Published in final edited form as:
Br J Sports Med. 2014 July ; 48(13): 1054–1058. doi:10.1136/bjsports-2014-093530.

HEALTHY BOUTS OF ACTIVITY: INTEGRATING GPS AND ACCELEROMETRY FOR MAP-PROMPTED BOUT RECALLS

Barbara B. Brown[1], **Laura Wilson**[2], **Calvin P. Tribby**[3], **Carol M. Werner**[4], **Jean Wolf**[2], **Harvey J. Miller**[5], and **Ken R. Smith**[6]

[1]Professor, Department of Family & Consumer Studies, Cancer Control & Population Sciences, Huntsman Cancer Institute, University of Utah, Salt Lake City, USA

[2]GeoStats Services, a division of Westat, Atlanta, GA, USA

[3]PhD student, Department of Geography, Ohio State University, Columbus, USA

[4]Professor, Department of Psychology, University of Utah, Salt Lake City, USA

[5]Professor, Department of Geography, Ohio State University, Columbus, USA

[6]Professor, Department of Family & Consumer Studies; Cancer Control & Population Sciences, Huntsman Cancer Institute, Salt Lake City, USA

Abstract

Objective—Obtaining the "when, where, and why" of healthy bouts of moderate-to-vigorous physical activity (MVPA) provides insights into natural physical activity

Design—In Salt Lake City, Utah, adults wore accelerometer and GPS loggers for a week in a cross-sectional study to establish baseline travel and activity patterns near a planned Complete Street intervention involving a new rail line, new sidewalks, and a bike path.

Results—At the end of the week research assistants met with the 918 participants who had at least three 10-hour days of good accelerometer readings. Accelerometer and GPS data were uploaded and integrated within a custom application, and participants were provided with maps and time information for past MVPA bouts of ≥ 3 minutes to help them recall bout details. Participants said that 'getting someplace" was, on average, a more important motivation for their bouts than leisure or exercise. A series of recall tests showed that participants recalled most bouts they were asked about, regardless of duration of the bout, suggesting that participant perceptions of their shorter lifestyle bouts can be studied with this methodology. Visual prompting with a map depicting where each bout took place yielded more accurate recall than prompting with time cues alone.

Conclusion—These techniques provide a novel way to understand participant memories of the context and subjective assessments associated with healthy bouts of physical activity. Prompts

Barbara B. Brown, 225 S 1400 E Rm 228, University of Utah, Salt Lake City, UT, 84108 ph 801-581-7111, fax 801-581-5156 barbara.brown@fcs.utah.edu

Competing interests. None.

with time-stamped maps that illustrate places of moderate-to-vigorous physical activity offer an effective method to improve understanding of activity and its supportive socio-physical contexts.

Keywords

Physical activity; neighborhood; mental recall; global positioning system; walking

INTRODUCTION

Researchers, designers, and policy makers need to know how everyday settings can encourage "active living."[1, 2] However, everyday bouts of activity may be difficult to track, given that many of them are short and not intended or thought of as "exercise." To understand the natural ecology of physical activity (PA), technological improvements can help address the when, where, and why of healthy activities. Understanding where people achieve bouts of MVPA will enable policy makers and designers to understand how everyday settings might be designed or altered to support healthy PA.

Accelerometers, providing objective measures of PA intensity, and Global Positioning System (GPS) data loggers, locating activities in space, have significantly improved research on PA.[3] In a national study, 51% of participants reported sufficient MVPA (30 minutes/day, most days of the week, in ≥10-minute bouts) but accelerometer measurements indicated <5% of participants met those guidelines.[4] Furthermore, recall of PA may be biased by health conditions, such as when obese individuals overestimate and healthy individuals underestimate their MVPA bouts.[5] Similarly, surveys provide undercounts of biking/walking trips compared to GPS/accelerometry identification.[6] When used in tandem, GPS/accelerometry measures can track PA episodes or bouts within parks[7] or along bike paths.[8] Maps displaying GPS-measured travel help participants recall more trips than unaided surveys.[9, 10] GPS and accelerometry are costly and add to participant burden, but merit examination to see if they yield more accurate recall and valuable contextual and experiential data.

When contextual or subjective information can be provided about why, with whom, or where the MVPA is occurring, researchers can better understand settings that promote activity. Although many contextual/experiential aspects of MVPA exist, we illustrate our novel technique for one fundamental example. In debates about how to increase walking, there has been controversy about whether environmental designs that support walkability might be more important for leisure walks compared with instrumental walks undertaken to get someplace.[11] Complicating this topic further, some researchers suggest that walks often result from multiple motivations.[12] However, we know very little about how people endorse these various motives for single bouts of activity. Thus we employed exit interviews after approximately week-long data collection periods to test whether the past week's MVPA bouts were motivated to achieve leisure/recreation, exercise, or "getting someplace," or some combination of these three.

Currently, it is not clear whether maps and time cues can effectively prompt recall of MVPA bouts from the past week, especially short life-style MVPA bouts. PA recall is often better over shorter[13] than longer intervals, such as found with past-day vs. one-week recalls.[14]

Past research has used accelerometer feedback alone to prompt recall of particular destinations for past MVPA walking bouts.[5] Adding location information via the novel procedure of providing participants with end-of-week maps of their recent MVPA bouts merits testing to see if it enhances participant recall.

In sum, we ask: What motivates MVPA bouts? How does recall of bouts decline across days, bouts, and bout frequencies and durations and for obese and non-obese participants? How valid is bout recall? Do end-of-week map prompts yield more accurate recalls than simply providing days/times of bouts as prompts?

METHOD

Procedures

The data are from the *Moving Across Places Study* (MAPS)--an evaluation of a Complete Street intervention in which a street is renovated to serve more than cars. Specifically, this street received light rail, a bike path, and improved sidewalks in early 2013. The pre-build data were collected March-December of 2012. Adults living within 2 kms of the planned transportation improvements were recruited to wear accelerometers (Actigraph GT3X+) and GPS loggers (GlobalSat DG-100 data loggers) for approximately one week. During in-home visits, participants completed surveys and were fitted with the devices.

At the exit interview, approximately one week later, participants described their bouts of MVPA. Research assistants (RAs) equipped with laptops and internet connectivity devices uploaded accelerometer and GPS files to a secure website. The website application, developed and hosted by GeoStats, merged GPS to accelerometer data, producing a report of past week bouts of MVPA. To reduce participant burden, this report first identified all 10-minute or longer bouts, using the NHANES specifications for wear time and MVPA detection (≥2020 counts per minute[4]). If the participant still did not have 10 10-minute bouts, ≥3-minute bouts were listed. The online survey then presented a Google Maps™ display depicting locations of bouts that had associated GPS points (see Figure 1), starting with most recent activities. RAs asked participants about their motivations (getting exercise; getting someplace; and/or getting leisure/recreation). Map controls included zoom and pan features to achieve desired resolution. Participants were asked to describe up to 10 bouts, but were invited to describe more bouts if willing, able, and time permitted.

When internet connectivity was not possible at the exit interview due to poor signal reception, the RAs could not download the maps of past week bouts, so they prompted participants to recall their bouts without maps, using time-of-day and day-of-week prompts from accelerometer feedback. These connectivity failures enabled us to test whether bouts with and without map prompting are equally likely to be remembered. For these validity checks, we focused on the subset of home-based bouts because home addresses were geocoded and represented common locations for MVPA bouts. Most home-based leisure walks[15] or active transportation walks[16] occur within about one-half mile from home; short MVPA bouts might occur anywhere along the half-mile route. Therefore, when the participant said the bout originated or ended at home and the GPS point for bout beginning or ending was within 800 meters (approximately ½ mile) of the geocoded home address, we

considered the bout location to be accurate. To explore sensitivity, we also tested other distances: 100m, 200m, 400m and 1600m. Connectivity failed more often for residents who were randomly selected within-household participants (see explanations below), so we also tested whether maps improved recall after controlling for this variable.

Participants

Eligible participants were Spanish or English speakers, aged ≥18, not pregnant, expected to reside within the neighborhood for another year, and able to walk a few blocks and complete surveys and wear the devices. To be retained, participants needed to complete surveys and register ≥3 days of ≥10-hour accelerometer wear.[17] [18] An initial mail invitation was followed by door-to-door recruitment visits at varied times of day and week. Among the 1015 participants who provided some initial survey information, 41 dropped out without wearing the accelerometers and 62 finished the first survey but had insufficient accelerometer wear time; 2 more were withdrawn due to technical problems or becoming ineligible during the week. The resulting 910 completions yielded a 28.93% response rate based on the universe of all addresses that could be recruited (using American Association of Public Opinion Researchers response rate formula 3; this improves to 30.9% if all survey completers are included). In addition, for a subset of 29 addresses, a second person living at the same address also participated. For 21 cases the epoch length saved on the accelerometer file did not mesh with GPS data, so those cases were dropped. The remaining analyses include 918 respondents.

Those who dropped out or had insufficient accelerometer wear times were compared to study completers on multiple variables: sex, Hispanic ethnicity, white race, marital and student status, employment, education (up to high school graduate, college graduate+ education), number of rooms in the home, parenting status, household income, car availability, years of residence, renter status, and single family detached housing. According to logistic regression, non-completers had lower education levels. Specifically, 43.1% of non-completers (from N=102 reporting) had education levels up to high-school completion versus 32.9% of completers, χ^2 (1, N=1027) = 4.32, p = .04. Thus completers and non-completers were comparable on many qualities.

For within-household selection, the youngest male/oldest female selection procedure was used to avoid intrusive household enumeration.[19] This method randomly selects an eligible adult unless the household has ≥3 eligible adults, in which case RAs recruit the youngest eligible male (to reduce gender/age bias); if he is unavailable, the oldest eligible female is recruited. Part way through the study, adults who were otherwise eligible but not the randomly designated individual within the household were allowed to participate as alternates, in keeping with practices in similar studies.[20] Of the 939 with sufficient wear, 200 (21.3%) were alternates, who were tested against randomly selected household members. Randomly selected participants, compared with alternates, were less likely to be female (51.90% vs. 61.50% for alternates), were older (40.45 years old vs. 37.64), and less likely to be married (38.13% vs. 53.57%; logistic regression Nagelkerke R^2 = .045).

RESULTS

Descriptives

Of the 939 total participants, 856 or 91.16% registered one or more bouts in their ≥3 days of 10-hour accelerometer wear. Participants averaged 5.43 days where GPS trips were detected (SD = 2.28) and 5.57 valid days of accelerometer wear (SD= 1.36). In combination, participants averaged 4.36 days with GPS trips and complete accelerometer wear (SD = 2.11). Bouts of ≥3 minutes of MVPA averaged 10.19 minutes duration (SD = 11.33; median = 5.0 MVPA minutes) and ranged from 3 minutes to 161 minutes. Across the 939 participants, between 0 and 63 bouts were detected, using reporting rules described earlier.

Motivations for bouts

"Getting someplace' was rated stronger than either exercise (paired t (825) = −12.08, $p < .001$) or leisure/recreation motives (paired t (825) = 12.42, $p < .001$). Exercise and leisure/recreation motives were strongly correlated and the other correlations were modest but significant (see Table 1).

Recall of bouts

During the exit interview participants were asked if they could recall the MVPA bouts when the RA showed them their time, date, and duration of bouts as well as map information if GPS points or traces were available. If participants recalled the bout, they were questioned about their motivations and other details. The following analyses demonstrate the recall pattern across days, all bouts, recent bouts, and for total numbers of bouts.

Figure 2, based on the past seven days of wear, shows that the bouts from the most recent days are the most easily recalled ones. Overall, 56% of the 7,896 total bouts detected across seven days were recalled by participants; instructions were to recall up to 10 bouts and 29% of the 7.896 bouts involved bouts 11 or higher. The linear trend of recall across days was significant, χ^2 (1, n= 7896) = 284.31, $p < .001$. Specifically, the fourth day prior to the final day had a 50% recall, with lower percentages prior to that.

Figure 3 shows recall by total number of bouts achieved. As expected, given the goal of 10 recalls, total percentage of recall diminished after a participant had achieved around 10 bouts; linear trend χ^2 (1, n= 9092) = 1073.63, $p < .001$. Those with ≤9 MVPA bouts recalled about 80% of them; only when an individual achieved ≥17 bouts did recall decline to <50% of total bouts.

Figure 4 demonstrates recall for a participant's most recent 10 bouts, regardless of the total number of bouts achieved or time since the bout. Participants were able to recall between 63% and 83% of their most recent 10 bouts; linear trend χ^2 (1, n= 6068) = 120.78, $p < .001$).

Figure 5 shows that longer bouts were more likely to be recalled; linear $\chi 2$ (1, n= 9113) = 89.61, $p < .001$. However, ≥ 50% of all bouts presented to participants were recalled, regardless of duration. These percentages increase to 68% or better recall for the 10 most recent bouts, $\chi 2$ (1, n= 6068) = 65.00, $p < .001$. Finally, bout recall was unrelated to measured obesity, once bout duration was controlled, Wald χ^2 <1.4, n.s.

To test whether having a map helped with activity recall and to verify the accuracy of these recalls, the subgroup of participants who had no maps because internet connectivity was poor provides a useful group to compare with the map-prompted sample. Those with connectivity were shown a map with time cues; those without connectivity were shown only the time cues (day, time, and duration of bout). Bouts might be short bursts of activity contained within longer trips to/from home. Therefore, we tested participants' recalls of bouts involving home as an origin or destination against GPS points within 800m of home, which should encompass most home-based walks.[15, 16] At 800m lengths, recall was corroborated by the GPS points for 94.71% of 850 bouts with maps and 81.91% of the 94 bouts without maps, χ^2 (1, n= 944) =22.57, $p < .001$.

Similar results held across other distances used to define home-based bouts from GPS points. At four different distances, recalls with and without maps were: 66.82% vs. 50% at 100m ($p < .002$); 82.82% vs. 64.89% at 200m, 91.76% vs. 76.60% at 400m, 97.06% vs. 88.30% at 1600m ($ps < .001$). In addition, maps improved recall accuracy when controlling for participants who were randomly chosen within households (not alternatives), who were more likely to be participants with connectivity failures. Those without maps were less likely to recall bouts within 800m of home as home-based (odds = .29 (CI .14 to .59)).

DISCUSSION

Prompting individuals to recall details of their MVPA bouts, when those bouts are measured objectively and recall is aided by the provision of place and time cues, allows more bout-specific information than many self-reports. By asking participants to describe their bout motives, we illustrate how this technique can clarify contextual and experiential qualities of healthy bouts of activity. Most MVPA bouts were described by participants as done to "get someplace," highlighting the importance of instrumental travel when studying the ecology of everyday activity. The same technique can be used to understand social and physical contexts, or other questions about psychological states, such as fear or happiness.

This paper focused on aspects of bout recall accuracy, an essential step prior to considering contextual/experiential aspects of bouts. This recall is different from many self-report forms, which require individuals to average their MVPA bout durations over the past week;[21] the current procedure retains bout-specific durations. At the same time, this procedure provides the challenge that recall has to be about a specific date, time, and place. Although in some cases it may be easier to provide answers about general PA patterns than to recall motives for specific bouts, our procedure also showed that most bouts of any duration presented to residents were recalled. This finding is encouraging for researchers who want to study short bouts and past bouts. Recent research shows that short bouts are as strongly related to obesity as longer bouts of 10 minutes, which are the ones traditionally studied.[22] Short lifestyle activities--the walk to a restaurant or transit stop--can be better understood with this procedure. Future research might compare specific bout recalls with more typical across-week recalls to understand how the different techniques might yield substantive differences. Future research is also needed to understand how bout lengths may differ by personal qualities of people, their places of activity, and their bout motivational and contextual qualities.

The majority of bouts were recalled by participants regardless of which recall parameter was investigated—days since the bout, total bouts retrieved (up to about 17 bouts), 10 most recent bouts, or bouts of varied durations. If a researcher wants to assess bouts efficiently, limiting recall to the 10 most recent bouts may be useful; this yielded between 63% and 83% recall for each of those 10 bouts. A simple analysis, based on two GPS points, indicated that when maps were shown to participants, corroboration of self-reports of home-based bouts improved by about 8–17%, depending upon the distance definition used to determine accuracy; future testing is needed to determine whether additional GPS route assessments can refine these estimates better than the use of two GPS points alone. Although we reduced participant burden by asking for recall of up to 10 bouts, we did not test the limits of recall comprehensively. Whether one should attempt to ask for participants to describe all their bouts without harming rapport or imposing excessive time and burden is a question for future research.

Important decisions for GPS/accelerometry researchers involve the choice of techniques to query participants and ways to collect complementary experiential data. Our technique is one of several options researchers can choose that vary according to targeted time intervals for behaviors of interest and participant burden. Ecological momentary assessment (EMA) methods, in which a smart phone provides a frequent short survey, offers the greatest immediacy between experience and self-report.[23] However, the requests for surveys are not tied to PA bouts; thus only 16% of the surveys in an EMA study of children included physical activities.[24] Transportation survey techniques that leverage GPS-based prompted recall methods collect more comprehensive and more accurate travel details by having participants visit a website that shows maps depicting their GPS traces, a method that enhances recall better than traditional surveys without maps; however, these surveys have not traditionally collected information about physical activities.[25] More recent transportation surveys, such as the 2011 Jerusalem Travel Habits Survey and three ongoing regional surveys in Israel are entirely based on GPS-based prompted recall methods;[26] PA researchers may find that collaboration with transportation researchers will enhance understanding of all forms of travel.

Our procedures worked well for our circumstances. The exit interviews focused on MVPA bouts without sensitizing residents to these issues throughout the week. Many in our sample did not have experience with smartphones or computers, so home visits reduced barriers to participation. Face-to-face meetings enabled the RAs to retrieve equipment and provide the interactive map survey of MVPA bouts in the same visit. The RAs also provided friendly motivation for completion, typed in addresses for bout origins/destinations, and provided the needed technical expertise for the data uploads and online surveys. Nevertheless, limitations include that the recruited sample underrepresented low-education individuals and participants must devote time and effort to remembering to recharge and wear the equipment and do the surveys and prompted recalls. Future technological improvements may ease data collection tasks, but for now, research assistants conducting home visits, especially when the sample is unfamiliar with the novel technology, were crucial to the success of the study.

Acknowledgments

The authors are grateful to Kristi Flick, project manager, and Victor Solis, field supervisor, for assistance with the study and to Anthony Fucci, Derek Jaworski, and Wyatt Jensen for technical support.

Funding. The project described was supported (in part) by grant number CA157509 from the National Cancer Institute at the National Institutes of Health and the Robert Wood Johnson Foundation.

References

1. Aytur SA, Rodriguez DA, Evenson KR, et al. Promoting active community environments through land use and transportation planning. Am J of Health Promo. 2007; 21:397–407.
2. Sallis JE, Cervero RB, Ascher W, et al. An ecological approach to creating active living communities. Annu Rev Public Health. 2006; 27:297–322. [PubMed: 16533119]
3. Janz KF. Physical activity in epidemiology: Moving from questionnaire to objective measurement. Br J Sports Med. 2006; 40:191–192. [PubMed: 16505072]
4. Troiano RP, Berrigan D, Dodd KW, et al. Physical activity in the United States measured by accelerometer. Med Sci Sports Exercise. 2008; 40:181–188.
5. Brown BB, Werner CM. Using accelerometer feedback to identify walking destinations, activity overestimates, and stealth exercise in obese and nonobese individuals. J Phys Act Health. 2008; 5:882–893. [PubMed: 19164822]
6. Bricka SG, Sen S, Paleti R, et al. An analysis of the factors influencing differences in survey-reported and gps-recorded trips. Transp Res Part C Emerg Technol. 2012; 21:67–88.
7. Quigg R, Gray A, Reeder AI, et al. Using accelerometers and gps units to identify the proportion of daily physical activity located in parks with playgrounds in New Zealand children. Prev Med. 2010; 50:235–240. [PubMed: 20153361]
8. Dill, J. Bikegps: Understanding and measuring bicycling behavior. Portland State: Robert Wood Johnson Foundation; 2010.
9. Wolf, J. Applications of new technologies in travel surveys. In: Stopher, PR.; Stecher, CC., editors. Travel survey methods—standards and future directions. Oxford, UK: Elsevier; 2006. p. 531-544.
10. Stopher, P.; Prasad, C.; Zhang, Y. Comparing gps and prompted recall data records. Sydney, AU: University of Sydney; 2010. Working paper ITLS-WP-10-24.
11. Saelens BE, Handy SL. Built environment correlates of walking: A review. Med Sci Sports Exercise. 2008; 40:S550–S566.
12. Alfonzo MA. To walk or not to walk? The hierarchy of walking needs. Environ Behav. 2005; 37:808–836.
13. Calabro MA, Welk GJ, Carriquiry AL, et al. Validation of a computerized 24-hour physical activity recall (24par) instrument with pattern-recognition activity monitors. J of Phys Act Health. 2009; 6:211–220. [PubMed: 19420399]
14. Kwak L, Kremers SPJ, Brug J, et al. Measuring physical activity in field studies: Comparison of a questionnaire, 24-hour recall and an accelerometer. Euro J Sport Science. 2007; 7:193–201.
15. Suminski R, Wasserman J, Mayfield C, et al. Walking during leisure-time in relation to perceived neighborhoods. Environ Behav. in press.
16. Millward H, Spinney J, Scott D. Active-transport walking behavior: Destinations, durations, distances. Journal of Transport Geography. 2013; 28:101–110.
17. Zenk SN, Schulz AJ, Matthews SA, et al. Activity space environment and dietary and physical activity behaviors: A pilot study. Health and Place. 2011; 17:1150–1161. [PubMed: 21696995]
18. Trost SG, McIver KL, Pate RR. Conducting accelerometer-based activity assessments in field-based research. Med Sci Sports Exercise. 2005; 37:S531–S543.
19. Hill CA, Donelan K, Frankel MR. Within-household respondent selection in an rdd telephone survey: A comparison of two methods. Research Triangle Institute. 1999
20. Oakes JM, Forsyth A, Hearst MO, et al. Recruiting participants for neighborhood effects research: Strategies and outcomes of the twin cities walking study. Environ Behav. 2008; 41:787–805.

21. Craig CL, Marshall AL, Sjostrom M, et al. International physical activity questionnaire: 12-country reliability and validity. Med Sci Sports Exercise. 2003; 35:1381–1395.

22. Fan JX, Brown BB, Hanson H, et al. Moderate to vigorous physical activity and weight outcomes: Does every minute count? Am J Health Promo. 2013; 28:41–49.

23. Dunton GF, Whalen CK, Jamner LD, et al. Mapping the social and physical contexts of physical activity across adolescence using ecological momentary assessment. Beh Med. 2007; 34:144–153.

24. Dunton GF, Liao Y, Intille SS, et al. Investigating children's physical activity and sedentary behavior using ecological momentary assessment with mobile phones. Obesity. 2011; 19:1205–1212. [PubMed: 21164502]

25. Bohte W, Maat K. Deriving and validating trip purposes and travel modes for multi-day gps-based travel surveys: A large-scale application in the Netherlands. Transp Res Part C Emerg Technol. 2009; 17:285–297.

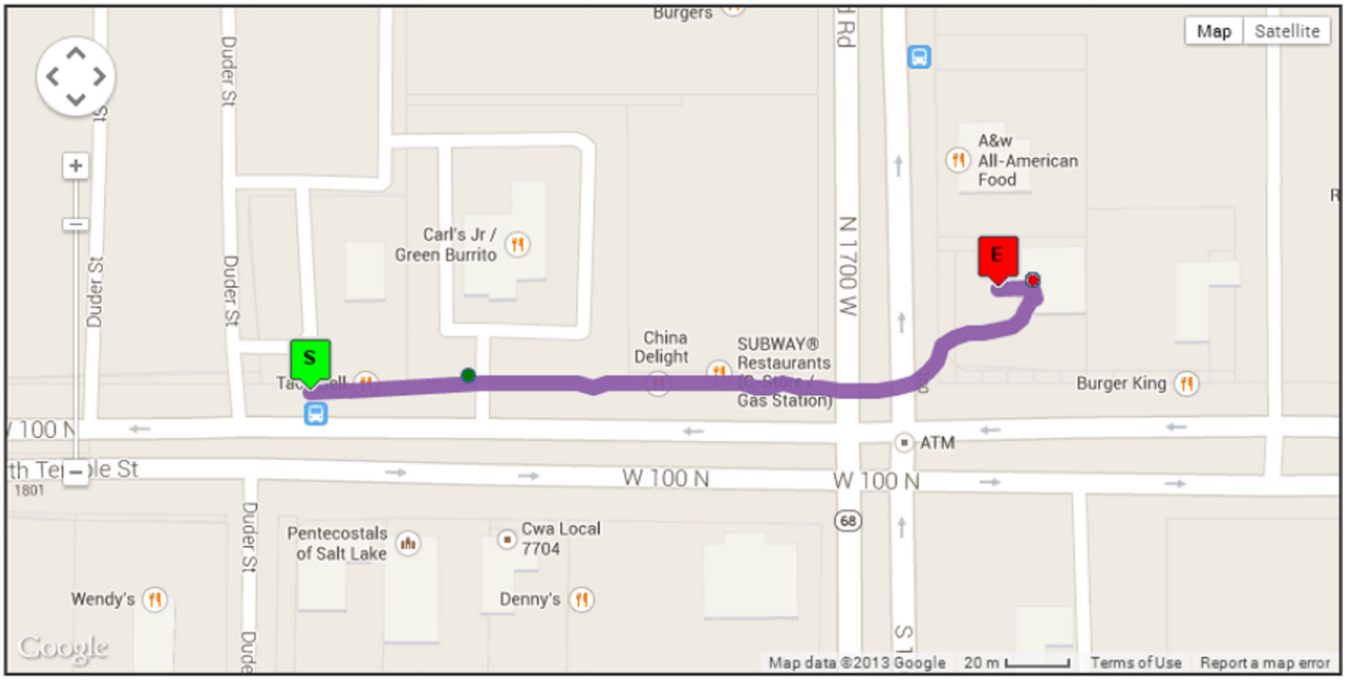
26. Oliveira MGS, Vovsha P, Wolf J, et al. Global positioning system-assisted prompted recall household travel survey to support development of advanced travel model in jerusalem, israel. Transportation Research Record: Journal of the Transportation Research Board. 2011; 2246:16–23.

What are the new findings?

- A novel method of providing participants with maps of their past week bouts of moderate-to-vigorous physical activity is presented.
- Participants were able to recall most of their past week bouts, even those of only 3 minutes duration.
- The provision of a map to prompt participants about their past week bouts yielded more accurate recalls of the location.
- The method can be useful for researchers who wish to get participant reports on the social, physical, and psychological aspects of recent bouts of activity.

How might it impact on clinical practice in the near future?

- Researchers have struggled to understand the daily context of healthy physical activity bouts.
- With this method involving prompting recalls by maps of healthy bouts, researchers will gain access to important social, psychological, and physical concomitants of bouts.
- This method should become more popular with advances in accelerometry and GPS measurements.



Please fill in START location name and address for activity on Friday, [redacted] at 5:05 PM:

Name	Sutherlands Lumber (Burrito stand)
	e.g. Home, Library, Neighborworks, Red Iguana
Address	1780 West North Temple, Salt Lake City, UT 84116, USA

Please fill in END location address.

Name	7-Eleven
	e.g. Home, Library, Neighborworks, Red Iguana
Address	1692 West North Temple, Salt Lake City, UT 84116, USA

Figure 1.

Example of bout activity map and participant-provided details (date cue was covered to preserve anonymity) Google and the Google logo are registered trademarks of Google Inc., used with permission.

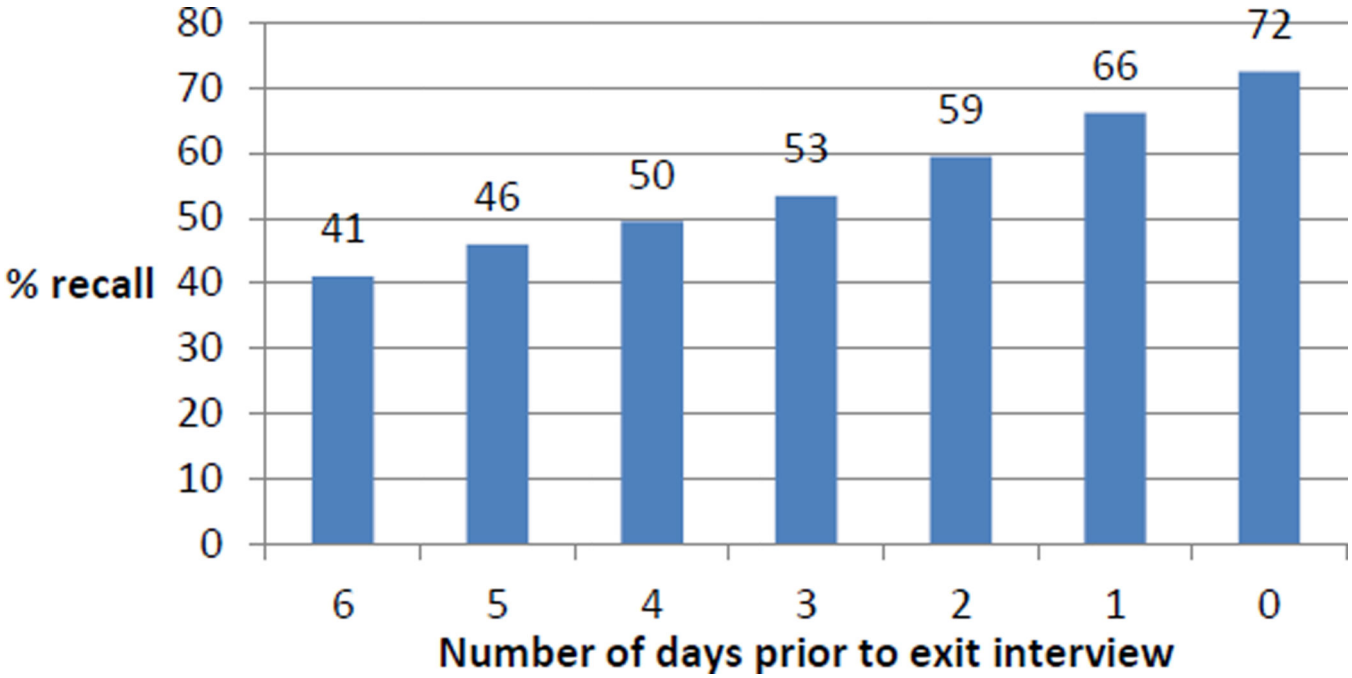


Figure 2.
Recall declines as number of days prior to recall day increases

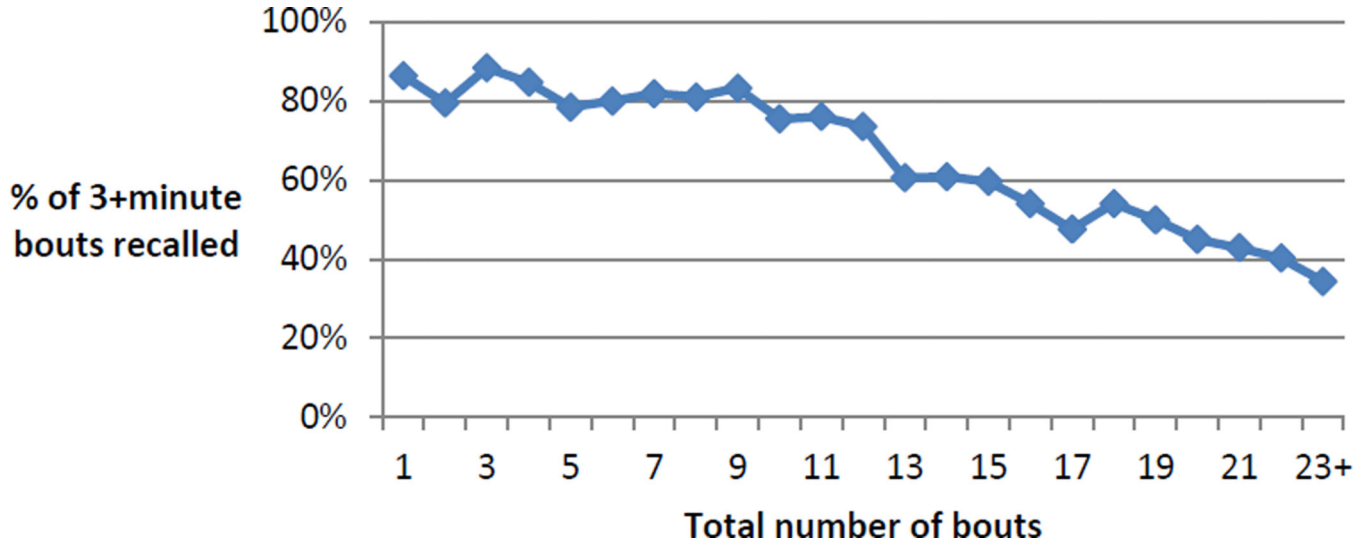


Figure 3.
Recall by total number of bouts achieved

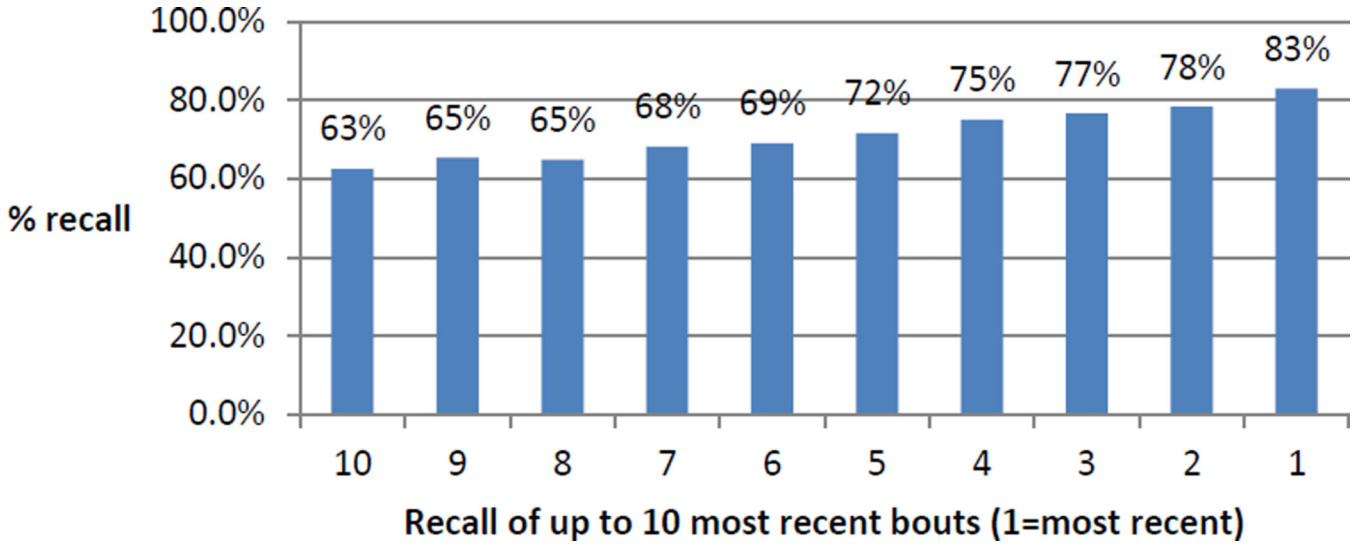


Figure 4.
Recall of the 10 most recent bouts

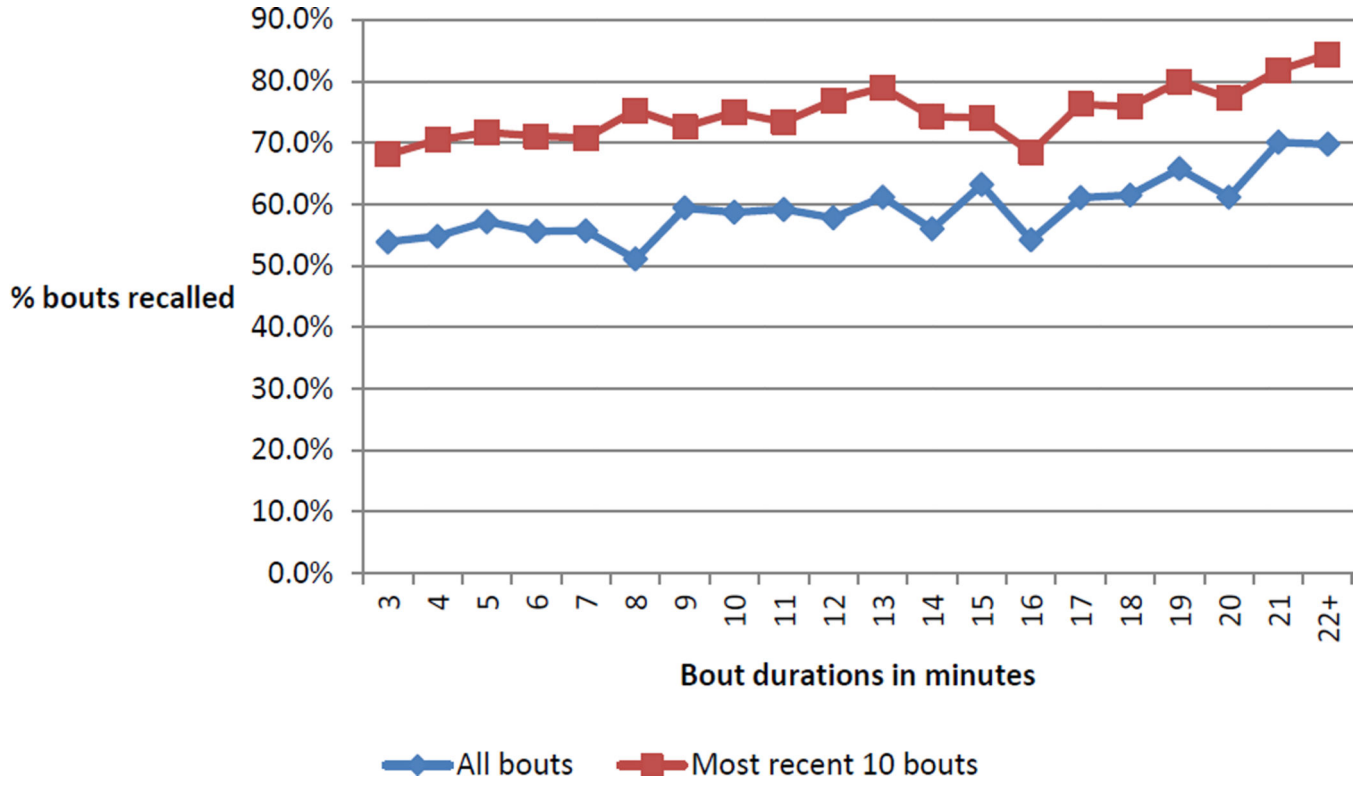


Figure 5.
Recall of all and 10 most recent bouts by bout duration

Table 1

Activity motivations: Means and correlations (N=826)

How important were the following goals to this activity? (1–5 scale, 5=very important)			rs	
	Mean	SD	1	2
1. Getting exercise	2.89	1.40	1.00	
2. Getting someplace	3.65	1.23	.08*	1.00
3. Getting leisure or recreation	2.93	1.30	.60**	.14**

* $p < .05$

** $p < .01$