Examining strategies to improve accelerometer compliance for individuals living with schizophrenia
Objective: This study examined the feasibility and effect of two investigator-based and two participant-based strategies on accelerometer wear time in individuals living with schizophrenia in order to improve accelerometry compliance. Methods: Four adults with schizophrenia were asked to wear an accelerometer for one week during the baseline, intervention, and follow-up phases of a study that evaluated exercise counseling. To encourage participants to wear their accelerometers, investigators modeled proper accelerometer use, provided verbal and written instructions, and placed reminder phone calls. Participants were also given wear time logs and reminder magnets. Results: All participants wore their accelerometers for the required amount of time during the study. Conclusions and Implications for Practice: Researchers should use multiple techniques to help ensure compliance. Research is needed to identify the most effective combination of strategies for this population.
Examining strategies to improve accelerometer compliance for individuals living with schizophrenia

Levels of physical activity are low in individuals living with schizophrenia and improving physical activity in this population has been suggested to decrease the risk of chronic health conditions and delay early mortality (Faulkner & Gorczynski, 2013). Researchers have noted that objective physical activity measurement, like accelerometry, can better capture temporal trends, incidental activity, and moderate and vigorous levels of physical activity than self-report questionnaires (Katzmarzyk & Tremblay, 2007). Most physical activity research involving individuals with schizophrenia has relied on recall questionnaires, which can be affected by recall challenges and social desirability. In order to produce useful data that allows researchers to determine minutes spent in different intensities of activity, accelerometers must be worn by participants for a certain period of time. An accepted definition of minimal wear time, or compliance, is at least 10 hours a day for 3 to 5 days in a span of 7 days (Trost, McIver, & Pate, 2005). A US study that examined accelerometer results from the 2003-2004 National Health and Nutritional Examination Survey found that out of 7,176 individuals aged 6 years and older, 67.8% of individuals provided at least 4 valid days of data with average wear time for a valid day being 14.2 hours (Troiano, Berrigan, Dodd, Masse, Tilert, & McDowell, 2008).

Although no large-scale accelerometer studies have been conducted in schizophrenia, some studies have reported low compliance of 45.4% (Jerome et al., 2009), while other studies have reported compliance rates over 80% (Dubbert, White, Grothe, Jile, & Kirchner, 2006; Janney et al., 2013; McKibbin et al., 2006; Wichniak et al., 2011). Missing data poses a threat to the validity and interpretation of trials using physical activity data from accelerometry. It also has resource implications given the potential need to increase sample sizes to compensate for
ACCELEROMETER COMPLIANCE IN INDIVIDUALS WITH SCHIZOPHRENIA

noncompliance. Several strategies have been recommended to help participants wear their accelerometers for the necessary amount of time to produce valid data. Ward and colleagues (2005) have suggested that researchers use investigator based strategies (e.g., phoning participants) and/or participant based strategies (e.g., wear time logs) to improve wear time. Research that has compared different strategies to improve wear time in adolescents in the general population has found that compensation contingent on number of complete days was most successful at encouraging participants to wear their accelerometers for the necessary amount of time followed by self-report journals and phone calls (Sirard & Slater, 2009). Studies involving individuals with schizophrenia have provided brief descriptions of their accelerometer protocols, but none have examined strategies to help improve accelerometer wear time in order to provide valid data.

Objective

This study examined the feasibility and effect of two investigator-based and two participant-based strategies on accelerometer wear time in individuals living with schizophrenia in order to improve accelerometry compliance.

Methods

Participants and Procedures

Ethical approval was obtained from the Health Sciences Research Ethics Board at the University of Toronto and the Centre for Addiction and Mental Health (CAMH) Research Ethics Board. The study took place at the Mental Health and Metabolism Clinic at CAMH. Adults diagnosed with any form of schizophrenia (American Psychiatric Association, 1994), who were overweight or obese (Body Mass Index ≥ 25), who were in the contemplation or preparation stage of the Transtheoretical Model for physical activity (Prochaska & DiClimente, 1986), with
Participants were asked to take part in a 2-month single-case experimental study that evaluated the efficacy of exercise counseling in increasing levels of moderate and vigorous physical activity. Participants were asked to wear their ActiGraph GT1M uni-axial accelerometers, unless showering or swimming, for one week during the baseline, intervention, and follow-up phases of the study. Accelerometer data were considered complete if participants wore their accelerometers a minimum of 10 hours per day on at least three weekdays and one weekend day. Accelerometers were set to capture data using 60-second epochs. Sixty straight minutes of zero counts indicated non-wear time. Two investigator-based and two participant-based strategies were employed with each participant during each phase of the study to help improve wear time based on previous research (Faulkner, Cohn, & Remington, 2006) and best practice recommendations (Ward, Evenson, Vaughn, Rodgers, & Troiano, 2005). Investigator-based strategies included modeling and providing verbal and written instructions about how and when accelerometers should be worn. Reminder phone calls were placed on three weekdays and one weekend day. Participant-based strategies involved providing participants wear time logs that allowed self-monitoring of accelerometer use. Reminder magnets that had pictures of their accelerometers were provided to participants based on suggestions provided by Ward and colleagues (2005) to have reminders in prominent places.

Analysis

Accelerometry wear time data was consolidated by study phase and paired t-tests, with alpha levels of .05, were used to compare different phase means.

Results
Demographic Information

Four high functioning individuals, two males and two females, participated in the study. Individuals were aged 25, 28, 29, and 36 years, respectively. Two participants were employed during the study and three participants lived at the hospital or in a group-housing complex. One individual lived independently.

Accelerometer Wear Time

All participants wore their accelerometers for the required amount of time during each phase of the study. Average daily wear times for the baseline, intervention, and follow-up phases were 14.8 hours (SD = 5.9 hours), 14.4 hours (SD = 5.5 hours), and 12.5 hours (SD = 1.0 hours), respectively. Overall, average mean wear time decreased from baseline to follow-up, but did not reach significance, $t = .77, p = .47$. Individual daily wear time averages per phase can be seen in Figure 1. Paired $t$-tests used to compare different phases revealed that only one participant had significantly different amounts of daily wear time between baseline and follow-up ($t = 7.291, p < .05$), however, this individual still achieved the necessary amount of wear time during all three phases.

Discussion

Results from this study showed that all four participants complied with the accelerometer protocol and wore their accelerometers the necessary amount of time to produce valid data. Average daily wear times were similar to those found in a large-scale study within the general population (Troiano et al., 2008). The production of valid data can help researchers examine physical and mental health rehabilitation outcomes of exercise more accurately and determine the specific dosage of exercise that is necessary to render such outcomes.

Findings from this study offer several suggestions to help improve accelerometer wear
time in schizophrenia research. First, researchers should strive to report detailed accelerometer protocols and compliance rates in their manuscripts. Providing these details will help improve future objective physical activity measurement by allowing different strategies to be compared for their effectiveness in improving wear time, as has been done in other populations (Sirard & Slater, 2009). Second, although it not possible to distinguish which strategy used in the current study was most successful at improving wear time, researchers should use multiple techniques to ensure compliance until future research can help clarify which strategy or combination of strategies is most effective. Throughout each phase of the study, connecting by telephone with participants who lived in the hospital or in group housing was challenging and required multiple attempts. Other strategies were not fully used by other participants. One individual neglected to fully complete his wear time logs during the study and another individual only partially completed her wear time log in the follow-up phase. Two individuals misplaced their reminder magnets during the baseline phase.

Improving wear time is only one consideration researchers must be aware of when using accelerometers to capture valid physical activity data with individuals living with schizophrenia where minimal wear time has been achieved. Statistical imputation techniques have been presented in order to account for missing data from accelerometers (Catellier et al., 2005), however no one has determined the single best approach for dealing with missing data from accelerometers nor has such an approach been used among individuals living with schizophrenia. It is likely that such statistical approaches will be needed to complement strategies to increase accelerometry compliance in order to most efficiently maximize the utility of data collected in the field.
ACCELEROMETER COMPLIANCE IN INDIVIDUALS WITH SCHIZOPHRENIA

References


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Figure 1. Individual daily wear time averages per phase. *p < .05.