

Youth Time Outside

A Comparison of Time Use Methodologies

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Abstract

Significant public attention has been given to the perceived lack of youth time spent outside. Diverse approaches make it difficult to develop consensus around youth time-use patterns and guide efforts to get kids outside. The purpose of this study was to compare results of a 7-day time diary used to document adolescent outdoor time with results from other time-use methodologies. Seventh graders ($N=43$) were selected to complete week-long time-use diaries and recall surveys. Time diary estimates were compared to an online survey, a simulated two-day time diary, and a simulated experience sampling. Results suggested that differences existed between time outside recorded in time diaries and recall survey. Using two days of diary data or experience sampling was more comparable.

Keywords: *Adolescents; outdoors; comparative methodology; time diaries*

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Since the publication of Louv's (2005) *Last Child in the Woods*, significant public attention has been given to the perceived lack of youth time spent outside. If youths are spending less time outside, as anecdotal evidence suggests, this trend has significant implications. Research findings suggest multiple benefits arise when youths spend time outside including increased physical activity (Cleland et al., 2008), lower levels of attention deficit disorder, (Taylor & Kuo, 2009), and reduced stress (Wells & Evans, 2003).

While the health implications of declines in youth outdoor time are important, there are also significant concerns about the educational and environmental consequences. If young people are not spending time outside, some have argued they will not develop curiosity about the natural world and therefore may be less likely to seek education and careers in natural sciences and have less interest in environmental stewardship (Ewert, Place, & Sibthorpe, 2005; Kahn & Kellert, 2002; Place, 2007). This perceived crisis has produced an increased demand for investment in policy, education, and management practices directed toward getting youth outside. Although a multitude of both public and private sector initiatives have been created in response, a scarcity of youth-generated data related to time spent outside is available to empirically guide or support these efforts.

While multiple youth time use studies exist (e.g., Csikszentmihalyi & Larson, 1986; Larson, Green, & Cordell, 2011; Larson & Verma, 1999; Zick, 2010), a diversity of approaches makes it difficult to develop consensus around specific time use patterns. For example, while the coordinated use of electronic beepers and temporal journals to collect data, usually known as experience sampling methodology (ESM; Larson & Csikszentmihalyi, 1983), has been employed with youth (Csikszentmihalyi & Hunter, 2003; Csikszentmihalyi, Larson, & Prescott, 1977), concerns exist regarding its validity. Some researchers have suggested that an ESM approach may lead to self-selection bias or even alter the phenomenon under consideration due to its potentially intrusive nature (Green, Rafaeli, Bolger, Shrout, & Reis, 2006). Additionally, it has been suggested that drawing a random selection of samples across multiple days may make it difficult to develop conclusions about actual time spent in different activities or activity duration (Reis & Gable, 2000).

While daily recall methods have been criticized for potential biases (Diffey, 2011), the efficiency of daily recall methods ensures they remain the predominant means of collecting information about time outside, particularly for children (e.g., Burdette, Whitaker, & Daniels, 2004; Cleland et al., 2008; Dirani et al., 2009). One of the largest and most recent time use studies that focused specifically on time outside employed a telephone recall methodology (Larson et al., 2011). Recall methods have also been used to document descriptive contexts (e.g., location and activity type) for youth physical activity patterns (Jago, Anderson, Baranowski, & Watson, 2005). While this methodology represents a pragmatic approach to collecting a large amount of data within a comparatively short period of time, conclusive evidence for strong, positive correlations between recall reports and actual time spent in activities remain lacking.

A potentially more practical approach to collecting robust time use data involves the use of time diaries. Diaries most often require respondents to provide detailed evidence about what they do each hour of the day over a certain number of days. The use of time diaries has a long history in leisure and recreation research going back to the mid-70s (Bishop, 1975). The most well-known time diary work produced by leisure researchers is the nationwide study conducted by Robinson and Godbey (1999) and detailed in their book, *Time for Life*. Other leisure researchers have used time diary approaches to look at time use among youth (Caldwell, Baldwin, Walls, & Smith, 2004), couples (Voorpostel, Van der Lippe, & Gershuny, 2010), and families (Shaw, 1992). Generally, time diaries capturing data over several consecutive days have been positioned

as having a higher validity than other methods of collecting self-reported time use data (e.g., ESM and recall), particularly for adolescents (Witkow, 2009).

Some researchers suggest that at least a full week of data is required to account for daily activity fluctuations and make valid estimates of daily time use (Witkow, 2009). However, time diaries are often criticized as being too intrusive, which may lead to fatigue among respondents, particularly when data is being collected over a prolonged period. This has led some researchers to suggest using ESM as a less intensive way to collect data over a longer period. However, some studies have opted to collect time diary data for two days, usually choosing one weekday and one weekend day (e.g., Hofferth & Sandberg, 2001) to extrapolate estimates of time use to longer periods.

Although understanding the types and quality of activities youth engage in outside is important, the ability to accurately and efficiently quantify time outside is foundationally essential. Researchers and policy makers are focusing significant efforts on multi-level interventions aimed at encouraging youth to spend more time outside. Examples include the “No Child Left Inside” bill submitted to the United States Congress by Rep. John Sarbanes in July 2013 and the National Wildlife Federation’s “Be Out There” campaign (2013). Because of the increased policy interest, there have been calls for better empirical documentation of youth time outside (Larson, Green, & Cordell, 2011). Valid and feasible measures of time spent outside are important to provide baseline data in order to understand the efficacy of interventions promoting time spent outside.

Thus, a quandary exists. There is a pressing need for accurate data documenting youth time spent outside before research can be expanded to inform policy and practice around efforts to “get kids outside.” However, time use data requires significant time and financial resources to collect, and consensus is lacking regarding the most efficacious data collection strategy for estimating adolescent time outside. Therefore, the purpose of this study was to pilot test a 7-day time diary to document adolescent outdoor time with a sample of youth and compare the results of this method with other real and simulated time use data collection methodologies. The overarching goal of this study was to determine the most efficient method for accurately understanding the amount of time youth spend outside.

Methods

Data for this study were drawn from a larger pilot study to measure adolescent outdoor time during May, 2012. The population for the study was comprised of 7th grade students in three middle schools in Texas. Approval for the study was obtained from the Institutional Review Board at the authors’ institution. Schools were sampled using a stratified approach to ensure that one middle school was included from each of the three community types (i.e., urban, suburban, and rural) designated by the National Center for Educational Statistics (Provasnik et al., 2007). The three different community types were chosen to ensure any potential contextual factors related to urban form could be accounted for during data collection.

A random list of schools in each community category and within a two hour’s drive of the authors’ institution was developed. Schools were contacted in order until a participating school was identified in each category. Initial contact was made with the principal of each school through email to introduce the purpose of the study and solicit their participation in the project. The principals who agreed to participate in the study were asked to identify one teacher who then designated one of his or her class periods to participate in the study. Class sizes ranged from 22 to 28 students. For their assistance in distributing consent forms, communicating with the research team, and reminding students to complete time diaries, participating schools were

compensated \$100. Youth participants were compensated \$25 each for completing time diaries and online surveys.

Participants were asked to complete paper and pencil time diaries to document all activity (e.g., primary and secondary activities, duration, location, and others present) for seven consecutive days. Time diaries were adapted from the Child Development Supplement to the Panel Study of Income Dynamics (Hofferth, Davis-Kean, Davis, & Finkelstein, 1999). This questionnaire was chosen because of its previous use with adolescents. For the purposes of the current study, only initial information related to duration and location of activities were used. Due to differential school calendars and standardized testing, all students at each school participated during the same week, but each of the schools participated on three separate consecutive weeks; with data collection beginning on Monday and ending on Sunday. It should also be noted that the weather in all three communities was partly cloudy, highs in the low 80s (Fahrenheit), with no precipitation during the entire data collection timeframe. In order to not conflict with school instructional time, students were only asked to document activities outside of school time.

In order to increase the adolescents' comfort level with the time diary method and facilitate participation, undergraduate students worked with the researchers to design and deliver an interactive face-to-face presentation in each of the classrooms. As part of this process, the undergraduate students worked with the youth to record that morning's activity as practice. This approach was expected to help youth more accurately complete their time diaries each day. Participants were also asked to complete an online 24-hour recall survey once during the week they were completing the time diaries to document their time outside in minutes during the previous day.

The primary goal of the recall survey was to help validate entries in the time diaries and determine whether recall methods would be acceptable for more efficient data collection in future studies. For the purposes of this study, we examined an item that asked how much time was spent outside during the previous day.

Following completion of time diaries, data were entered verbatim into a computer spreadsheet. Duration in each activity was calculated in minutes based on the entered start and end times. Respondents were given instructions to indicate whether the activity took place inside or outside, in addition to a specific location. However, the location of activities was unclear in 2.2% of activity entries. Following a standard methodology of content analysis, two independent researchers reviewed entries for each of these activities and assigned tentative codes for whether the activity took place inside or outside based on the type of activity and the stated location of the activity. Diagnostics of the 7-day time diary were analyzed to determine whether participants were able to record activities for all available time during each day or whether the amount of time recorded declined over the course of the week. The primary variable examined for this study was amount of time spent outside.

The results of data collected with the 7-day time diaries were then compared to results from three other potential methods to estimate respondents' time outside. Additional estimates of daily time outside from this sample were obtained from the results of the online recall survey, a simulated 2-day time diary (i.e., taking one weekday and one weekend day from the 7-day time diary data), and a simulated ESM. ESM was simulated by taking a random sample of six activities per day from each of the participants across the 7-day time diary data. This approach was designed to simulate the ESM process that typically asks participants to document activities and the duration of activities based on random alerts. Instead of a real participant responding, this process drew "responses" from existing time diary data. To get a measure of estimated daily outside time for the simulated ESM measure, daily time outside was calculated as activity time

outside (in minutes)/total activity time (in minutes) x 1,440 (total daily time in minutes). Following Schmitz et al. (2004), descriptive statistics, paired *t*-tests, and Pearson correlations were examined to determine the relationship between results across the different methods.

Results

A total of 49 youths agreed to participate in the study. At the end of the assigned week, 43 participants returned time diaries. Participants recorded a mean of 9,293.6 minutes (*SD* = 1,862.9) of total activity, or 92.2% of the maximum recordable time of 10,080 minutes. Overall, 34 participants recorded at least 98% of their minutes for the week and 39 participants returned time diaries with no missing days. One participant's time diary was incomplete for all days and was removed from analyses. No correlation was found between percentage of complete data and time across the week ($r = -.055, p = .351$), indicating no evidence of participant fatigue with the process of completing the time diary.

Based on the results of the full 7-day time diary, participants in our sample spent a mean of 712.3 minutes outside during the week (*SD* = 474.25), a daily average of 101.76 daily minutes. Mean comparisons of the estimated daily time outside across the four methods are presented in Table 1. Pearson correlations are presented in Table 2. A statistically significant difference was found between average daily time outside recorded in the 7-day time diary and outdoor time reported in the recall survey ($t = 2.42, p = 0.020$). Additionally, there was not a significant correlation ($r = .259, p = .107$) between estimates from the 7-day time diary and the recall survey. More agreement was found between estimates between the 7-day time diary and the simulated 2-day time diary and ESM. The combination of Tuesday and Saturday (mean = 764.5, *SD* = 621.8) demonstrated the closest relationship with results from the 7-day time diary ($r = .895, t = -1.57, p = .124$). The combination of Wednesday and Sunday produced the greatest mean difference in estimated daily outdoor time ($t = 2.87, p = .006$). The simulated ESM also produced results that were not significantly different from those reported in the 7-day time diary ($t = -.992, p = .328$). However, the relationship between individual-level results between the time diary and ESM method were not as strong ($r = .610$). In other words, while the ESM method was reliable in estimating the overall mean time outside for the sample, it was less reliable in estimating individuals' time outside in comparison to the 7-day time diary.

Discussion

Table 1

Mean Comparisons of Estimated Daily Time Outside by Method (N = 42)

	7-Day Time Diary	2-Day Time Diary (Tue/Sat)	2-Day Time Diary (Wed/Sun)	Recall Survey	Simulated ESM
Mean daily time spent outside (in minutes)	101.76	111.82	80.98	66.38	117.95
Standard Deviation	67.75	88.24	59.88	73.45	88.35
<i>p</i>^a		.124	.006	.020	.328

^aIndicates significance testing of mean difference with 7-Day time diary estimation

Table 2*Mean Pearson Correlations of Estimated Daily Time Outside by Method (N = 42)*

	7-Day Time Diary	2-Day Time Diary (Tue/Sat)	2-Day Time Diary (Wed/Sun)	Recall Survey	Simulated ESM
7-Day Time Diary	--	.891**	.737**	.259	.610**
2-Day Time Diary (Tue/Sat)	.891**	--	.523**	.055	.641**
2-Day Time Diary (Wed/Sun)	.737**	.523**	--	.329*	.211
Recall Survey	.259	.055	.329*	--	.131
Simulated ESM	.610**	.641**	.211	.131	--

Note: *Indicates correlation significant at the .05 alpha level; ** .01

The need to accurately assess youth time outside is important to support policy and practice development that has often relied on inconsistent and anecdotal methods. This study presented an effort to increase our understanding of the effectiveness of different methods to document adolescent time outside. The results of this multiple methods comparison suggested that time diaries, ESM, or similar methods of recording daily activities may be more valid approaches to assessing time outside than recall surveys. While recall surveys remain a popular way of collecting time use data from large samples in a short amount of time, the accuracy of recall data has been questioned (Witkow, 2009). Our results generally support that assessment.

Overall, simulated 2-day time diaries offered results that were equivalent to those taken from the 7-day time diary. The ability to collect two days of data may be more appealing for both participants and researchers. However, it is important to understand the relationship between data validity and the “typical” days chosen for data collection. For example, using Tuesday/Saturday, the 2-day time diary method more closely reflected outdoor time estimated by the 7-day time diary; while the use of Wednesday/Sunday underestimated outdoor time. Thus, researchers should exercise caution when selecting two representative days or, if interested in population-level outcomes, consider varying the selected days across their sample.

We also found that, despite suggestions to the contrary (e.g., Reis & Gable, 2000), it may be possible to extrapolate ESM to estimate daily or weekly time outside, if estimating at the population level. Using a simulated ESM, the overall mean of outdoor time was comparably equivalent to the results of the 7-day time diary, even with an overestimation of 16 minutes. However, the lower correlation found between time diary and ESM observations suggested that the within-subject relationship between the different methods of recording time use was not as strong as capturing all activities during the day. This suggests that ESM may be a less appropriate method for estimating an individual's daily outside time (e.g., to use as an individual level variable in regression models).

Limitations

This study was not without limitations, including a small and somewhat homogenous sample within a two-hour drive of the authors' institution. The time diary methodology partially compensates for the small sample size due to the large amount of data collected within the sample (e.g., our sample yielded 4,053 data points). Although the sample came from a constrained geographic region, steps were taken to systematically select schools from distinct urban, suburban, and rural locations. The site visits to each school also confirmed to the research team the distinct community differences across the participating schools which will be important to consider when conducting future research to understand differences in correlates of outside time, as well as types of activities youth participated in during their outside time. This study provides methodological guidance for using more efficient methods of data collection than 7-day time diaries for future time use studies with larger samples of youth from other geographic regions of the county.

Implications

Multiple reasons exist for needing to quantify the amount of time kids spend outside. This study provides researchers, policy makers, and practitioners with some clear guidelines regarding how to increase the efficacy of such efforts without necessarily losing validity. For example, while the collection of time diaries over a week or more may produce valid data, the resources required to do so may often be prohibitive. Fortunately, the data from this study suggest that collecting only two days, one weekday (Tuesday) and one weekend day (Saturday), can produce data as valid as a 7-day approach at a much lower cost in terms of time and resources for both respondents and researchers. The support for the efficacy of this abbreviated time diary approach will hopefully lead to the collection of time outdoor data in instances where it would not have been possible to implement a more extended data collection approach. Additionally, the support for ESM as an alternative data collection method that can still produce comparable results to a time diary approach at the population level may provide researchers increased flexibility to select the collection method that best fits their resources, questions, and target populations as a practical alternative to the collection of recall data.

Conclusion

As electronic technology becomes more accessible in the future, we expect the development and utilization of applications for electronic devices and other means will enhance our ability to document youth time outside. As we have already seen in the physical activity literature, GPS devices are being used to more objectively measure time spent at specific locations (e.g., Coombes, van Sluijs, & Jones, 2013; Rodríguez et al., 2012). Additionally, researchers have preliminary tested the validity of using light sensors to record outside time (Dharani et al., 2012). While these approaches offer significant promise as more objective measures of outside time, limitations exist with their use (Southward, Page, Wheeler, & Cooper, 2012) and decisions will still need to be made by researchers related to recording activities and the number of days needed to capture valid estimates of daily time use. The use of time diaries combined with GPS or other technologies may provide the most valid approach to triangulating data and estimating outside time. Our assessment was that using two days of time diary data or a full week of experience sampling, both of which have the potential to be less time intensive for participants and researchers, may be sufficiently comparable to suggest their use in the event that collecting time diary data across a full seven days is not feasible.

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