Changes in community readiness among key school stakeholders after Ready for Recess

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Abstract

School community readiness (CR) for health promotion efforts may be critical to the effectiveness of school-based interventions aimed at promoting youth physical activity and reducing childhood obesity. The purpose of this study was to: (i) identify key informants who scored highest on school CR at baseline and (ii) determine the effects of Ready for Recess on changes in CR among school key informants from baseline to post-intervention. Key informants (N=98) across 17 schools participated in CR interviews. Interview questions focused on school CR for physical activity and childhood obesity efforts across six dimensions. At baseline, principals scored higher than teachers in overall readiness and knowledge of the issue and higher than recess staff and nurses in leadership. Leadership readiness decreased across key informants at post-intervention and principals demonstrated greater decreases when compared with recess staff. Baseline disparities between principals and other key informants suggest principals may have overestimated the readiness of staff implementing the intervention. Declines among principals indicate that they may not have been prepared to deliver adequate support to successfully implement the intervention. These results illuminate the importance of assessing/improving school readiness prior to interventions. The CR model may provide an opportunity to improve school-based physical activity interventions.

Introduction

Despite the well-known benefits of physical activity (PA) participation on a number of health markers, including reduced risk of overweight/obesity, improved strength and endurance, healthy muscles and bones, improved blood pressure and cholesterol levels and enhanced mood states (e.g. stress, self-esteem) [1], the majority of youth do not meet recommendations for moderate to vigorous PA (60 min every day) [2, 3]. In coordination with Healthy People 2020 objectives, the Centers for Disease Control & Prevention [4] has identified schools as critical to PA promotion among youth, as more than 95% of American children are enrolled in schools and spend ~30 h per week at school. School recess in particular may offer a viable setting to promote PA because it provides the opportunity to improve youth PA without requiring additional time allotted to PA and accounts for ~42% of available school-day PA opportunity [5]. Further, a large body of recent research has established the effectiveness of environmental modifications (i.e. addition of recess equipment and staff training) for improving youth PA [6–11]. Unfortunately, this research lacks information on how the school’s readiness to implement PA efforts may impact the effectiveness of these environmental modifications [7, 8].

Recent studies suggest that individual school communities’ readiness to adopt and implement change efforts may be critical to the effectiveness of school-based interventions aimed at promoting youth PA and reducing childhood obesity [12].
The Community Readiness Model (CRM) [13] provides a useful platform to evaluate school communities’ capacity to adopt change efforts (i.e. readiness) in relation to specific issues, such as childhood obesity and low PA levels. The CRM is based upon the transtheoretical model (TTM) [14] and community development theory [15, 16]. Although the TTM provides important contributions to the CRM, its focus on individual readiness does not account for several factors present in community environments, including group processes (e.g. relationships between leaders and other community stakeholders), stabilization of programming (i.e. programs are fully integrated and accepted within a community), many distinct stages of readiness and the multidimensionality of community readiness (CR) [13]. For example, CR is community- and issue-specific in that different school communities may need different interventions to address the childhood obesity issue. Further, although community development theories address group decision-making processes within communities, they fail to define all of the stages of CR and the multidimensional nature of CR [13]. Utilizing the strengths and addressing the limitations of these theories, researchers at the Tri-Ethnic Center developed the CRM to define and measure CR and to provide suggestions for intervention. The CRM’s utility is 3-fold: (i) tailor interventions to each community’s level of readiness for a particular issue; (ii) gauge the impact of baseline CR on the effectiveness of an intervention and (iii) measure change in CR due to an intervention [13].

Ehlers and colleagues [12] recently demonstrated the CRM’s utility for addressing childhood obesity and PA in the school environment. Results of this study indicated that low school baseline CR may negatively impact the effect of environmental modifications on youth PA and that schools overall may have insufficient CR levels for the sustainable implementation of efforts aimed at increasing youth PA. Unfortunately, school-based PA research has not considered school readiness ‘before’ implementing change efforts, despite strong evidence to support CR’s role as a precursor to implementing change [17]. Research aimed at better understanding school CR may illuminate the consequences of ignoring CR before implementing PA efforts and, more importantly, may provide health promotion professionals with information critical to the successful design and implementation of school-based PA interventions.

As CR is based upon the readiness levels of key stakeholders (i.e. key informants) on a given issue, investigating the readiness of specific school stakeholders (e.g. principals, teachers and recess staff), as opposed to the school community’s overall readiness level, may provide the most significant information to guide the design and implementation of school-based PA interventions [12]. CR literature theorizes that varying levels of readiness by various types of key informants (e.g. practitioner versus leader) may impact the potential of change efforts in different ways [17]. For example, Huberty et al. [18] found that the readiness of school staff implementing a PA intervention and their perceptions of how the leadership supported changes may influence the success of efforts. Likewise, Kam et al. [19] found that principals’ capacity to lead and support efforts may be critical to school-based interventions. An improved understanding of key informant CR may help researchers to better tailor interventions and improve the sustainability of school-based PA interventions. Therefore, the purpose of this study was to: (i) identify key informants who scored highest on school CR (in relation to the childhood obesity issue and implementing PA efforts) at baseline and (ii) determine the effects of Ready for Recess, an intervention aimed at implementing environmental modifications to school recess (i.e. staff training, recess equipment), on changes in CR levels among key informants from baseline to post-intervention. We hypothesized that school leaders and individuals expected to have greater leadership in health and childhood obesity (principals, PE teachers and nurses) would score highest across CR dimensions at baseline. We also hypothesized that key informants’ CR levels would increase from baseline to post-intervention as a result of Ready for Recess. We also examined baseline differences and changes in each of the six dimensions of readiness in the CRM [20].
Method

Ready for Recess

Ready for Recess was delivered in a Midwestern Metropolitan area in the United States from August 2009–10 to May 2010–11 and targeted children in grades 3–6 (mean age $= 9.89 \pm 1.22$ years; Range: 8–13 years) at 17 schools randomly assigned to one of the four interventions: (i) recess staff training and equipment (ST + EQ), (ii) recess staff training only (ST), (iii) recess equipment only (EQ) (iv) or control (C). Although information about the Ready for Recess intervention and procedures has been reported elsewhere [6–8], Ready for Recess was guided by the ecological model [21] and adapted from the Active and Healthy Kids Program [22]. Specifically, Ready for Recess focused on the activity zone component of the Active and Healthy Kids Program. Recess staff, teachers who supervised recess, nurses/health aides and principals at schools assigned to the ST + EQ or ST interventions participated in a pre-intervention training to learn (i) more about the intervention and staff responsibilities in implementing activity zones, (ii) strategies to promote PA in youth and (iii) how to design and implement activity zones to maximize youth PA during allotted recess time. Schools assigned to the EQ intervention received recess equipment (e.g. balls, jump ropes, hula hoops, etc.), and staff at these schools did not participate in the pre-intervention training. Four inner-city schools, four urban schools and one rural school participated during the 2009–10 school year, and eight inner-city schools participated during the 2010–11 school-year. Only schools in which at least 50% of students were eligible for free/reduced lunch were invited to participate in Ready for Recess. This study was approved by a University Medical Center Institutional Review Board. Descriptive characteristics of the schools and the results of the Ready for Recess intervention (on youth PA) are reported elsewhere [7–9, 12].

Participants

Participants were 98 key informants (across six key informant groups) from the 17 schools for which baseline and post-intervention data were complete, including: the principal ($n = 16$), the school nurse ($n = 17$), the PE teacher ($n = 17$), one paraprofessional (i.e. recess staff) ($n = 17$), one third to sixth grade teacher ($n = 17$), and one parent ($n = 14$). The research team had direct contact with the principal and PE teacher during the recruitment of schools for Ready for Recess and contacted them directly to schedule CR interviews. Principals identified a paraprofessional, teacher and parent who would be available to participate in CR interviews and initiated contact with these individuals and the nurse on behalf of the research team. After the principal received initial consent from each key informant, the research team contacted each individual by phone and/or email to schedule baseline and post-intervention CR interviews.

CR interviews

CR was measured using interviews that consisted of a series of 26 open-ended questions targeting all six dimensions of readiness related to adopting childhood obesity and PA behavior change efforts [12]. The six dimensions of readiness include: (i) community efforts to address the issue, (ii) community knowledge of the efforts, (iii) leadership, (iv) community climate surrounding the issue, (v) community knowledge about the issue and (vi) resources related to the issue [20]. For example, the leadership dimension reflects the extent to which appointed and influential community members support efforts to address a particular issue, whereas the resources dimension refers to the extent to which resources (e.g. time, money, people and space) are available to address the issue [20]. The questions were developed and validated and school key informants were identified during the Ready for Recess pilot study [9]. Additional information on the development of the CR interview is published elsewhere [12]. Researchers at a local university conducted all interviews prior to or at the beginning of Ready for Recess and again after Ready for Recess (August 2009/May 2010, $n = 9$ schools; August 2010/May 2011, $n = 8$ schools). Six researchers conducted interviews (with one interviewer...
conducting each interview), and each interview lasted ~25–35 min. A total of 101 baseline interviews and 98 post-intervention interviews were conducted. All interviews were conducted in-person at the school site or over the phone at the key informant’s request and were transcribed on a Microsoft Word document while the interview was being conducted.

Researchers used the Community Readiness Handbook [20] to score the CR interviews they did not conduct. Each interview was independently scored by two researchers on each of the six dimensions using criteria for the nine stages of readiness [20]. The nine stages (as outlined in the CR Handbook) include: (i) no awareness, (ii) denial or resistance, (iii) vague awareness that a problem exists, (iv) preplanning, (v) preparation, (vi) initiation of change, (vii) stabilization of programs, (viii) confirmation or expansion of programs or (ix) professionalization. When assessing each dimension, the scorers referenced a rating scale for each dimension in the Community Readiness Handbook [20]. For example, in relation to leadership, a score of 1 (no awareness) signified ‘Leadership has no recognition of the issue’, a score of 4 (preplanning) signified ‘Leader(s) is/are trying to get something started’, and a score of 9 (professionalization) signified ‘Leaders are continually reviewing evaluation results of the efforts and are modifying support accordingly’ [20]. These ranks were assigned for each key informant for each dimension based upon their responses to the interview questions. The two scorers convened to discuss the dimension scores for each interview. When scores were different, scorers, using the Community Readiness Handbook [20], discussed their reasons for assigning a particular rank and came to an agreement on scores. The inter-rater reliability among scorers was moderate to high based on Kendall’s coefficient of concordance for ordinal responses (baseline dimensions: A = 0.78, B = 0.81, C = 0.81, D = 0.75, E = 0.71, F = 0.69; post-intervention: A = 0.81, B = 0.85, C = 0.85, D = 0.74, E = 0.74, F = 0.74; all P-values were <0.0001). Dimension scores (as agreed upon by two researchers) were summed for each key informant to calculate a final and total score for each interview (possible range = 6–54). Total scores and dimension scores were averaged across schools to calculate an overall and dimension-level average score for each key informant group. A score of 6 represented no awareness across all dimensions, whereas a score of 54 represented professionalization across all dimensions. The training of research assistants to conduct and score CR interviews is published elsewhere [12].

**Data analysis**

One-way analysis of variance (ANOVA) was used to compare overall CR score and the six dimension scores among the six key informants at baseline. Post hoc pairwise comparisons of key informant scores were conducted using least significant differences with Bonferroni adjustment. Individual dimensions showed some non-normality, but overall key informant CR scores were normally distributed. The dimension scores were equivalent to ranks because the response variables were ordinal (possible values 1–9) and variances were homogenous by the Brown and Forsythe test [23]. Therefore, the assumptions were adequately satisfied for an ANOVA test of ranked data.

Changes in overall CR and CR dimension scores from baseline to post-intervention were assessed using repeated measures ANOVA. Repeated measures analysis of covariance (ANCOVA) was used to test whether the main effects of school baseline CR or intervention-type significantly explained the variance in changes in overall key informant CR or in dimension scores across time and to test for interactions. The Wilcoxon signed rank test was used for assessing significant differences in individual key informant CR scores. The six CR dimensions were considered significant at \( P < 0.008 \), and pairwise key informant means within dimensions were considered significant at \( P < 0.003 \) (15 total tests). The precision of estimated mean differences are reported using 99% confidence intervals (CIs). All analyses were conducted in SAS 9.2 (SAS Institute Inc., Cary NC, USA).
Results

Baseline CR

Principals scored highest on overall CR at baseline, while teachers scored lowest (mean difference $=5.42$, 99% CI $0.01$–$10.8$, $P < 0.008$) (Table I). By dimension, principals scored higher on knowledge of the childhood obesity issue as compared with teachers (mean difference $1.03$, 99% CI $0.10$–$1.95$, $P < 0.008$), and on leadership as compared with recess staff (mean difference $1.35$, 99% CI $0.14$–$2.56$, $P < 0.008$). After removing the variance explained by baseline school CR, principals also demonstrated higher readiness in the leadership dimension as compared with nurses (mean difference $=1.11$, 99% CI $0.02$–$2.21$ $P < 0.008$).

Changes in CR after Ready for Recess

Repeated measures ANOVA

Significant changes from baseline to post-intervention were observed in the leadership dimension, $F(1, 92) = 10.9$, $P = 0.001$. Changes in individual key informants (within-individual changes) were stronger than changes observed by key informant category (between key informant groups), $F(5, 92) = 2.90$, $P = 0.02$. Although all key informants demonstrated some decreases in leadership, the greatest differences were observed between principals and recess staff. Specifically, decreases in leadership CR among principals attenuated the significant gap in leadership CR observed between principals and recess staff. This decrease contributed to the overall significant decrease in the leadership dimension (Table I).

Wilcoxon signed rank test

A significant decrease in leadership CR was observed in PE teachers ($n = 17$, $S = -43.5$, $P = 0.004$). No other significant changes were observed in other key informants from baseline to post-intervention.

Analysis of covariance

After accounting for the variance explained by overall school CR at baseline, decreases in leadership within individual key informants became more significant, $F(1, 90) = 11.9$, $P = 0.0009$. Decreases in leadership between key informant groups also became more significant, $F(5, 90) = 3.55$, $P = 0.0056$ (Table II). Differences in leadership CR between principals and recess staff from baseline to post-intervention also became stronger after accounting for overall school CR at baseline (mean difference $=1.35$, 99% CI $0.12$–$2.58$, $P < 0.003$).

Additionally, a marginally significant interaction was observed between changes in leadership CR (within key informants across time points) and overall school CR at baseline, $F(2, 90) = 4.00$, $P = 0.02$ (Table II). At baseline, CR in the leadership dimension was higher at schools with lower levels of overall CR [preplanning (2.54), vague awareness (3.29) and denial/resistance 4.25)]. However, at post-intervention, decreases in leadership were observed across schools, with the largest decreases occurring at schools in vague awareness (2.44) and denial/resistance (3.25) as compared with preplanning (2.51). Figure 1 illustrates the leadership dimension stratified by key informant group at baseline and post-intervention. The significant decrease in leadership was unaffected by the specific intervention type (ST + EQ, ST, EQ and C).

Discussion

The purpose of this study was to identify which key informants had highest baseline CR at schools participating in Ready for Recess and to evaluate changes in CR among key informants after Ready for Recess. The major findings of this study illustrate that disparities may exist between the leadership (i.e. principals) and other key informants, namely teachers, recess staff and nurses, especially at schools with the lowest levels of readiness. The disappearance of these disparities due to decreases in leadership CR among principals suggests that attempts to better prepare principals to lead change efforts may be essential. Most importantly, the results suggest that efforts to improve relationships
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*Denotes that principals demonstrated significantly higher CR at Time 1 (baseline) (P < 0.008; adjusted for baseline school CR).
*Denotes that principals demonstrated greater decreases in CR from Time 1 (baseline) to Time 2 (post-intervention) (P < 0.008).
*Denotes significant within subject changes from Time 1 (baseline) to Time 2 (post-intervention) (P < 0.0009; adjusted for baseline CR).
between leaders and staff implementing interventions may be most critical at schools with the lowest levels of readiness.

When asked about the formal and informal leaders, key informants most often identified principals as leaders within their school communities. At baseline, principals scored highest across all CR dimensions, especially when compared with teachers. Low overall CR and low CR in the knowledge dimension at baseline suggest that teachers may not have been adequately prepared to implement the

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**Table II. Repeated measures ANOVA statistics for changes in leadership CR (with overall school CR at baseline included)**

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*MS*, mean square; *df*, degrees of freedom; *F*, F-statistics

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*Fig. 1.* Leadership CR by key informant group and baseline school CR category at baseline and post-intervention.
Ready for Recess intervention. In addition to teachers, recess staff implemented Ready for Recess and demonstrated low overall CR at both baseline and post-intervention. Principals were the main point of contact during the Ready for Recess enrollment period and this may have resulted in principals overestimating staff readiness levels to deliver the intervention. Previous research indicates that principals may lack an adequate understanding of how prepared other stakeholders are to successfully implement and sustain prevention interventions [24]. Previous research has also acknowledged the need to better equip teachers and paraprofessionals with tools and skills to promote health behaviors in youth [25]. Naylor et al. [26] have shown that a whole-school approach, in which those implementing the intervention are primary points of entry into schools, may provide a more empowering model to promote PA among youth. Therefore, a whole-school approach that engages all key stakeholders before schools enroll in interventions may be more effective.

At baseline, disparities in leadership CR between principals and recess staff and principals and nurses, in addition to higher leadership CR among principals at schools with the lowest levels of readiness, indicate that relationships among the leadership and staff implementing interventions may have been weak. Previous research by Fagen and Flay [24] has provided evidence that weak relationships between leaders and those implementing the effort may result in low implementation fidelity and weak intervention outcomes [12]. Inadequate perceptions of the leadership, especially by those responsible for the implementation of an intervention, may have negatively affected the impact of Ready for Recess on PA outcomes [12]. These results, therefore, provide further support for a whole-school approach that engages all key informants in the early stages of intervention in order to cultivate stronger, more collaborative relationships between principals and other key stakeholders.

After Ready for Recess, baseline gaps in leadership readiness between principals and recess staff diminished because of declines among principals. These declines may be attributed to a premature commitment by principals to Ready for Recess [due to the attraction of incentives (i.e. ST + EQ, ST and EQ)] and/or a lack of understanding of the effort required of themselves and others in implementing the intervention. Principals, as the main leaders within each school, may have felt overwhelmed by the amount of leader support and resource allocation (e.g. time and effort) needed to successfully implement Ready for Recess, especially given recess staff and teachers’ low levels of baseline CR. Research suggests that schools which deliver successful PA interventions have school community leaders with high levels of support for and commitment to interventions [19, 27–29]. Therefore, efforts to educate principals about the amount and type of leadership support involved in implementing school-based PA interventions may help principals make more responsible decisions when taking on efforts.

Contrary to our hypotheses, neither the overall nor the dimension-specific CR of nurses or PE teachers was significantly higher when compared with other key informants [30]. In fact, nurses scored lower than principals in the leadership dimension and these low scores were consistent across schools. Although the scope of school nursing practice includes health needs assessments, health education instruction, development of curricula and evaluation of health education programming [31], widespread debate exists in relation to nurses’ potential for managing overweight and obesity in children [32]. Some studies suggest that nurses may perceive time constraints that prohibit them from being more of a resource to other school staff. Additionally, colleagues and school leaders may misunderstand nurse’s roles as little more than ‘skinned knees’ and ‘band-aids’ [33]. More research is needed to understand the role of nurses (and nurses’ perceptions of this role) in school-based obesity prevention and PA behavior change, in addition to the relationship between nurses and principals.

Significant decreases in leadership CR were observed among PE teachers. PE teachers are natural leaders for childhood obesity prevention and PA promotion; however, research shows that students engage in <20 min of moderate to vigorous
PA during PE lessons, indicating that PE teachers may need additional training in relation to maximizing PA opportunities (e.g. how to limit time children spend standing around while receiving instruction) [34]. Preliminary qualitative analyses of the CR interviews also suggest that the perceived knowledge and expertise of PE teachers in relation to childhood obesity and PA were limited, despite their education and training. Further, few studies have examined PE teachers’ capacity for leadership or perceived leadership role in improving youth PA and reducing childhood obesity. More research is needed to clarify the roles and perceived knowledge/expertise of PE teachers in the context of ST + EQ, ST and EQ. Further research using qualitative methods to examine the CR interviews is warranted and may elucidate important themes related to key informants’ readiness for change and perceptions of the leadership for childhood obesity and PA efforts. This research may provide additional information on relationships among key informants and may inform the design of future interventions in regards to how key informants individually and how schools as a whole should be targeted in efforts to increase CR prior to PA intervention.

Finally, the interaction observed between changes in leadership CR and overall school CR at baseline indicates that schools with the lowest levels of readiness may have been most susceptible to declines in leadership CR. CR levels at schools in pre-planning remained relatively stable across key informants, whereas CR declined across key informants at schools in denial/resistance and vague awareness. Recent research examining the impact of Ready for Recess on youth PA levels has demonstrated that not only were low baseline CR levels associated with low baseline PA and declines in PA after the intervention [12], but the impact of Ready for Recess on youth PA overall was varied as well [7, 8]. Unfortunately, despite prodigious allocation of resources to school-based PA promotion, the effectiveness of utilizing schools to improve youth PA and impact childhood obesity remains equivocal [30, 35]. This study provides further evidence that efforts to understand and improve CR within school environments and between key stakeholders prior to the initiation of childhood obesity and PA behavior change efforts may be critical. Research to identify the minimum level of CR needed (across key stakeholders) to successfully implement school-based PA interventions may be specifically warranted.

**Strengths and limitations**

This study is one of the first to examine relationships among key school stakeholders in childhood obesity prevention and PA behavior change. The results of this study illuminate important areas for further investigation of school readiness to undertake PA behavior change efforts. Despite its strengths, this study has limitations. First, CR scores were restricted to the first three levels of readiness and, although not entirely unexpected, it limits the variability of the sample. Second, three parents and one principal were excluded from the analyses due to lack of data at post-intervention. Parents were more challenging to schedule and the smaller sample size may limit our ability to fully understand the role of parents in school CR. Third, we relied upon the principals to access other key informants for interviewing. This approach was used in order to gain authorized access to the school as principals are the key leaders within school communities. However, this approach may also have introduced selection bias in relation to the key informants who participated in the interviews. Additionally, it is possible that the Ready for Recess intervention was not implemented as planned. Research assistants conducted periodic booster sessions with recess staff and PE teachers and completed journal entries after visits with schools as a method of informal fidelity monitoring. Results indicate that staff may have been more concerned about child safety or utilized recess time to socialize and that playground space may have been a limitation for some schools [7]. Therefore, more formal evaluation may provide more meaningful insights into the impact of staff CR on the implementation of the program. Although intervention type was not associated with changes among any of the key informants or across the CR
dimensions, the small sample of schools ($N=17$) and decreases in CR observed among the control schools limits our ability to compare CR by intervention type (ST + EQ, ST and EQ) and fully explain decreases in CR observed at the intervention schools. Additional research with a larger sample size is needed to further examine the role of staff training and the addition of equipment on overall, dimension and key informant CR levels. Finally, the CRM is designed to assess the capacity of a community to implement change efforts. Although children were recipients of the efforts, involving them in the assessment of school readiness for PA promotion may provide important information needed to support sustainable changes in school-based PA [36].

**Conclusion**

The results of this study illuminate the importance of assessing school CR prior to enrolling schools in PA interventions. A whole-school approach may be specifically beneficial in order to identify and understand overall school and individual key stakeholder needs for CR intervention. This approach may: (i) help health promotion professionals to better prepare key stakeholders to successfully implement PA interventions; (ii) help school leaders (i.e. principals) better understand their roles in PA efforts (e.g. leadership support) and the readiness levels of those individuals responsible for the implementation of efforts (e.g. teachers and recess staff) and (iii) help cultivate stronger relationships between leaders and staff implementing PA interventions. Such efforts may be specifically important at schools with the lowest levels of readiness. The CRM may, therefore, provide a promising opportunity to improve the effectiveness and sustainability of school-based PA interventions.

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**Conflict of interest statement**

None declared.

**References**

Key stakeholders’ readiness for change