evidence is "inconclusive" regarding the efficacy of physical activity counseling in primary care settings [11-13]. The effects of counseling on patient physical activity tend to be variable between and within studies. Some patients respond and become physically active while a substantial proportion does not [14].

Given the relationship between physical activity and environmental factors, it is logical to assume that the degree environmental factors are addressed by PCPs could contribute to some of the variation in patient physical activity changes. For example, a PCP may tell a patient to increase their physical activity to 150 min/wk by walking in the neighborhood. However, if the neighborhood is unsafe, the patient may find it difficult to adhere to the advice. Support for including environmental factors in PCP-patient discussions comes from a study showing significant effects on physical activity when PCPs wrote exercise prescriptions that included information on the locations of

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recreational facilities [15]. Beyond this, there is a considerable deficit in the literature regarding the consideration of environmental factors in PCP-patient physical activity discussions. Therefore, we examined whether PCPs communicated information to their patients about environmental factors that could affect physical activity. In addition, correlates (e.g., PCP characteristics) of addressing environmental factors were explored. The outcomes are intended to help PCPs more effectively counsel patients about physical activity by addressing environmental factors considered key social determinants of health [16].

Methods

Procedures

Questionnaire Development: We developed the PCP Environmental Awareness questionnaire for Physical Activity (PEA-PA) according to commonly used procedures (Appendix A) [17]. Content evidence validity was established using a two-stage, expert panel review. In stage one, panel members representing exercise science, family medicine, urban planning, measurement and health behavior reviewed each item and proposed revisions. During stage two, panel members reached consensus on proposed revisions to maximize face and content validity. The final version contained questions about the PCPs and their patients and three subscales. For subscale one, PCPs were asked if the addressed six different environmental factors when counseling patients about physical activity. The factors were: places for physical activity, presence/absence of sidewalks/trails/paths, traffic, home exercise equipment, safety from crime and aesthetics. For subscales two and three, PCPs were asked about resources they needed and used to convey information to their patients about environmental factors. A primary consideration for including a particular environmental factor or resource was the existence of empirical evidence supporting its relationships with physical activity (for an environmental factor) and primary care counseling (for a resource) [1-3,18]. Test-retest repeatability was examined by having a sample of PCPs, who did not take part in the main study, complete the PEA-PA on two occasions separated by one week.

Data Collection

The current study was conducted in the urban core of a relatively large (2.2 million people), Midwestern, metropolitan area (Table 1). To identify PCPs offering adult primary care in the urban core, key words (physician, family medicine, internal medicine, nurse practitioner, family practice, practitioner, general practitioner) were entered separately into online search engines (Google, WebMD, American Medical Association Doctor Finder, Medicare.gov and American Association of Nurse Practitioners) for each of the 25 zip codes that constitute the urban core. The resulting lists of PCPs were cross-checked to eliminate duplication and verify the practice was located in one of the zip codes. A total of 471 unique PCPs [120 Doctors of Medicine (MD), 35 Doctors of Osteopathic Medicine (DO) and 316 nurse practitioners] were identified. To obtain a study sample representing 20% of the 471 PCPs while accounting for a 50% non-response rate, a random sample of 190 PCPs (76 physicians and 114 nurse practitioners) was selected. This response rate is considered acceptable for obtaining a representative sample in survey research [19]. The 190 PCPs were mailed the PEA-PA along with a description of the study, instructions, informed consent forms and postage-paid, return-addressed envelopes. Follow-up contacts were made to determine if there were any questions and encourage survey completion. Two weeks after the initial mailings, the study was closed and no additional questionnaires were accepted (or received). A total of 104 completed questionnaires (54.7% return rate) were returned from 36 physicians and 68 nurse practitioners. Study procedures adhered to the principles expressed in the Declaration of Helsinki and the Common Rule in the Code of Federal Regulations (45 CFR 46) on the Protection of Human Subjects. The study protocol was approved by the Kansas City University's Institutional Review Board and all participants were properly instructed and have indicated that they consent to participate by signing the appropriate informed consent paperwork.

Table 1: Characteristics of the 25 urban core zip codes (U.S. Census 2010).

Characteristic	Mean (SD)
Total Population	14,707 (5,304)
% Non-white	45.1 (19.8)
% Less than High School Diploma	25.2 (11.5)
Median Household Income ($)	33,138 (7,263)
Population change 2000 to 2010 (%)	-4.3 (6.5)

Statistical Analysis

Questionnaire Psychometrics: Test-retest repeatability of categorical variables was examined using Cohen's kappa (κ) (overall kappa for two-level and weighted kappa for > two-levels) and percent agreement given the stability of κ is dependent on the prevalence of responses to a question [20]. Strength of agreement between categorical variables using κ was defined as: 0 to 0.19 poor, 0.2 to 0.39 fair, 0.4 to 0.59 moderate, 0.6 to 0.79 substantial and 0.8 to <1.0 almost perfect [20]. Percent agreement values > 66% was classified as fair [21]. Intraclass Correlation Coefficients (ICC) was calculated to examine similarities between test-retest responses for continuous variables with adequate reliability defined as an ICC ≥ 0.75 [17]. Internal reliability analyses (Cronbach's α) were performed on responses to multiple items within a subscale. Internal reliability was deemed acceptable if α was > 0.6 [17].

Data Quality Control

Several recommended quality-control efforts and procedures were put in place to ensure the quality and accuracy of data being collected using survey research methodology [22]. A comprehensive search was conducted to identify all PCPs meeting the inclusion criteria (offering adult medical care in one of the 25 zip codes constituting the urban core), a representative sample was obtained by randomly selecting an adequate number of PCPs from the pool of PCPs identified, an accepted method of delivering study materials to PCPs was utilized along with proper follow-up, rigorous questionnaire development methodologies were followed to produce the PEA-PA which displayed above average reliability and a data entry/quality monitoring process (e.g., coding and missing data checks) was adhered to ensure data integrity.

Data Analyses

Descriptive statistics were generated for all variables and distributions checked for normality and corrected if necessary. Other

assumptions (linearity, homoscedasticity, homogeneity of variance, collinearity and the presence of outliers) also were investigated and found to be within acceptable limits for the statistical tests employed. Bivariate relationships between the number of environmental factors addressed and other variables were examined using Pearson product-moment correlation. A multiple linear regression model was then created to explore predictors of the number of environmental factors addressed. The predictor variables used in the model were those found in the bivariate analyses to be significantly related ($P<0.05$) to the number of environmental factors addressed. The significance level was set at $\alpha < 0.05$ and all analyses were conducted using the SPSS statistical software package (IBM Corp. Released 2015. IBM SPSS Statistics for Windows, Version 23.0. Armonk, NY: IBM Corp.).

Results

Questionnaire Development

For categorical variables with two or more levels, the κ statistics ranged from 0.85 for "how often do you counsel your patients about physical activity" to 0.95 for a number of variables (e.g., academic degree). The κ values were all above 0.6 (substantial to almost perfect) for the environmental factors discussed, resources used and additional resources needed items. All categorical items showed at least fair agreement (> 66%) from test to re-test. The ICCs for continuous variables were all significant and greater than 0.88. The PEA-PA response scales were internally consistent as evidenced by high Cronbach's α statistics (0.77 for environmental factors addressed; 0.77 for resources used; 0.70 for additional resources needed).

Questionnaire Outcomes

Table 2: Primary care practitioner characteristics (n=104).

Characteristic	Mean (SD) or %
# Patients seen/month	172.6 (107.8)
1st time patients (%)	33.8 (21.2)
PCP frequency of discussing physical activity	
Always	14.4
Frequently	69.2
Sometimes	16.3
Never	0
Time/patient discussing physical activity (min:s)	6:56 (4:07)
% of patients in 18-65 y age group	82.7
% Female	71.2
% White	80.8
% African American	5.8
% Asian	5.8
Other	7.7
Academic Degree	
% MD	26
% DO	8.7
% Nurse Practitioner	65.4
PCPs meeting physical activity guidelines	59.60%

Table 3: Percentage of PCPs that addressed a particular environmental factor.

Environmental Factor	Percent Discussing
Places for physical activity	64.4
Presence/absence	63.5
sidewalks/trails/paths	
Traffic	26.9
Home exercise equipment	29.8
Safety	35.6
Aesthetics	5.8
Exercise routine[a]	88.5

[a]Non-environmental factor.

Most PCPs were white (80.8%), with more being female (71.2%) and a nurse practitioner (65.4%) (Table 2). Nurse practitioners were mainly female (91.2%) while the majority of physicians were male (66.7%) and MDs (75.0%). None of the PCPs indicated "Never" while 69.2% said they "Frequently" covered physical activity with their patients. Nearly 60% of the PCPs met current physical activity guidelines [23].

On average, PCPs addressed 2.3+1.7 of the six environmental factors. Five PCPs (4.8%) addressed all six, 42.3% addressed one to two and 25.0% did not address any factors. A breakdown of the coverage of each environmental factor can be found in table 3. Places for physical activity and the presence/absence of sidewalks/trails/paths were both addressed by approximately 64% of the PCPs. They were less likely to mention safety (35.6%), home exercise equipment (29.8%) and traffic (26.9%) and it was uncommon for a PCP to report addressing aesthetics (5.8%). A non-environmental factor, exercise routine (e.g., frequency, mode), was addressed by 88.5% of the PCPs.

The PCPs also were asked about common resources they used and/or needed to convey information to patients about environmental factors (Table 4). Only 29.2% actually used additional

Table 4: Resources used and needed by PCPs to help convey information to patients about environmental factors associated with physical activity.

Resources	
Used	
Brochures/flyers	15.4
Place to refer patients for physical activity	14.4
In-house staff	3.8
Visual images on walls	2.9
Computer Technology	3.8
Needed	
Brochures/flyers	75
Place to refer patients for physical activity	62.5
In-house staff	71.2
Visual images on walls	50
Computer Technology	16.3
More time	78.8
More education	28.8

Resources used 0.37 ±0.68, range 0 to 3; Resources needed 2.0 ±0.82, range 1 to 4.

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Table 5: Correlates of the number of environmental factors discussed by PCPs when Counseling patients about physical activity.

Correlate	Pearson's r	P Values
# patients seen in a month	0.2	0.04
% first time patients	0.17	0.08
Min spent with patient		
How often discuss activity (Sometimes = 1 to Always = 3)	0.1	0.34
Additional resources needed	-0.31	0.002
Additional resources used	-0.11	0.25
Gender (Female = 0, Male = 1)	-0.39	<0.001
Degree (DO/MD = 0, Nurse Practitioner = 1)	0.41	<0.001
Meet activity guidelines (No = 0, Yes = 1)	0.11	0.26
Average min spent discussing physical activity with a patient	-0.04	0.72

Table 6: Results of multiple linear regression analysis predicting the number of environmental factors addressed.

Independent Variables	Unstandardized β coefficients (95% CI)	SE	t value	Sr^2	VIF
(Constant)	3.444 (2.362 to 4.525)	0.545	6.32***		
Patients/month	0.003 (0.001 to 0.006)	0.001	2.71*	0.045	1
Gender (F=0)	-1.390 (-2.163 to -0.616)	0.39	-3.57**	0.079	1.7
Training (MD/DO = 0)	0.664 (-0.056 to 1.383)	0.363	1.83	0.021	1.6
# Resources needed	-0.909 (-1.252 to -0.566)	0.173	-5.26***	0.171	1.1

*p<0.01;**p<0.005;***p<0.001; SE: Standard Error; SR: Semi-Partial Correlation; VIF: Variance Inflation Factor; F: Female; MD: Doctor of Medicine; DO: Doctor of Osteopathic Medicine.

resources. Providing brochures/flyers (15.4%) and having places to refer patients to for physical activity (14.4%) were the most popular. Very few used in-house staff (3.8%), visual images on office walls (2.9%), or computer technology (3.8%). Consistent with their low use of resources, all PCPs indicated needing at least one additional resource to help them with environmental factors and 25% needed three or more additional resources. Having additional in-house staff (71.2%) and more time (78.8%) were high priority needs. Computer technology was not a priority, identified by only 16.3% of the PCPs as a needed, additional resource.

Bivariate analyses indicated that the number of environmental factors addressed was related to gender (r = -0.39; P<0.001; where female = 0 and male = 1), PCP degree (r = 0.41; P<0.001; where DO/MD = 0 and nurse practitioner = 1), the number of patients seen per month (r = 0.20; P= 0.04) and number of additional resources needed (r = -0.31; P= 0.002) (Table 5). Multiple regression analysis showed that the model containing number of patients seen/month, number of additional resources needed, gender (female = 0, male = 1) and degree (physician = 0, nurse practitioner = 1) explained a significant proportion of the variance in the number of environmental factors addressed (Table 6). The model parameters were as follows: R^2 = 0.387; Adjusted R^2 = 0.362; Standard Error of the Estimate (SEE) = 1.39; F=15.6 (4,99); P<0.001). More environmental factors were addressed if the PCP was female, saw more patients/month and needed fewer additional resources. The degree of the PCP was not significantly associated with the number of environmental factors addressed when the other variables were considered. The number of additional resources needed explained the highest percentage (17.1%) of the unique variance in number of environmental factors addressed followed by gender (7.9%) and number of patients seen/month (4.5%).

Discussion

The main purpose of this study was to determine if PCPs addressed factors associated with the neighborhood and built environments when counseling patients about physical activity. Although most PCPs frequently or always discussed physical activity with their patients, they did not report significant coverage of the environmental factors examined. Further, the use of resources to help expand counseling to include environmental factors was limited even though the PCPs indicated needing additional resources for this purpose.

To the best of our knowledge, this was the first study to specifically examine PCP coverage of environmental factors related to physical activity. Past research has focused on whether PCPs discussed physical activity and the amount of time devoted to such discussions [12,13,24,25]. In general, barriers (e.g., lack of time) limit the quantity of such counseling which appears to impact its effectiveness. According to the current study, these same barriers affect the quality by reducing coverage of environmental factors which have been shown to foster physically active lifestyles. Some studies provide indirect evidence about the omission and importance of considering environmental factors. Carroll and colleagues [26], using the 5As (Ask, Advise, Agree, Assist, Arrange) model in primary care to promote changes in patient behavior, reported few PCP-patient discussions of physical activity contained Assist or Arrange statements -the two that deal with environmental factors (e.g., mentioning available community resources). Elley at al. [15] found that a PCP-led intervention containing information on community-

based physical activity initiatives was more effective at promoting physical activity than the same intervention without such material. About half of the PCPs in the current study told patients about places in the community they could utilize for physical activity. Few covered other environmental factors, such as safety, which is a fairly strong correlate of physical activity especially walking [27]. This may be an especially relevant finding for adult patients living in urban settings given the popularity of walking in this population and the fact that most walking occurs in one's neighborhood [28-30]. If these patients have perceived or real issues with safety (e.g., from crime), they could find it difficult to adhere to their PCP's advice to be more physically active.

The use of resources by PCPs to inform patients about environmental factors was low; however, all PCPs indicated needing additional resources for this purpose. This speaks to the issue of resource inadequacies which is commonly cited as a limitation to providing optimal patient care [31,32]. For example, only 3.8% used in-house staff, but 71.2% said they needed this resource. This is discouraging given that in-house staff is effective for conveying information to patients about physical activity and enhancing behavioral change outcomes [33,34]. Furthermore, PCPs indicated needing people or places to refer patients to for help with physical activity. This is a logical mindset of a group that generally feels under-resourced, but one that has a high potential to accept the use of viable, alternative options for improving patient care. As noted by Muth and colleagues [35], additional, seamless mergers between clinical and community resources are advantageous to achieve more meaningful effects on patients' physical activity. Although a collaborative-based model of care is desirable, current regulations and reimbursement guidelines may limit this approach. Still, it is worth investigating particularly if appropriate partners are selected, such as personal trainers, who are taught to use recommended exercise prescription guidelines which include coverage of environmental factors [36].

Computer technology was not used to any great extent and was the least identified need. This is an area for further study given the impact technology can have on time efficiency. Intuitively, the use of technology should be at the forefront of medicine, but it is possible that restricted resources decrease PCPs' enthusiasm for implementing innovative approaches especially when it's targeting an area (e.g., environmental factors) they do not cover regularly. We did not observe a significant relationship between PCP physical activity levels and their consideration of environmental factors. Previous studies have found that physicians who are more physically active and in better health are more likely to counsel patients about physical activity than their inactive, less healthy peers [37,38]. It is possible that being active does not increase PCP awareness or knowledge of environmental factors affecting physical activity. Thus, they would have no basis to relay such information to their patients. Alternatively, active PCPs may know about relevant environmental factors but do not convey this knowledge to their patients because they lack the means (e.g., time).

Nurse practitioners were significantly more likely than physicians to discuss environmental factors according to the bivariate analysis. Wilcox et al. [39] also found differences between nurse practitioners and physicians in terms of involving patients in discussions about physical activity and writing exercise prescriptions. Others have suggested that variations in counseling are related to a PCP's gender [40,41]. Results of our multivariate analysis showed that variations in physical activity counseling content are not significantly associated with academic degree when gender is considered. It could be argued that because most of the nurse practitioners were female and physicians were male, there is a latent variable tied to degree leading to observed differences by gender. For example, lack of time and confidence in counseling abilities have been tied to academic degree as well as the provision of routine physical activity advising [33]. In either case, additional research is warranted to uncover reasons coverage of environmental factors varies by gender and/or training.

This study has strengths worth mentioning. It is the first to examine PCPs' coverage of environmental factors related to physical activity. Given the influence PCPs have on patient behaviors and the influence environmental factors have on physical activity, promoting PCP coverage of environmental factors could significantly improve patient outcomes. The PEA-PA questionnaire, although new, was developed according to a commonly used protocol and it expressed favorable psychometrics. The instrument may prove valuable for use in future studies extending this line of inquiry and as an asset for practice personnel wanting to enhance effectiveness.

There also are limitations that should be considered. The PCPs returning surveys could have possessed different perspectives and motivations than those not returning surveys. For instance, environmental factors related to physical activity may have been a topic of particular interest to survey returners with their level of interest related to how much they discussed environmental factors. Given this scenario, our findings are even more telling because consideration of non-responders would be expected to show that PCPs coverage of environmental factors is even lower. Data was self-reported which carries with it the possibility of reporting bias. Recordings of PCP-patient sessions would be the gold standard and one the PEA-PA questionnaire could be compared against for validation purposes. In addition, the PCPs were asked about only six environmental factors and whether the factor was addressed or not. Future studies could examine other factors, the degrees they are addressed (e.g., never, often) and/or the degrees they are addressed relative to certain patient characteristics (e.g., always address a factor with an inactive patient). Finally, the study was cross-sectional and conducted in the urban core of a large city limiting inferences regarding causality and possibly the applicability of our findings to non-urban areas (e.g., suburban and rural).

Conclusion

The PCPs in this study counseled their patients about physical activity, but only provided minimal coverage of environmental factors associated with physical activity. Addressing and alleviating the needs identified by PCPs may be an effective approach for increasing their discussion of environmental factors. It is recommended that researchers investigate the nature of the relationships between patient physical activity changes and the inclusion/omission of environmental factors including which factors are important given certain patient characteristics (e.g., gender). It also would be pertinent to further explore the discrepancy found between men and women as well as why computer technology was not seen as an important resource for enhancing coverage of environmental factors.

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