Tracking of sedentary behaviours of young people: A systematic review

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Abstract

Objective: To review the empirical evidence concerning the strength of tracking of sedentary behaviors from childhood and adolescence.

Methods: Published English language studies were located from computerised and manual searches in 2009. Included studies were prospective, longitudinal studies with at least one sedentary behavior for at least two time-points, with tracking coefficients reported, and included children (aged 3-11 years) and adolescents (12-18 years) at baseline.

Results: Based on data from 21 independent samples, tracking coefficients (*r*) ranged from 0.08 (over 16 years) to 0.73 (over 2 years) for TV viewing, from 0.18 (boys over 3 years) to 0.52 (over 2 years) for electronic game/computer use, from 0.16 (girls over 4 years) to 0.65 (boys over 2 years) for total screen time, and from -0.15 (boys over 2 years) to 0.48 (over 1 year) for total sedentary time. Study follow-up periods ranged from 1 to upto 27 years, and tracking coefficients tended to be higher with shorter follow-ups.

Conclusions: Sedentary behaviors track at moderate levels from childhood or adolescence. Data suggest that sedentary behaviors may form the foundation for such behaviors in the future and some may track slightly better than physical activity.

Introduction

The late Jeremy Morris reported more than half a century ago that a sedentary occupation was associated with greater health risk than its more active counterpart (Morris et al., 1953). However, it is not until more recent times that researchers have started to systematically address whether sedentary behavior, operationally defined as behaviors involving predominantly sitting, have deleterious health consequences. Data from adults show links between sedentary behavior and all-cause mortality (Dunstan et al., 2010, Katzmarzyk et al., 2009), cardiovascular disease (Katzmarzyk et al., 2009), obesity (Hu et al., 2003), and adverse metabolic profiles (Dunstan et al., 2007). Similar work with young people shows associations with body weight and obesity (Marshall et al., 2004, Vicente-Rodriguez et al., 2008, Hancox et al., 2004), adverse metabolic profiles (Ekelund et al., 2006), and poor fitness in later life (Hancox et al., 2004). These associations can vary in magnitude, can be complex, and may not always be independent of physical activity (Mitchell et al., 2009), but they do suggest that sedentary behavior is an important area of study and in need of further development.

If reductions in sedentary behavior prove to be important for health, we need to know more about the behavior and whether it persists over time. It is likely that some sedentary behaviors, such as TV viewing or recreational computer use, have a strong habitual element, thus are likely to 'track' over time, thus providing guidance, and challenges, for interventions designed to reduce such behaviors. Tracking is defined "as a tendency of individuals to maintain their rank or position in a group over time" (Telama, 2009, p. 1). While evidence has been summarised concerning the strength of tracking of physical activity (Telama, 2009, Malina, 1996), there is no review of the tracking of sedentary behaviors. The current paper, therefore, addresses this gap by reporting a systematic review of the tracking of sedentary behavior from childhood or adolescence.

Methods

This study followed the procedures for a systematic review produced by the NHS Centre for Reviews and Dissemination (NHS Centre for Reviews and Dissemination, 2001).

Search strategy

Search strategies, undertaken in 2009, were built around three groups of keywords: sedentary behavior, study type, and sample type. Key terms for sedentary behaviors were used in combination with key terms for study type and sample type to locate potentially relevant

studies. Key terms for sedentary behaviors included 'sedentary behavior', 'television viewing', 'screen-based media', 'inactivity', 'computer', 'video', and 'screen time'. Key terms for study type included 'longitudinal', 'prospective', 'cohort', and 'tracking'. Key terms for sample type included 'children', 'child', 'adolescent(s)', 'adolescence', 'youth', 'boys', 'girls', 'teenage(r)', and 'school-age'. The following electronic databases were searched using the key terms: Science Direct, PubMed, PsychINFO, and Web of Science. In addition to electronic searches, manual searches of personal files were conducted along with screening reference lists of primary studies and identified articles for titles that included the key terms.

Inclusion and exclusion criteria

For inclusion, studies were required to (i) include pre-school children aged 3-5 years, school-aged children aged 6–11 years and/or adolescents aged 12–18 years (or a mean within these ranges) as subjects of study at baseline. Studies that stated an age range were classified in the relevant group depending on the age of the majority of the sample; (ii) be prospective, longitudinal studies; (iii) have a measure of at least one sedentary behavior for at least two time points; (iv) assess tracking of at least one sedentary behavior (i.e. studies that quantify whether a child will maintain his or her relative rank for a behavior within a cohort of children over time (Malina, 1996); (v) be published in peer-reviewed journals in the English language; and (vi) be published up to October 2009. Intervention studies, and studies where adults were the only participants at baseline, were excluded.

Identification of relevant studies

Potentially relevant articles were selected by (i) screening the titles; (ii) screening the abstracts; and (iii) if abstracts were not available or did not provide sufficient data, the entire article was retrieved and screened to determine whether it met the inclusion criteria.

Data extraction

Data were extracted on standardised forms developed for this review and included: author, date and country of study, characteristics of the participants (sample age at baseline, sample size and gender), length of follow-up, sedentary behavior outcome, assessment of sedentary behavior, and measures of sedentary behavior. This information is summarised in Tables 1 and 2.

Sedentary behavior tracking coefficients

Tracking coefficients (r) were extracted from included articles, and were classified as small (0.10-0.29), moderate (0.30-.49) or large (>/=0.5) according to strength of association cut-off points described by Cohen (1988). Tracking coefficients are displayed separately for TV viewing (Table 3), electronic games/computer use (Table 4), total screen time (Table 5), and total sedentary behavior time (Table 6), and are categorised by the sample age at baseline (<3-5 years, 6-11 years, and 12-18 years), and length of follow-up. An independent sample was used as the unit of analysis and was defined as the smallest independent sub-sample for which relevant data were reported (e.g. boys/girls) (Cooper, 1998).

Results

The literature search yielded 6237 titles of potentially relevant articles and 14 papers (21 samples) were considered eligible for this review (See Table 1 and 2). The majority of studies were conducted in the USA (n=9). Six studies assessed tracking of sedentary behaviors for boys and girl combined, six assessed tracking separately for boys and girls, and two studies were on girls only. Five studies had a follow-up length of 2-years, three studies had follow-up of 3-years, two studies had 5-years. Tracking over 1-year, 18-months, 21-years, and 27 years were studied once. The majority of studies assessed sedentary behaviors through self-report (n=6) and parent proxy report (n=5), using questionnaires (n=11). Three studies used accelerometers to assess total sedentary behavior time (see Table 6 for a definition of accelerometer assessed total sedentary behavior time). Ten studies also had data on physical activity tracking.

Tracking of television viewing

Table 3 summarises nine studies (eight samples) reporting tracking coefficients for television (TV) viewing. Four samples were assessed for tracking of TV viewing in children aged 3-5 years at baseline. Hancox et al. (2004) and Landhuis et al. (2008) report on the same sample of 1,037 New Zealand children. Hancox et al. report that tracking coefficients decreased with length of follow-up in a sample of 5-year old children (decreased from 0.35 at 2-year follow-up to 0.08 at 16-year follow-up). However, tracking for periods of 2-4 years showed values approximately between 0.3-0.4 when later ages were included, and even a 6-year follow-up from 15-21 years of age showed a value of 0.42. The measure of childhood TV viewing was for weekday only and was parent reported between ages 5-11 years and self-reported for ages 13-21 years. In the same study, Landhuis et al. (2008) found that an aggregated value for weekday TV viewing for ages 5-15 years tracked moderately well at aged 32 years (r=0.33).

Janz et al. (2005) tracked TV viewing for 3 years in a sample of children from the USA, and reported coefficients of 0.46 for boys and 0.44 for girls. Taylor et al. (2009) found tracking coefficients of 0.56 after one- and two-year follow-up in a sample of 3 year old children from New Zealand. Salbe et al. (2002) presented a 5-year tracking coefficient of 0.22 for boys and girls aged 5-years from the USA.

Two studies assessed tracking of TV viewing in children aged 6-11 years at baseline. Davison et al. (2005), in a sample of American girls, reported a large tracking coefficient of 0.73 over 2-years. Hesketh et al. (2007) tracked TV viewing in a sample of Australian boys and girls for 3-years, and presented a moderate-to-large coefficient of 0.48. In addition, two studies assessed tracking of TV viewing in US adolescents. Both reported large coefficients of 0.51 (Berkey et al., 2003) and 0.53 (Motl et al., 2006), albeit over only a 1-year period.

Tracking of electronic games/computer use

Table 4 summarises the three studies reporting tracking coefficients for electronic (video) games/computer use (VG). Janz et al. (2005) tracked VG use for 3 years in a sample of children from the US, and reported tracking coefficients of 0.18 for boys and 0.37 for girls. Hesketh et al. (2007) tracked VG use in a sample of Australian children for 3-years with a moderate tracking coefficient of 0.34. Motl et al. (2006) reported a larger two-year tracking coefficient of 0.52 in a sample of 7th grade adolescents from the US.

Tracking of total screen time

Table 5 summarises the six studies reporting tracking coefficients for total screen time (ST). Taylor et al. (2009) found that ST tracked well over one- (r=0.56) and two-years (r=0.58) in a sample of three year olds from New Zealand. Four studies assessed tracking of ST in children aged 6-11 years at baseline. Hesketh et al. (2007) tracked ST use in a sample of Australian children for 3-years, with a tracking coefficient of 0.46. Janz et al. (2000) reported tracking of ST over 5 years in American children. In girls, year 5 ST tracked only with year 4 (1-year tracking), whereas ST tracking coefficients were moderate-to-large for boys at all time points (r=0.65-0.40). Pate et al. (1999) found that ST tracked moderately well in boys and girls over a 3-year period (r=0.42 and r=0.39 respectively). Laurson et al. (2008) found that ST tracked moderately well over an 18-month period in boys and girls (r=0.37 and r=0.38 respectively).

Berkey et al. (2003) found that ST tracked well over a one-year period in older and younger adolescent boys (r=0.46 and 0.50) and girls (r=0.47 and 0.51) from the USA.

Tracking of total sedentary behavior time

Table 6 summarises the four studies reporting tracking coefficients for total sedentary behavior time (TST). Taylor et al. (2009) found that TST tracked well over one (r=0.48) and two years (r=0.40) in three year olds from New Zealand. Janz et al. (2005) found that objectively assessed TST tracked moderately over 3-years in three year old boys (r=0.41) and girls (r=0.41) from the USA. Kelly et al. (2007) reported significant tracking coefficients for objectively assessed TST over a 2-year period in a sample of Scottish children (r=0.35), however, when analysed separately by gender, tracking coefficients were not significant (boys r=-0.15, girls r=0.35). Baggett et al. (2008) assessed tracking of TST in middle school American girls using accelerometers and a self-report measure (3DPAR). Intraclass correlations for self report, 3-day accelerometry, and 6-day accelerometry were 0.17, 0.06, and 0.16 respectively.

Comparison of strength of tracking for physical activity and sedentary behavior

Ten studies had data on tracking for both physical activity and sedentary behaviour. Overall, the pattern of tracking strength was similar between the two behaviours (data not shown but available from first author). Specifically, 27% of the tracking coefficients for sedentary behaviour were 'low' (29% for physical activity), 46% 'moderate' (44%), and 27% 'high (27%). However, data are not directly comparable due to different types of physical activities and sedentary behaviours being assessed across different time periods.

Discussion

Sedentary behavior research is experiencing rapid growth. Papers are now showing potentially important negative health outcomes for various markers of sedentary behavior, when this is defined as sitting behaviors or an aggregate measure of total sedentary time. As a result, researchers in this field need to identify correlates of sedentary behavior, including to what extent such behaviors are stable over time. The current review sought to identify the nature and strength of tracking of sedentary behaviors for young people, something that has not been reviewed before.

It is informative to note that tracking coefficients, overall, show moderate-to-large values for follow-up over several years, with smaller coefficients for longer time periods. Tracking also varies by behavior with evidence for slightly stronger tracking for TV viewing than other behaviors. Although precise direct comparisons are not possible, it appears that the tracking of some sedentary behaviours, such as TV viewing, may be slightly stronger than that for physical activity (Telama, 2009). However, overall, the strength of tracking is broadly similar between the physical activity and sedentary behaviour.

The tracking of TV viewing is quite strong over a few years of follow up. TV is the most prevalent sedentary behavior for young people and has been implicated in adverse health and fitness outcomes (Hancox et al., 2004, Viner and Cole, 2005, Pardee et al., 2007) and has been the focus of sedentary behavior change interventions yielding mixed outcomes (DeMattia et al., 2007). Although trends show small declines in absolute values of TV viewing during mid-to-late adolescence and across cohorts (Sturm, 2005, Marshall et al., 2006), our review data suggest that TV viewing is a relatively stable behavior. For example, Landhuis et al's (2008) follow up from an aggregated value for childhood weekday TV viewing to the age of 32 years shows a value for 0.33. Notwithstanding the weakness of an aggregated value across a wide age range, this could be considered highly significant in practical terms given the length of follow up. However, age-specific (not aggregated) analyses from the same sample show a clear decline over 2-16 years of follow up, suggesting that TV will not be that stable after about a 4 year period (Hancox et al., 2004). There are no other studies with such a length of follow up to test tracking beyond 5 years. However, given that Hancox et al have shown the equivalent of a dose-response relationship between the average weekday TV viewing of 5-15 year olds and early adulthood BMI and low fitness, even moderate tracking of TV viewing is noteworthy. It should noted, though, that for ages 5-11 years, weekday TV viewing was assessed by the parent, and this method is likely to reduce validity. Indeed, validity of assessment is a problem in this field as many studies include self-reports of unknown validity (Bryant et al., 2007). Whether this affects the strength of tracking remains to be seen. Moreover, TV viewing may not reflect overall sedentary behavior very well in young people (Biddle et al., 2009).

Only three studies report the tracking of computer use and games. Inevitably, this is still a relatively new behavior across the population but one that is changing rapidly. This will make tracking quite difficult to interpret in the future, especially if measures are not careful in

differentiating active from sedentary forms of computer games. With the exception of a sample of young boys, tracking appears to be small-to-moderate up to a period of 3 years. With the changing nature of computer gaming, whereby increasingly sophisticated and attractive games become widely available, trends in this behavior need close scrutiny. The trend for less TV viewing in adolescence may reflect a shift towards more computer gaming. With the potential for addictive-type interaction with such interfaces (Griffiths & Hunt, 1998), this is a cause for concern.

Some studies chose to assess TV and computer time together – 'screen time'. Our review suggests that screen time tracks in a moderate-to-large way across 1-5 years. For young people, much of their screen time will be in discretionary leisure-time, although some will involve work at school and homework. In contrast, some adults will spend long periods in front of a computer screen at work. Leisure-time screen behaviors may provide a good target for interventions for young people and the use of computers, and computer-related screens, need evaluating over time. For example, there is a trend towards technology 'convergence' whereby one piece of hardware can accommodate multiple functions, such as mobile phones being used to listen to music and laptops showing films. This needs monitoring as to how it might affect time spent being sedentary or active.

Recent advances in technology are making movement sensors, such as the accelerometer, the instrument of choice for the assessment of physical activity. However, data showing low levels of movement can also be used for the assessment of sedentary behavior. We identified three studies assessing 'total' sedentary time using accelerometers, which, in general, showed moderate tracking over 2-3 years. However, the reference values determining 'sedentary behavior' varied between studies, and this requires further investigation.

One important limitation concerning the literature on tracking of sedentary behaviours is that all but one of the studies reported tracking using correlation coefficients. (Odds ratios have been used by Janz et al. (2005) and Baggett et al (2008). Other papers have used multiple methods to assess tracking, but they all have used correlations and thus we reported these so that the results are somewhat comparable between studies). There are several limitations to this method, including a lack of control for possible confounding variables, and the misrepresentation of actual change in behaviour over time because a correlation will simply

show strength of association and relative within-group position. In other words, the behavior may change but the strength of tracking be high.

Conclusion. Overall, sedentary behavior does show some stability over time. Clearly, tracking will weaken with time, but there is evidence that different sedentary behaviors, and sedentary behavior determined by accelerometry, will track during childhood and adolescence and into adulthood. There was little evidence for any gender differences in tracking, and most studies combined the assessment for boys and girls.

Tracking values for TV viewing appear to be slightly larger than for physical activity, but otherwise the two categories of behaviours are broadly similar. However, the changing nature of sedentary pursuits, and in particularly computer interfaces, will make this area a fruitful one for future research. What we can say is that sedentary behavior is potentially detrimental to health and has some stability that needs 'uncoupling' for successful behavior change for those with high levels. However, for those adopting lower levels of sedentary behaviour in youth, the prognosis may be better.

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Table 1. Study characteristics

Author, date & country	Length of follow-up	Baseline age	Gender	Sample size	Sedentary b assessed
Sample age < 3 - 5 years					
Hancox et al. 2004 & Landhuis, et al. 2008 New Zealand [1]	Up to 16 years (Hancox) & 27 years (Landhuis)	5 years (with data for 7, 9, 11, 13 & 15 years; see Figure 1)	BG	1037	TV
Janz et al. 2005 * USA	3 years	5.6 years	B/G	379	TST, TV, V
Kelly et al. 2007 * UK	2 years	3.8 years	B/G	42	TST
Salbe et al. 2002 * USA	5 years	5 years	BG	138	TV
Taylor et al. 2009 * New Zealand	2 years	3 years	BG	244	TV, ST, TST
Sample age 6 – 11 years					
Davison et al. 2005 USA	2 years	9 years	G	173	TV
Hesketh et al. 2007 Australia	3 years	7.6 years	BG	1278	TV, VG, ST
Janz et al. 2000 * USA	5 years	10.5 years	B/G	126	ST
Laurson et al. 2008 * USA	18 months	10 years	B/G	268	ST
Pate et al. 1999 * USA	3 years	10.7	B/G	181	ST
Sample age 12 – 18 years					
Baggett et al. 2008 * USA	2 years	11.9 years	G	951	TST
Berkey et al. 2003 * USA	1 year	I = 10-12 years II = 13-15 years	B/G	11 887	ST
Motl et al. 2006 * USA	2 years	7th grade (12-13 years)	BG	4594	TV, VG

Total sedentary behavior time (TST) = sum of time spent in all sedentary behaviors, Total screen time (ST) = sum of time spent watching TV and electronic games / computer use, TV = time spent watching television, VG = time spent playing electronic games and computer use.

BG = boys and girls assessed together, B/G = boys and girls assessed separately, G = Girls only.

[1]These two papers report on the same sample but with different follow-up periods. See Figure 1 for more detail and follow-up values from later ages. * these studies also assessed the tracking of physical activity

Table 2. Characteristics of studies included in the review: sample age at baseline, sample size, gender, length of follow-up, sedentary behavior outcome, assessment and measurement of sedentary behaviors, reliability and validity of sedentary measures and country of study.

	References
Sample age at baseline	
3 years	4 BG
3.8 years	13 B/G
5 years	1 BG, 2 BG, 5 BG
5.6 years	3 B/G
7.6 years	7 BG
9 years	6 G
10 years	12 B/G
10.5 years	10 B/G
10.7 years	11 B/G
11.9 years	14 G
10-12 years	8 B/G I
13-15 years	8 B/G II
12-13 years	9 BG
Sample size	
< 100	10 B, 10 G, 11 B, 11 G, 13 B, 13 G
100-299	3 B, 3 G, 4 BG, 5 BG, 6 G, 12 B, 12 G
300-499	
500-999	14 G
1000-2999	1 BG, 2 BG, 7 BG, 8 B I, 8 B II
3000-4999	8 G I, 8 G II, 9 BG
Gender	
Girls only	6, 14
Boys and girls combined	1, 2, 4, 5, 7, 9
Boys and girls separately	3, 8 I II, 10, 11, 12, 13
Length of follow-up	
1 year	8 B/G I II
18 months	12 B/G
2 years	4 BG, 6 G, 9 BG, 13 B/G, 14 G
3 years	3 B/G, 7 BG, 11 B/G
5 years	5 BG, 10 B/G,
16 years	1 BG
27 years	2 BG
Sedentary behavior outcome	
TV viewing (TV)	1 BG, 2 BG, 3 B/G, 4 BG, 5 BG, 6 G, 7 BG, 8 BG, 9 BG
Electronic games / computer use (VG)	3 B/G, 7 BG, 9 BG
Total screen time (ST)	4 BG, 7 BG, 8 B/G I II, 10 B/G, 11 B/G, 12 B/G
Total sedentary behavior time (TST)	3 B/G, 4 BG, 13 B/G, 14 G
Assessment of sedentary behavior	
Self-report	8 B/G I II, 9 BG, 10 B/G, 11 B/G, 12 B/G, 14 G
Parent report	3 B/G, 4 BG, 5 BG, 6 G, 7 BG
Self and Parent report	1 BG, 2 BG
Objective measure	3 B/G, 13 B/G, 14 G
Measure of sedentary behavior	
Questionnaire	1 BG, 2 BG, 3 B/G, 4 BG, 5 BG, 6 G, 7 BG, 8 B/G I II, 9 BG, 10 B/G, 12 B/G,
PDPAR	11 B/G
3-day PAR	14 G
Accelerometer	3 B/G, 13 B/G, 14 G
Country	
United States (US)	3 B/G, 5 BG, 6 G, 8 B/G I II, 9 BG 10 B/G, 11 B/G, 12 B/G, 14 G
United Kingdom (UK)	13 B/G
Australia	7 BG
New Zealand	1 BG, 2 BG, 4 BG

Reference numbers: (1) Hancox, Milne & Poulton R (2004); (2) Landhuis, Poulton, Welch & Hancox (2008); (3) Janz, Burns, Levy (2005); (4) Taylor, Murdoch, Carter, Gerrard, Williams & Taylor (2009); (5) Salbe, Weyer, Harper, Lindsay, Ravussin & Tataranni (2002); (6) Davison, Francis & Birch (2005); (7) Hesketh, Wake, Graham & Waters (2007); (8) Berkey, Rockett, Gillman & Colditz (2003); (9) Motl, McAuley, Birnbaum & Lytle (2006); (10) Janz, Dawson & Mahoney (2000); (11) Pate, Trost, Dowda, Ott, Ward, Saunders & Felton (1999); (12) Laurson, Eisenmann & Moore (2008); (13) Kelly, Reilly, Jackson, Montgomery, Grant & Paton (2007); (14) Baggett, Stevens, McMurray, Evenson, Murray, Catellier & He (2008).
[1]Hancox et al. (2004) and Landhuis et al. (2008) report on the same sample but with different follow-up periods, and thus are counted as two studies, but one independent sample.
Total sedentary behavior time (TST) = sum of time spent in all sedentary behaviors, Total screen time (ST) = sum of time spent watching TV and electronic games / computer use, TV = time spent watching television, VG = time spent playing electronic games and computer use.
BG = boys and girls assessed together, B/G = boys and girls assessed separately, G = Girls only, for reference (Berkey et al., 2003), I = sample under 13 years of age, II = sample 13 years and over.

Table 3. Television viewing (TV) tracking coefficients (*r*), by length of follow-up and age group at baseline

TV viewing	Age 3-5 years at baseline				Age 6-11 years at baseline		Age 12-18 at baseline	
	Hancox et al. 2004 & Landhuis et al. 2008[1]	Janz et al. 2005	Taylor et al. 2009	Salbe et al. 2002	Davison et al. 2005	Hesketh et al. 2007	Berkey et al. 2003	Motl et al. 2006
Length of follow-up								
1 year			BG=0.56***				BG=0.51nr	
2 years	BG=0.35§		BG=0.56***		G=0.73nr			BG=0.53nr
3 years		B=0.46§ G=0.44§				BG=0.48nr		
4 years	BG=0.33§							
5 years				BG=0.22**				
6 years	BG=0.21§							
8 years	BG=0.19§							
10 years	BG=0.16§							
16 years	BG=0.08*							
27 years[1]	BG=0.33***							

§p<0.0001, ***p<0.001, **p<0.01, *p<0.05, nr= p value not reported.
BG=assessed boys and girls together (i.e. total sample), B/G=boys and girls assessed separately, G=girls only.
[1]All values from Hancox et al. except for 27 years. The report by Landhuis et al. (2008) aggregates baseline weekday TV viewing for ages 5-15 years and correlates this with weekday TV viewing at aged 32 years. Follow-up, therefore, includes values from 17 to 27 years.

Table 4. Electronic games / computer use (VG) tracking coefficients (*r*), by length of follow-up and age group at baseline

Electronic games / computer use (VG)	**Age 3-5 years at baseline**	**Age 6-11 years at baseline**	**Age 12-18 at baseline**
	Janz et al. 2005	Hesketh et al. 2007	Motl et al. 2006
Length of follow-up			
2 years			BG=0.52
3 years	B=0.18* G=0.37§	BG=0.34nr	

§p<0.0001, ***p<0.001, **p<0.01, *p<0.05, nr= p value not reported.
BG=assessed boys and girls together (i.e. total sample), B/G=boys and girls assessed separately, G=girls only

Table 5. Total screen time (ST) tracking coefficients (*r*), by length of follow-up and age group at baseline

Total screen time (ST)	**Age 3-5 years at baseline**		**Age 6-11 years at baseline**			**Age 12-18 years at baseline**
	Taylor et al. 2009	Hesketh et al. 2007	Janz et al. 2000	Pate et al. 1999	Laurson et al. 2008	Berkey et al. 2003
Length of follow-up						
1 year	BG=0.56***		B=0.56* G=0.59*			B I = 0.46nr B II = 0.50nr G I = 0.47nr G II = 0.51nr
18 months					B=0.37** G=0.38**	
2 years	BG=0.58***		B=0.65* G=0.16ns			
3 years		BG=0.46nr	B=0.40* G=0.26ns	BG=0.41*** B=0.42*** G=0.39***		
4 years			B=0.48* G=0.16ns			

§p<0.0001, ***p<0.001, **p<0.01, *p<0.05, nr= p value not reported.
BG=assessed boys and girls together (i.e. total sample), B/G=boys and girls assessed separately, G=girls only.
For reference Berkey et al. (2003), I = sample under 13 years of age, II = sample 13 years and over.

Table 6. Total sedentary behavior time (TST) tracking coefficients (*r*), by length of follow-up and age group at baseline

Total sedentary behavior time (TST)	**Age 3-5 years at baseline**			**Age 12-18 years at baseline**
	Taylor et al. 2009	Janz et al. 2005[1]	Kelly et al. 2007[1]	Baggett et al. 2008[2]
Length of follow-up				
1 year	BG=0.48***			
2 years	BG=0.40***		BG=0.35* B=-0.15ns G=0.35ns	Accelerometer 3 day ICC: G=0.06nr Accelerometer 6 day ICC: G=0.16nr 3DPAR 3-day ICC: G=0.17nr
3 years		B=0.41§ G=0.41§		

Total sedentary behavior time (TST) = sum of time spent in all sedentary behaviors.
[1] TST assessed by accelerometer (Janz et al. 2005: inactive minutes were defined by a cut-point approximately equal to 1.4 METs; Kelly et al. 2007: sedentary behaviour was defined as <1,100 counts per minute) , [2]TST assessed by accelerometer and 3DPAR questionnaire (Baggett et al. 2008: an accelerometer count range of 0-50 counts per 30 seconds was used to determine 'inactivity').
§p<0.0001, ***p<0.001, **p<0.01, *p<0.05, nr= p value not reported.
BG=assessed boys and girls together (i.e. total sample), B/G=boys and girls assessed separately, G=girls only.