Averting Uncertainty: A Practical Guide to Physical Activity Research in Australian Schools

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Abstract: Preventative health has become central to contemporary health care, identifying youth physical activity as a key factor in determining health and functioning. Schools offer a unique research setting due to distinctive methodological circumstances. However, school-based researchers face several obstacles in their endeavour to complete successful research investigations; often confronted with complex research designs and methodological procedures that are not easily amenable to school contexts. The purpose of this paper is to provide a practical guide for teachers (both teacher educators and teaching practitioners) seeking to conduct physical activity-based research in Australian school settings, as well as discuss research practices. The research enabling process has been divided into six phases: preparation; design; outcome measures; procedures; participants; and feedback. Careful planning and consideration must be undertaken prior to the commencement of, and during the research process, due to the complex nature of school settings and research processes that exist in the Australian context.

Background

Preventative health has now become the focus of contemporary health care, with physical activity identified as a key factor in determining an individual's health and functioning (Australian Institute of Health and Welfare, 2010; World Health Organization, 2004). The focus of these health promotion initiatives has now turned to youth. This is in light of a number of investigations which have found adolescent physical activity to increase the likelihood of maintaining physical activity and other positive health-related lifestyle behaviours throughout adulthood (Guo & Chumlea, 1999; Hallal, Victora, Azevedo, & Wells, 2006; Muller-Riemenschneider, Reinhold, Nocon, & Willich, 2008; Parsons, Power, Logan, & Summerbell, 1999; Wright, Parker, Lamont, & Craft, 2001). The lack of youth physical activity in particular and its potential consequences later in life has been identified as an area of concern for the Australian Federal Government over the past decade (Australian Institute of Health and Welfare, 2004, 2006, 2008, 2010, 2012). According to recent data from the 2009-10 National Secondary Students' Diet and Activity survey, 85% of secondary school students from years 8-11 reported not engaging in sufficient levels of physical activity necessary to provide health benefits (Cancer Council Australia, 2011), in accordance with the Department of Health and Ageing's physical activity recommendations for 12-18 year olds (Department of Health and Ageing, 2004).

Schools have often been targeted as important settings for health promotion strategies aimed at increasing youth physical activity levels (Cleland, Dwyer, Blizzard, & Venn, 2008). In 2004, the World Health Organisation specifically identified schools as a target setting for the promotion of physical activity among youth in its Global Strategy on Diet, Physical Activity and Health (World Health Organization, 2004). Youth spend many hours each year in school, and their school experiences profoundly influence their development (Alibali & Nathan, 2010). They are an ideal setting for population-based physical activity measurement and interventions (Dobbins, DeCorby, Robeson, Husson, & Tirilis, 2009). The demographics of samples obtained from schools are often diverse and differing substantially from those obtained via traditional methods of recruitment outside of the school environment (Alibali & Nathan, 2010). They also offer unique methodological circumstances, such as the ability to target students via pre-existing structures like curriculum (Dobbins, et al., 2009). Salient findings from school-based studies have the potential to inform school policy development. On this front, current practising teachers should be aware that the introduction of a new national curriculum may correspond with increased studies being conducted within school settings, evaluating content, process and implementation procedures. This is likely to include studies involving health promotion, which is a key theme found throughout the most recent "Shape of the Australian Curriculum: Health and Physical Education" document (Australian Curriculum Assessment and Reporting Authority, 2012b). In this context, school-based research may be conducted by those within government, not-for-profit, university or school organisations; or by a combination of researchers from more than one organisation type.

Several key obstacles must be overcome to enable successful research in Australian schools. These obstacles may be complex and difficult to navigate for those within, or external to school organisations. A recurrent theme for school-based physical activity intervention studies is the recruitment of teaching staff within the school as collaborators and project facilitators (Dobbins, et al., 2009). This role is often crucial to the success or failure of such programs. Therefore, improving research capacity among teachers, including enhanced knowledge of research practices, could lead the way to truly collaborative approaches, beneficial to all parties.

Teachers' engagement in school-based physical activity research is consistent with their contemporary role in school organisations. Teachers acting as researchers into their own practices and those within their schools is long established (Babkie & Provost, 2004; Ilisko, Ignatjeva, & Micule, 2010). Australian education departments have described ongoing review of relevant research and literature as the key to achieving a critical awareness of significant issues and existing findings in an area of research (Department of Education and Early Childhood, 2006). This also has implications for teacher education. Appropriate teacher education strategies can empower teachers through researching their own practice, enabling teachers to become more aware of the complexities of the school environment, and for teacher research to be a self-reflection of their own professional practice (Gray & Campbell-Evans, 2002). Teachers involved in the physical education field or the general health and wellbeing of student populations will likely engage with school-based physical activity research. This engagement may come in the form of contributions to school-based research activities that are being undertaken, or in the consumption of research findings to inform practice and policy.

Due to the need for programs that promote physical activity among Australian youth, and the complex nature of research within Australian school settings, a user-friendly guide to inform those seeking to conduct research, and those facilitating research practices in Australian schools is warranted. The purpose of this paper is to provide a practical guide for those seeking to engage with research being undertaken in Australian school settings. For the purpose of this discussion, the research process framework has been divided into six phases: preparation; design; outcome measures; procedures; participants; and feedback.

Preparation

The preparation phase of the research process comprises two significant obstacles. These obstacles must be addressed prior to the commencement of any data collection. These undertakings include collaborating with schools, and gaining ethical approval to conduct the research.

Collaborating with schools

Successful plans for recruiting and retaining school engagement often extend beyond research considerations and necessitate addressing the political, economic, educational, and organisational needs of the school setting (Petosa & Goodman, 1991). Petosa and Goodman present a taxonomy of decision-making procedures characteristic of school districts. The taxonomy provides a framework for designing effective recruitment and retention strategies. It divides the decision-making procedures of school districts into five distinct phases being: legitimacy; information seeking; expressions of limitations; expressions of engagement; and commitment. Olds and Symons (1990) published a set of recommendations based on field experience. They suggested investigators submit proposals that are procedurally and philosophically sound, and emphasise to schools the tangible benefits of participation.

There are at least five exigent scenarios that investigators may face in order to build successful collaborations to conduct research within school organisations. First, although administrators may express interest in the potential outcomes of a proposed project, they may be unwilling to disrupt the operation of their schools to conduct the project (Petosa & Goodman, 1991). Second, administrators may be willing to agree to their schools involvement, however, some teachers or school-based research liaisons may be non-participatory (either actively or passively). This non-participation may be due to perceived (or actual) increased burden caused by research participation, differing priorities between school administrators and teachers, or other elements of administrator-teacher dynamics that may be intrinsic to the culture of a school. Third, administrators and teacher colleagues may be unwilling to disrupt classroom organisation or student learning experiences for research design considerations (Petosa & Goodman, 1991). This may include a disinclination to withhold potentially innovative curricula from a portion of students to permit a 'control group' comparison. Fourth, administrators or teachers may perceive the motivation and demands of research projects to be incompatible with the ideology or operation of schools (Petosa & Goodman, 1991). Fifth, there may be a perception within schools that adequate structures already exist that stifles the introduction of new policy initiatives around physical activity (including physical activity research) (Mathews, Moodie, Simmons, & Swinburn, 2010).

In many cases, there is likely to be a trade off between study design rigour and practical considerations for the school involved in the research. While some elements of 'ideal' study design may need to be compromised, investigators must ensure that a degraded research plan does not ultimately undermine the future wider practical application of the research findings (Petosa & Goodman, 1991). On the other hand, if schools refuse to participate, a systematic bias may be created whereby sample populations from 'co-operative schools' evident in the research literature are not representative of the actual population (Petosa & Goodman, 1991). It has wisely been suggested that investigators must endeavour to maintain positive relationships with teachers and school administrators, who are key to the research process (Alibali & Nathan, 2010). This is likely to involve patience, non-disruption to the curriculum (wherever possible), flexibility to accommodate school structures and requirements, and use of outcome measures and feedback mechanisms that benefit faculty, administration, and students. It is important to understand and emphasise the spirit of mutual

partnership, whereby practitioners are active researchers. Discussions with school staff prior to commencement of the project may be beneficial. Opportunities may be identified for staff professional development or school improvement which can be tailored for in the design phase.

Ethical approval

School-based physical activity research must adhere to regulatory guidelines for the ethical conduct of human research. At a minimum, this will usually involve a review and approval of the planned research protocol by a local human research ethical review board or designated individual. Most peer-reviewed scientific journals will no longer publish reports of human research that have not received relevant local ethical approvals. Multiple ethical approvals may be required prior to the commencement of data collection. First, it may be necessary to complete institutional ethics applications. For university-based researchers conducting research within schools, this will usually require a letter of collaborative agreement from a suitable representative at the school where the research will be undertaken to accompany their application for ethical approval. Ethical requirements for government schools may differ depending on the size of the project, and the number of schools participating. For example, in the state of Queensland, if one school is participating, approval is only required from the corresponding school principal. If several schools in a single Department of Education and Training (DET) region are participating, approval must be obtained from the regional director. If schools in more than one DET region are participating, approval is required from the Central Office (Department of Education and Training, 2005).

Local processes for ethical approval also differ for schools governed by religious bodies. For example in Brisbane, Queensland, all applications to conduct research in diocesan catholic schools are coordinated centrally through the relevant archdiocese executive director's office. All applications to conduct research in religious institute schools (independent Catholic schools administered by religious orders) must be addressed separately and directed specifically to the principals of these schools (Catholic Education Archdiocese of Brisbane, 2010). Applications are considered by the relevant Catholic Education Research Committee, which typically meet on a monthly basis. Once the application has been reviewed and accepted, a letter of approval to approach the principal(s) at the respective school(s) nominated will be sent to the principal(s) notifying them of the researcher's proposed approach. It is a condition of approval that upon completion of the research, the researcher will provide Brisbane Catholic Education with a copy of the research findings, provide the schools in which the research was conducted with a summary of the research findings, and give permission for Brisbane Catholic Education to disseminate the reports to its personnel (Catholic Education Archdiocese of Brisbane, 2010).

The specific processes (including application forms) for attaining ethical approval are subject to variability between institutions, states, and education systems throughout Australia and internationally. However, the fundamental tasks involved in completing ethical applications remain much the same. Applications for ethical approval commonly require description of the study aims, methods, and descriptions of how common potential ethical concerns (including privacy and confidentiality) have been addressed. The key considerations of ethical review boards are also somewhat consistent across institutions; namely beneficence, respect and justice are central values (National Health and Medical Research Council, 2007). This not only includes the merit and integrity of the research or whether the benefits of the research outweigh any potential risks, but also the manner with which research is to be conducted and ensuring sufficient protections are in place for vulnerable persons (NHMRC, 2007). In this regard, children in schools are likely to be considered vulnerable persons. Therefore, investigators need to consider the nature of dependent relationships

between teachers and students to ensure that consent is not granted as a deference to the investigator's perceived position of power, or to someone else's wishes. (NHMRC, 2007) Individuals should only be included if their participation is voluntary (NHMRC, 2007).

School-based research involving children as participants raises some specific ethical concerns regarding the provision of informed consent. These concerns centre around children and young persons' capacity to understand what the research entails, and therefore whether their consent to participate is sufficient (NHMRC, 2007). The National Statement on Ethical Conduct in Human Research details four levels of maturity (NHMRC, 2007). First, infants, who are unlikely to be involved in school-based research, are unable to take part in discussion about the research. Second, young children who are able to understand some relevant information and take part in limited discussion about the research, but require parental (or guardian) consent. Third, young people of developing maturity, who are able to understand the relevant information but whose relative immaturity means that they remain vulnerable, meaning that their consent is required, but is not sufficient to authorise research without concurrent parental (or guardian) consent; and, young people who are mature enough to understand and consent, and are not vulnerable through immaturity in ways that warrant additional consent from a parent (or guardian) (NHMRC, 2007). It is not possible to attach fixed ages to each level, as they may vary from child to child. Participants should be engaged in discussion at their level about the research and its likely outcomes.

Design

A key consideration for any research activity is the study design. The same overarching principles of research design that govern research in most contexts also apply to school-based research. There is an almost limitless range of possible research design variations that may be implemented. However, research design selection for any specific project should be informed by a range of factors. Some common factors include the research question or study aims, available resources (funding, equipment, support, and time), the nature of the sample, institutional restrictions and ethical considerations. Study types may be divided into two broad categories; observational studies and intervention studies (dos Santos Silva, 1999).

Observational studies are those investigations that do not include an intervention being allocated to participants as part of the research protocol (dos Santos Silva, 1999). School-based observational studies may draw inferences about students, teachers, parents, organisational structures or processes and other topics of relevance in schools. Observational studies may also involve drawing some inferences about the effectiveness of interventions or changes in curriculum activities that occurred (but were not assigned to participants as part of the research protocol). However, observational studies of this nature could only postulate causal links in the absence of a control group for comparison purposes. Where the aim of a research investigation is to evaluate the effect of an intervention, an intervention study design would be more appropriate.

Intervention studies generally aim to evaluate the effect of an intervention on a specific group of participants (dos Santos Silva, 1999). Randomised controlled trials are often considered the 'gold standard' for intervention studies, and this holds true for school-based physical activity research (Dobbins, et al., 2009). While randomised trials are a rigorous way to evaluate the effectiveness of an intervention, they are not always pragmatic in school settings. For this reason a range of other quasi-experimental designs are often used (Dobbins, et al., 2009). Quasi-experimental designs generally do not involve the random allocation of participants to an intervention or control group. This approach may be more palatable to school organisations who do not want to withhold potentially innovative and effective interventions on the basis of random allocation.

A recent Cochrane systematic review that included both randomised trials and quasi-experimental designs summarised the current evidence of effectiveness for school-based interventions in promoting physical activity and fitness in children (Dobbins, et al., 2009). It was found that school-based interventions can have positive impacts on physical activity, television viewing, Vo2max, and blood cholesterol. However, existing studies have not demonstrated an effect on leisure time physical activity rates, systolic and diastolic blood pressure, body mass index, and pulse rate. At a minimum, a combination of printed educational materials and changes to the school curriculum that promote physical activity can result in positive effects. The authors concluded that, given that there are no harmful effects and that there is some evidence of positive effects on lifestyle behaviours and physical health status measures, ongoing physical activity promotion in schools are recommended (Dobbins, et al., 2009). It was also recommended that school-based interventions be tailored to the developmental level of participants and foster positive attitudes toward physical activity (Dobbins, et al., 2009). Given these findings, there is much room for innovation, evaluation and refinement of school-based physical activity interventions.

There is growing support for the consensus that broad social-ecological approaches are needed to promote positive lifestyle behaviours (Booth et al., 2001). Social ecological models propose multiple dimensions of influence and hypothesise that self-regulation is difficult to establish without broader social and institutional support (Dzewaltowski, 1997). It is a recurring theme throughout the literature that a multi-faceted approach must be taken when promoting youth positive lifestyle behaviours. This approach includes the utilisation of associated groups such as parents, teachers, school administrators, and members of the community (Booth, et al., 2001; Dobbins, et al., 2009; Lambin & Erwin, 2007; Faber, Kulinna, & Darst, 2007). Past notable strategies to increase student physical activity in school settings include: changes to curriculum (Eliakim et al., 1996; McKenzie, Sallis, Faucette, Roby, & Kolody, 1993; McKenzie, Sallis, Kolody, & Faucette, 1997); provision of equipment (Verstraete, Cardon, De Clercq, & De Bourdeaudhuij, 2006); training for teachers (McKenzie, et al., 1997); educational materials for teachers (Carrel et al., 2005; Eliakim, et al., 1996), students and parents (Burke et al., 1998); community-based strategies (Bush et al., 1989; Ewart, Young, & Hagberg, 1998); mass media involvement (Lionis et al., 1991; Owen, Bauman, Booth, Oldenburg, & Magnus, 1995); and the use of counsellors and other health professionals (Graf et al., 2005).

An additional recurrent theme for school-based physical activity intervention studies is the use of teaching staff within the school as project facilitators. To increase the potential success of these types of studies: (1) it is important for classroom teachers and other school personnel to recognise that developing healthy and active students is ideally a school-wide effort and whole school responsibility, reinforced within the school environment (Cale, 2000; Lambdin & Erwin, 2007; Faber, et al., 2007); (2) physical educators should model healthy and active behaviours (Dobbins, et al., 2009; Faber, et al., 2007); (3) classroom teachers should implement physical activities and health knowledge into a range of cross-curricular subjects inside the classroom; and (4) teachers in the school should be informed about the goals and benefits of the program, and about the benefits of physical activity breaks and of integrating health knowledge into other subjects (Faber, et al., 2007). This concept of integration already exists in Australia, with cross-curriculum priorities present in the new Australian Curriculum. However, health (or physical activity) promotion is not currently one of these priorities. At the time of writing, they stand as “Aboriginal and Torres Strait Islander histories and cultures”, “Asia and Australia’s engagement with Asia”, and “Sustainability” (ACARA, 2011).

School Selection

Some key considerations that need to be made regarding school selection prior to collecting data include; whether the school is single or mixed gender, in a rural or urban setting, private or public, as well as the socio-economic factors of the school and the area in which it resides. One particularly useful tool to judge the SES background of a school is the Australian Curriculum, Assessment and Reporting Authority's (ACARA's) Index of Community Socio-Education Advantage (ICSEA). Briefly, ICSEA is a scale that enables meaningful comparisons to be made across schools. It has been designed specifically for the ACARA's *My School* website for identifying schools serving similar student populations. The variables used in calculating a value on the ICSEA scale include student-level data on the occupation and education level of parents/carers, and/or socio-economic characteristics of the areas where students live, whether a school is in a metropolitan, regional or remote area, the proportion of students from a language background other than English, as well as the proportion of Indigenous students enrolled at the school (ACARA, 2012a).

The ICSEA method may have practical advantages over traditional methods for determining SES in Australia, such as the Socio-Economic Indexes for Areas (SEIFA). These indexes are compiled at the Census Collection District (CD) level, and may be used to rank CDs according to the general socio-economic well-being of residents (Adhikari, 2006). This use of ICSEA prevents artificial misrepresentations whereby a student from a high SES family, or living in a highly ranked CD, is attending a school in a low SES ranked neighbourhood (CD). Identifying the SES background of youth is critical, and may have implications for a number of factors related to physical activity, such as participation in studies (Nickelson et al., 2011), and barriers to being physically active (Humbert et al., 2006).

Outcome Measures

Most studies include a range of demographic variables, as well as both primary and secondary outcomes. In the context of school-based physical activity research, demographic variables may be collected from students, parents, teachers or administrators. Some variables such as date of birth, height and weight (BMI), and ethnic background (Aboriginal and/or Torres Strait Islander) may be relevant to all groups. However, some demographic variables are likely to be specific to adults, such as smoker status, marital status, and level of education. Variables of relevance to teacher participants may include teaching experience, formal qualifications and teaching areas.

Primary outcome measures often represent the outcome of greatest potential therapeutic benefit relevant to the research aim, and hence the outcome of greatest importance to the study at hand. Secondary outcome measures may provide information on additional effects (such as side-effects, or tolerability), that are relevant to address the research aim and are of secondary importance (Sedgwick, 2010). While specific primary and secondary outcomes may vary substantially depending on the research question at hand, one construct that is likely to be measured in almost all school-based physical activity research is physical activity.

Instruments that measure the prevalence of physical activity have long been used as a part of school-based research, both as tools to facilitate physical activity, and to evaluate effectiveness (Dobbins, et al., 2009). Its accurate assessment is critically important when examining the relationship between physical activity and health (e.g., cardiovascular disease risk factors, fatness, and aerobic fitness) (Ekelund et al., 2001). Physical activity assessments can also provide valuable information to children and parents, and may also provide a meaningful outcome for school administrators and teachers (Welk, 2008). Monitoring the physical activity levels of youth requires a valid measure that is age appropriate, easy to administer, and which poses minimal participant burden (Trost, Marshall, Miller, Hurley, & Hunt, 2007). A wide range of methods have been used to measure physical activity in

children and adolescents. These can be broadly grouped as direct observation, self-report and instrumental categories.

Direct observation

Direct observation of physical activity levels may be used to examine physical activity levels within specific contexts and direct observation (Belton & Donncha, 2010; Fairclough & Stratton, 2006; Kohl, Fulton, & Caspersen, 2000; Pate, 1993; Sallis et al., 2003; Sleap, 1996; Trost, 2007). This may include observation and recording of the types and duration of physical activity undertaken by students during their lunch break, or other context specific occasions. An advantage of direct observation is the ability to record the type of physical activity undertaken. However, key disadvantages of direct observation is that it is labour intensive, lacks scalability and can be difficult to quantify the intensity of physical activity being undertaken among individuals within an observed group.

Self-Report Physical Activity Measurement

Self-report measures have a practical advantage over other approaches for studies with large sample sizes and restrictive budgets due to their relative ease of administration (in comparison to instrumental measurement or interview techniques) and low cost (Chinapaw, Mokkink, van Poppel, van Mechelen, & Terwee, 2010). However, this may come with some compromise on the reliability and validity of self-reported data which is dependent on recall of prior activity (Chinapaw, et al., 2010). It is not an easy task for investigators to determine which instrument is most suitable for their purpose due to the diversity in available questionnaires (Chinapaw, et al., 2010). Some examples of self-report instruments which have been widely used in school settings include the Previous Day Physical Activity Recall (PDPAR) (McMurray et al., 2008; Saunders et al., 1997; Trost, et al., 2007; Trost, Ward, McGraw, & Pate, 1999; Welk, Dzewaltowski, & Hill, 2004; Weston, Petosa, & Pate, 1997; Yngve, Anderson, & Hagstromer, 2005), and the Bouchard 3-day Activity Record (Bratteby, Sandhagen, Lotborn, & Samuelson, 1997; Bratteby, Sandhagen, & Samuelson, 2005; Henry, Webster, Gandy, & Elia, 1999).

Youth have a physical activity pattern that is much more variable and intermittent than that of adults (Baquet, Stratton, Van Praagh, & Berthoin, 2007), and they are less likely to make accurate self-report assessments than adults due to developmental differences, especially in the ability to think abstractly and report detailed recall (Going, Levin, & Harrell, 1999; Sallis, 1991). It may help to include a practice administration in an effort to help familiarise youth with the survey procedures and assess validity using multiple administrations of the instrument (Trost, et al., 2007). Where possible more sophisticated measures of physical activity and sedentary behaviour should be used, such as accelerometers, time-use diaries, or direct observation (Trost, Pate, Freedson, Sallis, & Wendell, 2000).

Instrumental Physical Activity Measurement

Instrumental measures with real time data storage capabilities, offer a distinct advantage over self-report methods in that they provide reliable information on patterns of physical activity within a given day or over several days (Trost, et al., 2000). It is often helpful to include an objective measurement tool to avoid dependency on recollection and the reading of questionnaires while measuring physical activity in children and adolescents (Cuddihy, Pangrazi, & Tomson, 2005). There has been a rapid increase in both the number

and type of objective physical activity assessment instruments, including pedometers and accelerometers, which are commercially available to researchers, practitioners, and consumers (Chen & Bassett, 2005).

The increase in the availability of instruments to measure physical activity has led to investigators being often overwhelmed and confused when attempting to select the one which is most appropriate for their purposes (Tudor-Locke & McClain, 2009). As a result, researchers and practitioners at times make under-informed choices with regard to instrument selection (Tudor-Locke & McClain, 2009). Some popular instrumental approaches which have been used frequently in school settings include; accelerometers (Baquet, et al., 2007; Cooper, Page, Foster, & Qahwaji, 2003; Corder et al., 2009; Haerens, De Bourdeaudhuij, Maes, Cardon, & Deforche, 2007; Maia, Ferreira, Lopes, & Vasques, 2007; McMurray, et al., 2008; Mota et al., 2007; Pate, Ross, Dowda, Trost, & Sirard, 2003; Trost, et al., 2000; Trost, et al., 1999; Tudor-Locke, McClain, Hart, Sisson, & Washington, 2009; Tudor-Locke et al., 2004; Welk, et al., 2004; Weston, et al., 1997; Wickel et al., 2007; Yngve, et al., 2005), pedometers (Lee & Trost, 2005; Scruggs, Mungen, & Oh, 2010a, 2010b; Trost, et al., 2007; Weston, et al., 1997), doubly labelled water (Arvidsson, Slinde, & Hulthen, 2005; Corder, et al., 2009; Ekelund, et al., 2001; Sjoberg et al., 2003) and heart rate monitors (Belton & Donncha, 2010; Watson, Beveridge, & Scruggs, 2003; Weston, et al., 1997).

Distribution and collection of physical activity measurement instruments may be problematic for physical activity researchers working with both youth and adults. However, schools provide a structured environment with fixed routine interaction points that can be utilised to facilitate the distribution and collection of instruments. This may alleviate the need to expend resources mailing and collecting instruments for physical activity measurement (Keyserling et al., 2008; Price, Tucker, Griffin, & Holman, 2008; Robinson et al., 2008; Sanchez et al., 2008; Sloane, Demark-Wahnefried, Snyder, Kraus, & Lobach, 2009). One potential drawback from physical activity measurement instruments is that they may introduce a strong focus on the desired outcome, at the expense of less focus being attributed to the underlying behaviour that is being promoted (physical activity) (Welk, 2008).

There is almost always a trade-off between practicality and accuracy when quantitatively measuring physical activity. Unfortunately, cost and logistical challenges may prohibit the use of ‘gold standard’ physical activity measurement approaches such as doubly labelled water. However, other objective methods such as heart rate monitoring, accelerometry, pedometry, indirect calorimetry, or a combination of measures have the potential to capture the duration and intensity of physical activity, but do not capture information about the type or context of this activity. Self-reported measures can capture the type and context of physical activity and have a practical advantage over other approaches due to their relative ease of administration and low cost. These practical advantages may come at the expense of precision due to dependence on recall of detailed historical activity information. However, this compromise is likely to be justified among large samples if the purpose of physical activity evaluation does not require a high degree of measurement precision for each individual (Rachele, McPhail, Washington, & Cuddihy, 2012).

Participants

Recruitment

Information regarding recruiting child participants for school-based research is limited (Pincus & Friedman, 2004). Popular strategies for promoting the recruitment of participants within school settings include; the use of flyers (Park, Hong, Lee, & Kang, 2007), school newsletters (Kipping, Jago, & Lawlor, 2012; Park, et al., 2007), special presentations (Reed, Warburton, Macdonald, Naylor, & McKay, 2008) and announcements at full school and year level assemblies (McLaughlin, 2006; Pate et al., 2005). However, the comparative

effectiveness of these approaches is currently unknown, and multiple approaches run in parallel may be the best way to disseminate information about the study being conducted (Jamner, Spruijt-Metz, Bassin, & Cooper, 2004).

Unless a waiver of consent has been granted as part of the ethical approval process, potential research participants have the right to decide whether or not they would like to participate in the research. It is common for studies that utilise a large number of aggregated de-identifiable routinely collected data to be granted a waiver of consent during the ethical review process. However, in all other circumstances participants must provide informed consent as part of the recruitment process. This frequently occurs through the use of participant information sheets and written consent forms, which are central to the recruitment process. Potential participants may choose to decline participation (or withdraw from the study at any time) for any reason. These reasons may include: being burdened by data collection requirements; having difficulty reading questionnaires or completing assessments; disclosing information about sensitive topics; invasiveness of measurements; and confidentially concerns (Rice, Bunker, Kang, Howell, & Weaver, 2007). If the study is being conducted during class time, the investigators must consider what activities non-participating students might perform while their peers are completing the study, and will that activity disadvantage study participants or non-participants. For example, non-participating students may be given a relative advantage if completing homework or assessment tasks while their peers take part in the research investigation.

Retention

The retention of participants can often determine the success of studies; particularly studies with longitudinal designs and longer term follow-up assessments. Participants who dropout can produce bias affecting study findings and interpretation (Frank, Nader, Zive, Broyles, & Brennan, 2003). Investigators should be alert to personal issues, beliefs, and attitudes of potential participants (Frank, et al., 2003). The retention rate of participants is likely to be enhanced by ensuring participants are informed about the tasks they will be expected to complete during the study. Common important tasks that participants should be informed about include the number and timing of re-assessments, the nature of interventions they may receive, and the length of the study. Factors affecting participant retention among school children are likely to include; family non-participation, research environment, incentives, knowledge of condition, community outreach, gender, and ethnicity (Frank, et al., 2003). Several strategies can be used to maximise retention of participants during the implementation of a study. Examples may include reminders about upcoming re-assessments, integrating re-assessments into school scheduling, providing multiple opportunities to complete re-assessments, and ensuring that assessments aren't long and burdensome.

Incentives

The issue of incentives should be considered early in the design of the research proposal, with attention to developmental age, ethical considerations, purpose of the research, and burden to the child and family. Decisions about payment or reimbursement in kind should take into account the customs and practices of the community in which the research is being conducted (NHMRC, 2007). Prior discussion with relevant school staff is advised as to "what" and "how much", or whether incentives are to be included at all during the research process, and should be reflective of the burden undertaken (Rice & Broome, 2004). Payment that is disproportionate to the time involved, or any other inducement that is likely to encourage participants to take risks is ethically unacceptable (NHMRC, 2007).

Feedback

Context specific feedback provided directly to school administrators or teachers is an important mechanism through which investigators can maximise the benefit that participating schools receive from the research. This is not only an important altruistic objective of school-based research, but also improves the likelihood of school participation in a research study, and emphasises the partnership of mutual benefit between school and researcher. In return for their teachers' and students' time and services, feedback must be meaningful for participants (Petosa & Goodman, 1991). In this sense, discussions with appropriate school staff prior to the commencement of the project may be beneficial, and opportunities may be identified for staff professional development or school improvement. The most valid and sincere form of feedback that is appealing to schools who choose to participate will generally come in the form of study results. Results should be returned to schools in a format that is meaningful to school administrators, and provides the school with relevant information about its population. Therefore, research publications acquired from the data collected at the school may not always be the best form of feedback that researchers can provide. Alternative feedback could be provided in the form of lay-language reports which focus on specific outcomes of interest to the school, or customised presentations to school staff and administrators.

Conclusion

Those wishing to investigate school-based physical activity face several obstacles in their endeavour to complete successful research investigations. Careful planning and consideration must be undertaken prior to the commencement of, and during the research process, due to the complex nature of school settings and research processes that exist in the Australian context. Improving the research capacity among teachers, including enhanced knowledge of research practices, could lead the way to truly collaborative approaches, beneficial to all parties. This may ultimately lead to the prevention of barriers which are potentially averting schools from participating in research studies, and avoid disruption to staff and students during the research process. Advancing the relationship between schools and research institutions may lead to increased collaboration, with mutual benefits.

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