Validity and reliability of the HomeSPACE-II instrument to assess the influence of the home physical environment on children's physical activity and sedentary behaviour

Abstract

The home physical environment has an important influence on children's physical activity levels and time spent in sedentary behaviours. The aim of this study was to validate the HomeSPACE-II instrument for use in two-storey homes, to measure physical environmental factors that influence children's physical activity and sedentary behaviours within the home. Parents (n=31) with at least one child aged 9-13 years, completed the instrument independently alongside a criterion-trained researcher, then one week later alone, to assess validity and reliability, respectively. Parents were mostly female (87.1%) and university educated (61.3%) with a mean age of 41.68 ± 4 years, while houses were mostly semi-detached or terraced (61.3%) with two parents (87.1%). Intra-class correlation coefficients, Pearson correlation coefficients and Kappa statistics revealed that most items, outside of accessibility and size measures, had strong reliability and validity (94% having ICC > 0.60 and 97% having r > 0.80). Excluding physical activity equipment, accessibility items with lower reliability and validity had low between-subject variation. The HomeSPACE-II instrument covers a wide range of parameters within the home and demonstrated strong validity and reliability, suggesting it is a useful tool for measuring physical factors that influence children's physical activity and sedentary behaviour within the home.

Keywords; Measurement, youth, screen time, house, families

Introduction

The importance of physical activity (PA) for disease prevention and health promotion in children is well established (Poitras et al. 2016). Conversely, time spent sedentary, particularly using screens, has been associated with poor health outcomes (Carson et al. 2016). Despite this, few children meet the current PA and sedentary behaviour recommendations (Department of Health Physical Activity 2011). The social ecological model is used to contextualise the determinants of children's sedentary behaviour and PA (Veitch et al. 2013; Wilk et al. 2018). This model emphasises the influence of the environment and posits that behaviours are most likely influenced by the setting in which they occur (Bronfenbrenner 1977; Sallis et al. 2006). Outside of school, children spend significant time within their home and neighbourhood environments. The influence of the neighbourhood environment on children's PA levels and sedentary behaviour has been well studied, where proximity to parks and recreation areas have been positively associated with PA (Tappe et al. 2013), and neighbourhood safety has been negatively associated with sedentary behaviour (Côté-Lussier, Mathieu, and Barnett 2015). However, children have less independent mobility (Karsten 2005) and therefore opportunities for active free play (J. Veitch, Salmon, and Ball 2008) in their neighbourhoods compared with previous generations. Given that children spend considerable time at home (Karsten 2005), an improved understanding of its influence on PA and sedentary behaviour is imperative for developing effective interventions.

To date, research into the influence of the home environment on children's PA and sedentary behaviour has focused on the social environment, with the physical environment receiving little attention (Maitland et al. 2013; Kaushal and Rhodes 2014). Nonetheless, there is a consistent positive relationship between the quantity of media equipment within the home

(Rosenberg et al. 2010; Sirard et al. 2010), its presence within a child's bedroom (Atkin, Corder, and van Sluijs 2013; Tandon et al. 2012), and screen-based sedentary behaviours. There is limited evidence for an association between PA equipment and PA levels (Maitland et al. 2013). Moreover, some studies have reported an inverse relationship between media equipment and PA (Wong et al. 2010; Ridgers et al. 2010), and between PA equipment and sedentary behaviour (Rosenberg et al. 2010; Sirard et al. 2010), but evidence is inconclusive (Maitland et al. 2013). Similarly, whilst PA at home is most likely to occur outdoors (Biddle et al. 2009), the relationship between garden space and PA remains equivocal (Page et al. 2010; Trang et al. 2009). Even though the evidence base is growing, there remains a paucity of research investigating the home physical environment, outside of PA and media equipment.

In addition, most home environment measurement tools only assess the availability of equipment, without considering its accessibility, thus limiting investigation. Accessibility is associated with "ease of use and cueing of behaviour" (Sirard et al. 2008),[p.2], therefore, a readily available item posing little barrier to use may act as an important prompt to engage in a behaviour. Studies investigating accessibility have reported a positive relationship between the accessibility of PA equipment and accelerometer-derived PA in children (Sirard et al. 2010; Hales et al. 2013; Gattshall et al. 2008), as well as the accessibility of media equipment and screen-time in girls (Sirard et al. 2010). Hales et al. (2013) also found that only the accessibility, and not availability, of portable play equipment was positively associated with children's outdoor play (Hales et al. 2013). Taken together, these findings demonstrate the potential utility of accessibility in influencing behaviour, and accordingly the need to include a measure of accessibility in a measurement tool.

Reviews (Maitland et al. 2013; Kaushal and Rhodes 2014) recommended that more objective measurement tools are needed to improve our understanding of how the home physical environment influences children's PA and sedentary behaviour. Sirard et al. (2008) developed a valid and reliable PA and media equipment inventory (PAMI), a room-level home audit which records the availability and accessibility of PA and media equipment in homes. Similarly, Pinard et al. (2014) created a parent-report instrument to measure PA and media equipment in low income family homes, however in-home observation was not used to assess criterion validity. Lastly, the HomeSTEAD instrument (Hales et al. 2013) underwent rigorous validity and reliability and it provides a more comprehensive assessment, including a large range of PA and media items as well as garden characteristics, although it did not include room-level location for most items. Whilst these provide valid and reliable assessments of media and PA equipment at home, instruments which explore other physical environmental factors in detail are lacking.

The HomeSPACE-I instrument (Maitland et al. 2018) advanced previous instruments by measuring previously unexplored characteristics of the physical home environment such as musical instruments, room/area size and furniture, as well as providing room-level data, assessing garden size and outdoor features. Thus, the HomeSPACE-I instrument allows a more detailed assessment of the physical home environment than previous instruments (Sirard et al. 2008; Hales et al. 2013). The HomeSPACE-I instrument was designed and validated for use in Western Australia (WA) where homes are typically one-storey, thereby potentially limiting its appropriateness for use in countries with predominantly two-storey homes. Specifically, one-storey homes are often open plan and have less separation between the bedroom and living areas, and therefore likely to impact family interaction as well as parents' ability to monitor children's electronic media usage. One-storey homes can offer

families more freedom to design the layout to suit their preferences and priorities, which may or may not be aligned to promotion of healthy behaviours. In contrast, two-storey homes have a smaller footprint, which generally allows more outdoor space when on a similar sized plot. Such inherent layout and design differences highlight the necessity for the HomeSPACE instrument to be validated for use in two-storey homes.

The HomeSPACE-II instrument was developed for use in two-story homes with the added measure of accessibility, to measure parameters of the home physical environment that influence children's PA and sedentary behaviours. The construct validity of the measure has been established previously, with significant associations between several home physical environmental factors assessed by the instrument and children's objectively measured home-based sitting and PA in the expected directions being found (Sheldrick et al. 2019). Specifically, home-based sitting time was negatively associated with musical instrument accessibility and availability, perceived house size, and an open plan living area, and positively associated with media equipment availability and accessibility. Total physical activity (TPA) levels at home were also positively associated with the number of floors in the home and an open plan living area. The present study aimed to test the criterion validity and reliability of the HomeSPACE-II instrument.

Method

Participants

A convenience sample and parents of children participating in the Swan-Linx school health, fitness and wellbeing project (Sheldrick et al. 2018) were provided with information about the study. Thirty-one families, 22 via Swan-Linx and nine from the convenience sample, living in the two largest conurbations in South Wales (Cardiff and Swansea) agreed to participate. Families had at least one child aged 9 to 13 years and a parent or guardian

prepared to complete the audit on two separate occasions. Family passes for a local water park were offered as an incentive for participating in the study. The institutional ethics committee approved the study.

HomeSPACE-II instrument

The HomeSPACE-II instrument measures the physical environment of the home space in relation to children's PA and sedentary behaviour, and was based on the audit section of its Australian counterpart (Maitland et al. 2018). However, the instrument was adapted to include equipment most relevant to home-based activity in the UK, and to assess the accessibility as well as the availability of each item and where appropriate questions were adapted to the UK context. A draft instrument was reviewed by researchers with over 10 years of experience in the field of children's PA and sedentary behaviour (GS and CM). The instrument and full study procedure were then pilot tested with a convenience sample of two families. At the end of the home visits, parents provided verbal feedback on the audit and home visit data collection protocol. Based on their feedback the audit was refined to improve instruction clarity, the magazines item was moved to the questions section, and items commonly found in UK households such as a football net, frisbee, skipping rope, hula hoop, table football and swing ball were added, and a spa was removed.

The final instrument incorporated 39 equipment items, and allowed the presence, amount and accessibility of each item, as well as room size (perceived), to be recorded for up to 14 rooms indoors and eight areas outdoors (see instrument provided as a supplementary file). Accessibility was rated on a scale of A-D, using developed and validated scores (Sirard et al. 2008). The response options were; A: put away and difficult to get to; B: put away and easy to get to; C: in plain view and difficult to get to; D: in plain view and easy to get to. The

accessibility options were designed to also account for the condition of an item. For example, a punctured football in plain view should be given a C rating, while a tennis racquet in usable condition and in plain view should be given a D rating. Instructions and examples were provided on the first page of the instrument. There were ten items assessing the presence of outdoor features in the front garden, back garden and verge. Items related to home features (home type, home size, number of storeys, stairs, fencing and adjacency to public open space) were also included. In addition, there were questions for home equipment (books, magazines, DVDs, TV channels, electronic games, active electronic games, smartphones, internet service, dogs and other pets) that could not be assessed by the room-level audit.

Procedures

Participant home visits were conducted during February to May 2016. Parents were provided the study information prior to the visit. Under ethical guidelines, written informed consent was received upon arrival and all family members provided verbal permission for the home visit. One parent/guardian was required to walk around their home and complete the instrument, while a criterion-trained researcher simultaneously, but independently, completed the instrument. Parents were asked not to communicate with the researcher during the audit. If items were hidden, such as underneath furniture, parents were asked to make them visible. At the end of the visit, parents were given a second copy of the instrument, which they were asked to complete one week later and return via a pre-paid envelope. All the data collected was kept private and confidential.

Data Reduction

Individual items, features and the number of items within each accessibility group were collated into category summary scores (Table 1). Density measures were calculated by dividing the category summary scores by the total number of indoor rooms, outdoor areas or total rooms/locations in the house. Summary scores that accounted for the accessibility and availability of the media equipment, PA equipment, musical instrument and seated furniture items were also created by multiplying each item by their accessibility scores (A=1; B=2; C=3; D=4). The higher the score, the greater the overall "presence" of the type of item in the home. Further, an overall home environment score was calculated to assess whether a home was more conducive to physical activity or sedentary behaviour. The score was calculated as the ratio of PA equipment summary score to media equipment summary score (activity: media ratio score). A higher score would reflect a home more likely to facilitate PA and discourage sedentariness.

Demographics

Parents reported their age, place of birth, sex, educational status, as well as the postcode, sex and age of primary child, family situation, homeowner status and the main language spoken at home. Additionally, postcodes (i.e., zip codes) were used to generate Welsh Index of Multiple Deprivation (WIMD) scores, using the National Statistics Postcode Directory database, as an indication of socioeconomic status (SES). The WIMD scores, consider eight domains of deprivation; employment; health; income; housing; community safety; access to services; education and the environment (Noble et al. 2006). Small areas in Wales are ranked from 1-1909, with 1 being the most deprived and 1909 being the least deprived. Tertiles of SES were formed: Low (WIMD score = 1-636), medium (WIMD score=636-1272) and high (WIMD score=1272-1909).

Statistical Analysis

For continuous variables, criterion validity was assessed by examining agreement between the "gold standard" trained researcher and the participant using Pearson correlation coefficients and 95% limits of agreement. Mean differences between the researcher and the participant were evaluated using two-tailed paired t-tests. Test-retest reliability between participants at time-points was evaluated using intraclass correlation coefficients (ICC; 95% confidence intervals displayed). ICCs were rated using cut-off points of: < 0.40 (poor); 0.40 to 0.59 (fair); 0.60 to 0.74 (good); and 0.75 to 1.00 (excellent) (Cicchetti 1994).

For the categorical variables, validity and test-retest reliability were assessed by Cohen's Kappa coefficients (CKC; 95% confidence intervals displayed). Kappa coefficients were interpreted as follows: < 0.00 (poor); 0.00 - 0.20 (slight); 0.21- 0.40 (fair); 0.41- 0.60 (moderate); 0.61- 0.80 (substantial); and 0.81-1.00 (almost perfect) (Landis and Koch 1977). Statistical analyses, were conducted using IBM SPSS statistics 22 (IBM SPSS Statistics Inc., Chicago, IL, USA), where significance was set at ≤ 0.05.

Results

Demographic characteristics of the participating families are provided in Table 1. All parents (n=31) completed the HomeSPACE-II instrument at both time-points, where 87.1% were female, 61.3% held a university degree and 45.2% lived in the highest SES locations. Houses were mostly semi-detached or terraced (61.3%) with two parents (87.1%), and there were most often four occupants per home (48.4%), including two children (51.6%). Most participants reported they had either a medium or large-sized house (45.2% and 41.9% respectively), and a medium or large-sized garden (42% for both).

Validity

The results of the availability validation analysis are shown in Table 2. Pearson correlation coefficients between the researcher and parent were > 0.80 for all the room/area summary variables, and ≥ 0.84 for the availability and density of PA equipment, musical instruments, media equipment and seated furniture. Three of four outdoor features correlations were > 0.90, only the "back garden" summary item fell below 0.70 (r = 0.65). There were significant mean differences for five PA equipment categories, including sports equipment (p = 0.05), PA equipment indoors (p = 0.01) and in total (p = 0.03), and the density of PA equipment indoors (p = 0.02) and in total (p = 0.03). Significant mean differences were also noted for three seated furniture categories; seated furniture indoors (p = 0.03) and in total (p = 0.03), and the density of seated furniture indoors (p = 0.05).

Table 3 contains the results for the accessibility variables. Correlation coefficients between the researcher and participant were ≥ 0.35 across all four accessibility ratings for PA equipment (total, indoor and outdoor), media equipment and musical instruments. Correlation coefficients for three accessibility ratings for seated furniture (total, indoor and outdoor) fell below 0.18. Correlation coefficients for the number of items recorded as "in plain view and easy to get to" were most favourable, where six of eight were ≥ 0.80 (Table 3). Average accessibility ratings for three of eight item categories achieved correlation coefficients ≤ 0.35. Mean differences were noted between the researcher and participant for four accessibility ratings, with the researcher recording a greater number of PA equipment items indoors as "in plain view and easy to get to" (p = 0.02) and both outdoors and in total as "put away and easy to get to" (both p = 0.01), as well as more media equipment items as "in plain view and easy to get to" (p = 0.02). Further, there were significant differences in average accessibility ratings for two item categories, with the researcher observing fewer PA equipment in total as harder to access (p = 0.04) and more PA equipment outdoors as harder to access (p = < 0.01).

Correlation coefficients were high for the calculated accessibility and availability summary scores ($r > 0.75$ [number of items * accessibility rating]) [Table 2] and for the PA: Media ratio score (the ratio of PA equipment summary score to the media equipment summary score [$r = 0.70$]; Table 3). However, the media equipment accessibility and availability summary score was significantly greater for the researcher ($p = 0.02$).

Validation results for the categorical variables are provided in Table 4. All variables assessing adjacent space showed almost perfect agreement ($K > 0.80$) and those assessing home design showed either substantial or almost perfect agreement ($K \geq 0.69$). Validity for seven out of 14 size measures showed either substantial or almost perfect agreement ($K \geq 0.63$), and the remaining seven demonstrated fair or moderate agreement ($K = 0.24$ - 0.58).

Reliability

For test-retest reliability, ICCs for 28 of the availability variables were excellent (ICC $\geq$ 0.76), with the other 6 being either fair or good (ICC = 0.52 – 0.73; Table 2). For the majority of the categorical variables, Cohen's Kappa was either substantial or almost perfect ($K >$ 0.61; Table 4). Most other kappa coefficients were moderate ($K = 0.41$- 0.60), however one item, hall size, was fair ($K = 0.28$).

As shown in Table 3, most of the ICCs for the accessibility categories were either excellent or good (ICC > 0.60). Across the accessibility summary categories, the highest ICCs were found for the number of items rated as "put away and difficult to get to" and "in plain view and easy to get to", where six of seven and five of eight, respectively, were excellent (ICC $\geq$ 0.75). Conversely, the lowest ICCs were found for the number of items rated as "in plain view and difficult to get to", with five of eight being poor (ICC = -0.03 -

0.32). In terms of average accessibility ratings, all but one of the item categories achieved fair to excellent ICCs $\geq$ 0.42; the ICC for musical instruments was poor (ICC = 0.15). Reliability was excellent between the parent at Time 1 and Time 2 for all four accessibility and availability summary scores (ICC $\geq$ 0.84; Table 2), and for the PA: Media Ratio score (ICC = 0.79; Table 3).

291 **Table 1-Descriptive statistics of the study sample**
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		Both validity and reliability and Sample *n*=31 %	Families from Swansea *n*=22 %	Families from Cardiff *n*=9 %
Family Characteristics				
Parent age, mean (SD)		41.67 (4.04)	41.68 (4.20)	41.67 (5.46)
Parent sex	Female	87.1%	90.9%	77.8%
	Male	12.9%	9.1%	22.2%
Parent country of birth	Wales	74.2%	72.7%	77.8%
	England	16.1%	13.6%	22.2%
	Other	9.7%	13.6%	-
Primary child age, mean (SD)		10.15 (0.98)	10.16 (0.78)	10.11 (1.45)
Primary child sex	Girl	48.4%	36.4%	77.8%
	Boy	51.6%	63.6%	22.2%
Main language spoken at home	English	83.9%	77.3%	100%
	Welsh	12.9%	18.2%	-
	Other	3.2%	4.5%	-
Number of children at home	1	12.9%	13.6%	11.1%
	2	51.6%	50%	55.6%
	3	25.8%	22.7%	33.3%
	≥ 4	9.7%	13.6%	-
Number of people at home	≤ 3	12.9%	18.2%	0
	4	48.4%	45.4%	55.6%
	≥ 5	38.7%	36.4%	44.4%
Parental education	$\leq$ Secondary school	12.9%	18.1%	-
	Trade or Diploma	25.8%	18.1%	44.4%
	University degree	61.3%	63.6%	55.6%
SES (based on WIMD scores)	High	45.2%	45.5%	44.4%
	Medium	38.7%	31.8%	55.6%
	Low	16.1%	22.7%	-
Family situation	Single parent	9.7%	13.6%	-
	Two parents	87.1%	86.4%	88.9%
	Other	3.2%	-	11.1%
Home ownership	Rent	12.9%	18.2%	-
	Owner	87.1%	81.8%	100%
Home characteristics				
House type	Detached house	38.7%	40.9%	33.3%
	Semi-detached or terrace house	61.3%	59.1%	66.7%
House size	Small	12.9%	9.1%	22.2%
	Medium	45.2%	45.5%	44.4%
	Large	41.9%	45.5%	33.3%
Garden Size	No	-	-	-
	Small	16%	13.6%	22.2%
	Medium	42%	45.5%	33.3%
	Large	42%	40.9%	44.4%

293 **Table 2. Validity and reliability for home equipment and features–continuous variables.**
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Home equipment and features	Time 1 (n=31)	Researcher (n=31)	Time 2 (n=31)	Validity Time 1 vs Researcher			Reliability Time 1 vs Time 2
				Pearson's correlation	t-test of means	Limits of agreement (95%)	Intraclass Correlation Coefficient (1.1)
	Mean (SD)	Mean (SD)	Mean (SD)	*r*	P-value		ICC (95% CI)
ROOMS/ AREAS							
Living rooms	4.32 (1.09)	4.29 (1.05)	4.35 (1.31)	0.96	0.57	(0.58, 0.65)	0.86 (0.73, 0.93
Bedrooms	3.52 (0.76)	3.52 (0.76)	3.45 (0.66)	1	Constant	-	0.88 (0.76, 0.94
Total-Indoors	7.84 (1.57)	7.81 (1.51)	7.81 (1.67)	0.98	0.57	(-0.58, 0.65)	0.89 (0.79, 0.95
Total-Outdoors	3.26 (1.05)	3.35 (0.93)	3.45 (1.01)	0.83	0.37	(-1.27, 1.07)	0.53 (0.23, 0.74
Total-Home	11.10 (2.28)	11.16 (2.16)	11.26 (2.37)	0.96	0.60	(-1.40, 1.27)	0.87 (0.75, 0.94)
OUTDOOR FEATURES							
Back garden	5.74 (1.16)	5.71 (1.05)	5.66 (1.40)	0.65	0.85	(-1.83, 1.89)	0.61 (0.32, 0.78)
Front garden	4.16 (2.11)	4.45 (2.06)	4.52 (1.92)	0.93	0.06	(-1.91, 1.33)	0.84 (0.69, 0.92)
Verge	1.23 (2.28)	1.19 (2.16)	1.38 (2.20)	0.97	0.77	(-1.15, 1.22)	0.95 (0.89, 0.98)
Total-Outdoors	11.13 (3.75)	11.35 (3.63)	11.55 (3.73)	0.91	0.45	(-3.41, 2.96)	0.87 (0.74, 0.94)
PA EQUIPMENT							
Sports	13.65 (9.52)	15.87 (10.83)	16.03 (11.25)	0.84	0.05*	(-10.75, 7.91)	0.78 (0.59, 0.89)
Transportation	8.81(5.01)	9.06 (4.63)	8.48 (5.66)	0.94	0.42	(-3.69, 3.69)	0.81 (0.64, 0.90)
Fitness	1.65 (2.01)	1.90 (2.48)	1.94 (2.54)	0.94	0.13	(-2.08, 1.56)	0.86 (0.74, 0.93)
Outdoor play	2.77 (2.09)	2.90 (2.12)	2.90 (2.39)	0.90	0.46	(-2.01, 1.75)	0.86 (0.73, 0.93)
Indoor play	0.35 (0.54)	0.42 (0.75)	0.32 (0.59)	0.90	0.33	(-0.77, 0.64)	0.76 (0.56, 0.87)
Total-Indoors	6.03 (4.70)	7.19 (5.66)	6.71 (6.22)	0.91	0.01*	(-6.02, 3.70)	0.79 (0.61, 0.89)
Total-Outdoors	21.19 (12.69)	22.97 (13.31)	22.97 (14.94)	0.87	0.16	(-15.12, 11.57)	0.85 (0.71, 0.92)
Total-Home	27.23 (13.43)	30.16 (14.93)	29.68 (17.26)	0.88	0.03*	(-17.21, 11.34)	0.83 (0.67, 0.91)
Density-Indoors	0.83 (0.72)	0.98 (0.83)	0.88 (0.85)	0.92	0.02*	(-0.81, 0.52)	0.76 (0.55, 0.88)
Density-Outdoors	6.74 (4.06)	7.13 (4.41)	6.59 (3.81)	0.84	0.39	(-5.28, 4.49)	0.70 (0.46, 0.84)
Density-Home	2.50 (1.29)	2.79 (1.52)	2.62 (1.60)	0.89	0.03*	(-1.68, 1.10)	0.81 (0.65, 0.90)
Summary score [1]	80.26 (45.22)	83 (45.38)	91.16 (61.20)	0.77	0.63	(-62.96, 57.48)	0.84 (0.69, 0.92)
MEDIA EQUIPMENT							
Fixed	8.52 (3.65)	8.58 (3.54)	8.00 (4.29)	0.97	0.69	(-1.81, 1.81)	0.89 (0.78, 0.94)
Portable	5.03 (2.40)	5.46 (2.50)	5.10 (2.79)	0.88	0.07	(-2.83, 2.00)	0.81 (0.63, 0.90)
Bedrooms	3.94 (2.85)	4.00 (2.93)	3.81 (3.04)	0.99	0.49	(-1.07, 0.94)	0.90 (0.82, 0.95)
Total-Home	13.55 (4.88)	14.03 (4.71)	13.10 (5.92)	0.95	0.11	(-3.68, 2.71)	0.91 (0.83, 0.96)
Density-Home	1.22 (0.36)	1.26 (0.37)	1.16 (0.50)	0.90	0.17	(-0.28, -0.37)	0.82 (0.67, 0.91)
Summary score [1]	48.42 (17.40)	51.26 (16.51)	48 (22.32)	0.93	0.02*	(-15.10, 9.42)	0.93 (0.86, 0.97)
MUSICAL EQUIPMENT							
Total-Home	2.68 (2.31)	2.58 (2.37)	2.77 (2.15)	0.97	0.37	(-1.07, 2.14)	0.92 (0.83, 0.96)
Density-Home	0.24 (0.22)	0.23 (0.22)	0.24 (0.20)	0.96	0.38	(-0.11, 0.13)	0.92 (0.84, 0.96)
Summary score [1]	9.42 (8.16)	9.48 (9.00)	9.74 (7.83)	0.95	0.90	(-5.63, 5.50)	0.96 (0.92, 0.98)
SEATED FURNITURE							
Bedroom	2.52 (3.97)	2.58 (3.14)	2.32 (2.83)	0.92	0.78	(-2.54, 2.41)	0.81 (0.64, 0.90)
Total-Indoor	15.39 (8.29)	16.19 (8.74)	15.35 (9.81)	0.97	0.03*	(-4.80, 3.19)	0.91 (0.83, 0.96)
Total Outdoor	3.65 (4.04)	3.90 (4.21)	2.48 (3.99)	0.95	0.28	(-2.84, 2.32)	0.73 (0.49, 0.86)
Total-Home	19.03 (9.06)	20.10 (9.40)	17.84 (9.93)	0.96	0.03*	(-6.30. 4.17)	0.86 (0.74, 0.93)
Density-Indoors	1.90 (0.73)	2.01 (0.76)	1.89 (0.88)	0.93	0.05*	(-0.46, 0.68)	0.78 (0.59, 0.89)
Density-Outdoors	1.23 (1.31)	1.20 (1.18)	0.66 (0.97)	0.81	0.81	(-1.57, 1.57)	0.52 (0.19, 0.74)
Density-Home	1.70 (0.66)	1.78 (0.66)	1.55 (0.67)	0.97	0.46	(-0.38, -0.38)	0.72 (0.47, 0.84)
Summary score [1]	73.83 (35.90)	78.19 (37.23)	68.58 (38.51)	0.94	0.06	(28.63, 19.92)	0.85 (0.71, 0.92)

295 * Significant difference ($p < 0.05$) between parent at Time 1 and Researcher. [1] Accessibility and availability equipment
296 summary score.

297 **Table 3. Validity and reliability for accessibility of home equipment– continuous**
298 **variables**
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Home equipment and features	Time 1 (*n*=31)	Observer (*n*=31)	Time 2 (*n*=31)	Validity Time 1 vs Researcher		Reliability Time 1 vs Time 2
				Pearson's Correlation	t-test of means	Intraclass Correlation Coefficient (1.1)
	Mean (SD)	Mean (SD)	Mean (SD)	r	P-value	ICC (95% CI)
PA EQUIPMENT						
Total-Home accessibility						
A-Put away and difficult to get to	3.26 (6.83)	2.74 (4.38)	2.65 (5.90)	0.51	0.64	0.87 (0.75, 0.94)
B-Put away and easy to get to	8.29 (8.23)	13.90 (10.62)	8.45 (9.73)	0.39	0.01*	0.48 (0.16, 0.71)
C-In plain view and difficult to get	1.65 (4.18)	0.65 (1.98)	1.94 (3.59)	0.43	0.16	0.05 (-0.32, 0.40)
D-In plain view and easy to get to	13.87 (10.94)	12.71 (10.15)	16.45 (14.19)	0.46	0.57	0.74 (0.53, 0.87)
Average accessibility rating (1-4)	3 (0.69)	3.14 (0.71)	2.75 (0.57)	0.55	0.04 *	0.59 (0.31, 0.78)
Total-Indoor accessibility						
A-Put away and difficult to get to	0 (0)	0 (0)	0.03 (0.18)	-	-	-
B-Put away and easy to get to	2.45 (3.50)	2.81 (3.14)	1.97 (3.28)	0.82	0.35	0.85 (0.71, 0.93)
C-In plain view and difficult to get	0.10 (0.30)	0 (0)	0.45 (2.30)	-	0.08	-0.00 (-0.36, 0.35)
D-In plain view and easy to get to	3.39 (3.69)	4.58 (4.79)	4.65 (4.75)	0.84	0.02*	0.75 (0.52, 0.88)
Average accessibility rating (1-4)	3.21 (0.75)	3.17 (0.70)	3.44 (0.61)	0.52	0.76	0.48 (0.15, 0.72)
Total-Outdoor accessibility						
A-Put away and difficult to get to	3.26 (6.83)	2.74 (4.38)	2.61 (5.91)	0.51	0.64	0.87 (0.75, 0.94)
B-Put away and easy to get to	5.84 (8.12)	11.10 (10.46)	6.48 (9.49)	0.39	0.01*	0.43 (0.09, 0.68)
C-In plain view and difficult to get	1.55 (4.20)	0.65 (1.98)	1.48 (2.99)	0.44	0.20	0.08 (-0.29, 0.42)
D-In plain view and easy to get to	10.48 (9.74	8.13 (8.06)	11.81 (11.84)	0.35	0.22	0.73 (0.51, 0.86)
Average accessibility rating (1-4)	3.03 (0.87)	2.59 (0.67)	2.99 (0.83)	0.61	<0.01*	0.53 (0.21, 0.75)
MUSICAL INSTRUMENTS						
Total -Home accessibility						
A-Put away and difficult to get to	0.03 (0.18)	0.06 (0.25)	0.03 (0.18)	0.70	0.56	1.00
B-Put away and easy to get to	0.48 (0.91)	0.32 (0.74)	0.55 (0.98)	0.54	0.45	0.36 (0.00, 0.63)
C-In plain view and difficult to get	0.03 (0.18)	0 (0)	0.03 (0.18)	-	0.33	-0.03 (-0.40, 0.33)
D-In plain view and easy to get to	2.10 (1.86)	2.19 (2.13)	2.13 (1.86)	0.88	0.85	0.92 (0.85, 0.96)
Average accessibility rating (1-4)	3.56 (0.63	3.67 (0.52)	3.56 (0.60)	0.29	0.64	0.15 (-0.29, 0.53)
MEDIA EQUIPMENT						
Total-Home accessibility						
A-Put away and difficult to get to	0.45 (1.29)	0.48 (1.32)	0.35 (1.15)	0.92	0.75	0.95 (0.90, 0.97)
B-Put away and easy to get to	1.94 (2.15)	1.74 (1.83)	1.55 (1.88)	0.57	0.58	0.61 (0.33, 0.79)
C-In plain view and difficult to get	0.29 (0.73)	0.06 (0.35)	0.10 (0.30)	0.43	0.07	0.32 (-0.02, 0.59)
D-In plain view and easy to get to	10.81 (4.34)	11.77 (3.96)	11.06 (5.59)	0.87	0.02*	0.83 (0.67, 0.91)
Average accessibility rating (1-4)	3.62 (0.35)	3.67 (0.30)	3.68 (0.36)	0.55	0.34	0.45 (0.13, 0.69)
SEATED FURNITURE						
Total-Home accessibility						
A-Put away and difficult to get to	0.26 (0.95)	0.19 (0.90)	0.26 (0.95)	0.89	0.79	0.97 (0.93, 0.98)
B-Put away and easy to get to	0.23 (0.79)	0.55 (1.62)	0.35 (1.40)	0.10	0.33	0.34 (-0.02, 0.62)
C-In plain view and difficult to get	0.29 (0.96)	0.26 (1.01)	0.26 (0.95)	0.59	0.90	0.88 (0.76, 0.94)
D-In plain view and easy to get to	18.06 (8.56)	19.03 (9.01	16.71 (9.12)	0.92	0.67	0.83 (0.68, 0.92)
Average accessibility rating (1-4)	3.93 (0.14)	3.91 (0.21)	3.89 (0.22)	0.16	0.64	0.42 (0.07, 0.67)
Total-Indoor accessibility						

A-Put away and difficult to get to	0.03 (0.18)	0.03 (0.18)	0.03 (0.18)	-0.03	1.00	-0.03 (-0.40, 0.33)
B-Put away and easy to get to	0.16 (0.72)	0.06 (0.25)	0.13 (0.71)	0.67	0.49	0.97 (0.94, 0.99)
C-In plain view and difficult to get	0.23 (0.94	0.10 (0.53)	0.19 (0.90)	0.93	0.52	0.91 (0.82, 0.95)
D-In plain view and easy to get to	14.84 (7.88)	16.03 (8.54)	14.74 (9.14)	0.96	0.58	0.92 (0.83, 0.96)
Average accessibility rating (1-4)	3.97 (0.10)	3.98 (0.06)	3.98 (0.07)	0.35	0.34	0.48 (0.16, 0.71)
Total-Outdoor accessibility						
A-Put away and difficult to get to	0.23 (0.94)	0.16 (0.88)	0.23 (0.94)	0.93	0.79	1.00
B-Put away and easy to get to	0.06 (0.35)	0.48 (1.62)	0.23 (1.24)	0.17	0.16	-0.02 (-0.37, 0.34)
C-In plain view and difficult to get	0.06 (0.25)	0.16 (0.88)	0.06 (0.35)	0.70	0.57	0.66 (0.40, 0.82)
D-In plain view and easy to get to	3.23 (3.43)	3.00 (3.41)	1.97 (3.29)	0.80	0.80	0.54 (0.24, 0.75)
Average accessibility rating (1-4)	3.80 (0.63)	3.70 (0.61)	3.63 (0.92)	0.41	0.10	0.80 (0.49, 0.93)
PA: Media ratio score	1.72 (0.91)	1.75 (1.24)	1.94 (1.07)	0.70	0.88	0.79 (0.61, 0.90)

*Significant difference ($p < 0.05$) between parent at Time 1 and Researcher

Table 4. Validity and reliability for home equipment and features - categorical variables

Home Equipment and Features	Potential Score	Validity and reliability sample (*n*=31)	
		Time 1 vs Researcher Cohen's Kappa K	Time 1 vs Time 2 Cohen's Kappa K
HOME DESIGN			
Type of home	4 options	1.00	0.92
Number of storeys	3 options	0.69	0.82
Internal stairs	Y/N	constant	1.00
External stairs	Y/N	constant	constant
Front fence	Y/N/Partial	0.79	0.70
HOME SIZE ^			
Entry/Hall/Foyer	S/M/L	0.54	0.28
Open plan living room	S/M/L	0.80	0.69
Kitchen	S/M/L	0.38	0.41
Lounge room (separate)	S/M/L	0.58	0.76
Dining room (separate)	S/M/L	0.92	1.00
Games room	S/M/L	0.94	0.82
Study	S/M/L	0.87	0.67
Bedroom of primary child	S/M/L	0.24	0.64
Garage	S/M/L	0.73	0.64
Garden shed	S/M/L	0.63	0.60
Back garden	S/M/L	0.55	0.52
Front garden	S/M/L	0.81	0.56
Total house size	S/M/L	0.40	0.88
Total garden size	No/S/M/L	0.26	0.83
ADJACENT SPACE			
Next to public open space	Y/N	0.93	0.83
Next to laneway	Y/N	0.86	0.57
Next to vacant block	Y/N	1.00	1.00
Next to pedestrian cut-through	Y/N	0.82	0.51
HOME EQUIPMENT			
Number of books	6 options	N/A	0.60
Number of magazines	6 options	N/A	0.49
Number of DVDs	6 options	N/A	0.64
Number of TV channels	6 options	N/A	0.55
Number of electronic games	6 options	N/A	0.49
Number of active electronic games	6 options	N/A	0.54
Number of smartphones	6 options	N/A	0.89
Type of internet	3 options	N/A	1.00
PET OWNERSHIP			
Dog ownership	Y/N	N/A	0.61
Other pet ownership	Y/N	N/A	0.75

^Not all participant homes included every room/area.

Discussion

This study assessed the validity and reliability of the HomeSPACE-II instrument, designed to measure parameters of the home physical environment that may influence children's sedentary behaviour and PA at home. Whilst the instrument was primarily based on HomeSPACE-I (Maitland et al. 2018), there are several differences. Specifically, it was tested for use in two-storey homes and modified to include equipment most relevant to home-based activity in the UK and to assess the accessibility, as well as the availability, of each item. The strong criterion validity and reliability demonstrated in this study for most of the equipment, size, feature and design items and the already established construct validity of the instrument (Sheldrick et al. 2019), suggest it can be independently used by parents to detect important characteristics of the home physical environment that may impact children's PA and sedentary time.

Most of the continuous variables for availability showed good to excellent reliability, however reliability results for accessibility were mixed. For items rated as "put away and difficult to get to" and "in plain view and easy to get to", ICCs were mostly to good excellent. However, ICCs for the number of items rated as "put away and easy to get to" and "in plain view and difficult to get to" were mostly poor to fair. This may be because, the terms "put away and difficult to get to" and "in plain view and easy to get to" are less ambiguous and more congruent than "put away and easy to get to" and "in plain view and difficult to get to". Moreover, ICCs for the average accessibility ratings were mostly fair. Between the parent completing the instrument at time one and time two, items may have moved location and therefore the parent's perception of accessibility may have changed which may partly explain the lower reliability estimates. Despite this, the overall summary scores (number of items * accessibility rating) for all four item categories were strong.

Reliability for the categorical variables was generally high, except for home equipment and size. Indeed, hall size was the only variable to fall below acceptable reliability limits, possibly because the parent did not record it at the second time-point as they may not have perceived it as a living area. Moreover, the moderate reliability limits achieved for several of the home equipment variables assessed by questions rather than the walk-through audit, may reflect the difficulty in estimating a number of smaller items from memory, particularly when a large number of that item exists within the home.

Validity was strong for most of the continuous variables, outside of accessibility. Further, validity coefficients for PA equipment, media equipment, seated furniture and musical instrument measures were higher than in the HomeSPACE-I tool (Maitland et al. 2018). However, the sample size was slightly smaller in this study, which may, at least in part, explain the more favourable validity coefficients (Goodwin and Leech 2006). In contrast, validity for the 10 outdoor features across the three areas (front garden, back garden and verge) was better in HomeSPACE-I. It could be postulated that the WA sample were more familiar with their outdoor space due to the better climate they experience (Murphy and Raper 2007), which may partly explain this discrepancy.

While validity coefficients in general were strong, several differences between the researcher and the parent were observed. The researcher achieved a higher media accessibility and availability summary score which might reflect the greater number of items recorded as “in plain view and easy to get to” by the researcher. In addition, the researcher recorded a higher number of seated furniture indoors and in total than the parent, which concurs with Maitland et al. (2018). This could be due to the researcher taking a more thorough walk-through approach recording all types of seated furniture, whereas the parent

may have not acknowledged some pieces or identified table and chairs together as one piece of furniture. Further, the researcher recorded more PA equipment items indoors and in total, which would account for the higher total and indoor PA equipment density. This difference is likely driven by the greater number of balls recorded by the researcher in total, indoors and outdoors (result not shown). Perhaps, because the researcher recorded all types of balls irrespective of their condition, while the parents may have missed those either in poor condition or smaller balls as they were less visible. To minimize such error, efforts were made to define what constitutes seated furniture and balls; parents were also instructed to record everything regardless of condition. Nonetheless, these items may need further clarification in future versions of the instrument.

Validity of home size measures was assessed by comparing the parent's estimates against the researcher's. While a number of studies have sought to validate self-reported garden size against a researcher with little success (Bryant et al. 2008; Spurrier et al. 2016; Hales et al. 2013), Maitland et al. (2018) are the only other group to validate self-reported size for indoor rooms, non-garden outdoor areas, overall house size and garden size. In general, validity estimates for the home size measures were higher than those reported by Maitland et al. (2018), with most showing moderate agreement. The reason for this difference is not clear, however the average house in Australia is one of the largest in the world (CommSec 2017), which may have influenced parental perceptions in the Maitland et al. (2018) study. Although, overall house and garden size achieved only fair agreement, compared to the moderate agreement achieved in the Maitland et al. (2018) study for the equivalent measures. Whilst the reason for this is unknown, housing type may have influenced perceptions of house and garden size. Specifically, all the houses in this study had two storeys and were mostly semi-detached or terraced (61.3%), converse to the Australian sample where most

were single-storey (83%) and detached (90%). Therefore, these discrepancies in parent-researcher agreement are most likely related to the difference in the nature of homes (e.g., layout, type and size). As overall house and garden size may influence children's PA levels and sedentary time (Maitland et al. 2013; Sheldrick et al. 2019), an objective measurement of size may be necessary. Conversely, if UK homes continue to reduce in size (Roberts-Hughes 2011), the design and layout of homes may be of greater importance.

Achieving agreement between the researcher and parent for a largely subjective construct, such as accessibility, was challenging. In general, acceptable validity was observed; although results for PA equipment were particularly low, with the researcher observing fewer PA equipment in total as harder to access and more PA equipment outdoors as harder to access. Similar discrepancies were observed in previous inventories that assessed the accessibility of PA equipment within the home (Hales et al. 2013; Sirard et al. 2008), although the HomeSPACE-II demonstrated higher ICCs for validity for the average accessibility rating of PA equipment than the HomeSTEAD instrument (Hales et al. 2013). These results suggest that parents may have different perceptions of accessibility, particularly for PA equipment. However, while trained researchers may provide an objective assessment of accessibility, it might be just as, or more, important to consider a parent's perception of accessibility. For example, if an item seems hard to access to the researcher, but is frequently made available to the child by the parent, then the parent's perception of accessibility may better indicate how that item influences activity. Further, the HomeSTEAD study (Hales et al. 2013) found a stronger relationship between child BMI and parent reported accessibility compared with researcher reported accessibility. Therefore, it may be more important for future studies to consider parents' perceptions when investigating the relationship between equipment accessibility and children's behaviour.

The strengths of this study include its rigorous reliability and validity testing procedure and the extensive nature of the HomeSPACE-II instrument, which covers a wide range of parameters within the home, providing a comprehensive assessment of the physical home space. There were equal representations of boys and girls within the sample, which is important given studies have found a greater density of PA equipment within boys' houses (Sirard et al. 2010) and boys are more likely to have electronic media in their bedroom (Nuutinen, Ray, and Roos 2013). Although measurement tools have been tested in Australia (Maitland et al. 2018) and the USA (Hales et al. 2013; Pinard et al. 2014; Sirard et al. 2008), this is the first to be used in a European country. This is important due to several environmental differences; Australia and America largely experience a better climate than most parts of Europe (Murphy and Raper 2007), their average house size is significantly larger than in any European country (CommSec 2017), and Europe is less ethnically and racially diverse than America (Gören 2013).

This study also has several limitations. First the sample was homogenous, as most parents were female, university educated, and houses were mostly semi-detached or terraced with two parents. Although, the predominantly female and university educated sample is similar to that of previous studies (Hales et al. 2013; Maitland et al. 2018; Sirard et al. 2008). We sought to validate home size measures against a researcher with mixed success, however due to the subjective nature of these items, future research should seek to validate them against objective measures (e.g., GIS [Geographic Information System software]). There was low between subject variation for accessibility ratings in several item categories, which can result in low ICCs (Lee et al. 2012) and Pearson correlation coefficients (Goodwin and Leech 2006), which may explain why some accessibility variables had low validity coefficients and

519 ICCs, in spite of their means and standard deviations indicating minimal differences between
520 scores. The sample was comprised of families living in Wales' two largest cites. Whilst
521 Wales is less affluent than the national average (Office for national statistics 2014), its
522 physical geography, home environmental characteristics and cultural traits are comparable
523 with the rest of the UK. Further, data were collected in the spring and winter and therefore
524 seasonality may have influenced accessibility data, particularly for outdoor PA equipment,
525 whereby equipment may be stored away in the winter but made accessible in the spring.
526 Lastly, the large number of statistical tests conducted in this study may have increased the
527 risk of type I error. Given that some of the results may have therefore occurred by chance, the
528 authors considered employing a more stringent alpha value, however, such corrections may
529 have increased the probability of type II error. As the present results are similar to those
530 reported in other studies (Sirard et al. 2008; Hales et al. 2013; Maitland et al. 2018), an alpha
531 value of 0.05 was retained.
532
533 Several modifications should be considered for future iterations of the HomeSPACE
534 instrument. Given that types of seated furniture, balls, electronic games and active games
535 varied greatly, the instrument would benefit from further clarification around what defines
536 these. Secondly, although the importance of considering a parent's perception of accessibility
537 has been discussed, the accessibility ratings may need further investigation. Specifically,
538 although the accessibility ratings were designed to take into account condition (Sirard et al.
539 2008), this may not have been clear enough to the parents. To improve how the accessibility
540 ratings are defined, future research should seek to utilise qualitative methodologies to
541 ascertain how parents perceive and interpret accessibility. Thirdly, the number of TV
542 channels question should be replaced with a question concerning the type of TV service as
543 even Freeview offers over 70 channels. Moreover, a question on movie streaming services
544 (e.g., Netflix, Now TV, Amazon Prime, etc…) should be included, due to their growing

popularity, essential for a comprehensive assessment of media sources available in the home. Portable types of electronic media (laptops, tablet computers and handheld devices) do not have a fixed location and can therefore be used almost anywhere, meaning they may not always be captured with the instrument. Therefore, future work on how to account for the portable nature of these devices may be needed. Finally, fitness trackers (e.g., Fitbits, apple watches, Garmin) should be explored, as they have the potential to facilitate children's PA in interventions through goal-setting and self-monitoring (Ridgers, McNarry, and Mackintosh 2016). The presence of these in a home may reflect a family promotive of being physically active. Due to constant changes in media technology, updating these types of instruments with relevant media equipment will be ongoing.

Conclusion

The HomeSPACE-II instrument builds upon its Australian counterpart (Maitland et al. 2018) by being tested in two-storey homes and because it includes a wider range of PA equipment, and a measure of accessibility, rather than just availability. The generally strong reliability and criterion validity demonstrated here and the construct validity established previously (Sheldrick et al. 2019), HomeSPACE-II is a useful tool for assessing the home physical environment in relation to children's PA and sedentary behaviour.Using the instrument will provide researchers with greater insight into the correlates of important health-related behaviours in an environment where children spend a significant amount of time (Briggs et al. 2003; Khajehzadeh and Vale 2017). Such insight may also impact future home planning and design to create physical home environments more conducive to health behaviours. Additionally, the HomeSPACE-II instrument may also help parents become more aware of how their home environment is influencing their child's PA and sedentary time, thereby indirectly promoting healthy active living in families. The instrument may be

appropriate for use in countries which share similar geographical and home environment characteristics with the UK.

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Conflicts of Interest:

The authors report no conflicts of interest

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Audit Categories -Room/Area Level	*Individual Items*	*Summary Scores*			
		Sum of	***Density***	***Average Accessibility Rating***	***Accessibility and Availability Score***
Physical Activity (PA) Equipment	Number, accessibility and location of 19 types	- Sports Equipment - Transport Equipment - Exercise Equipment - Outdoor Play Equipment - Indoor Play Equipment - PA Equipment Indoors - PA Equipment Outdoors - PA Equipment Home	- PA Equipment Indoors - PA Equipment Outdoors - PA Equipment Home	- PA Equipment Indoors - PA Equipment Outdoors - PA Equipment Home	- PA Equipment
Musical Instruments	Number, accessibility and location of 3 types	- Musical Instruments Home	- Musical Instruments Home	- Musical Instruments Home	- Musical Instruments Home
Media Equipment	Number, accessibility and location of 10 types	- Fixed Media Equipment - Portable Media Equipment - Bedroom Media Equipment - Media Equipment Home	- Media Equipment Home	- Media Equipment Home	- Media Equipment Home
Seated Furniture	Number, accessibility and location of 7 types.	- Seated Furniture Bedroom - Seated Furniture Indoors - Seated Furniture Outdoors - Seated Furniture Home	- Seated Furniture Indoors - Seated Furniture Outdoors - Seated Furniture Home	- Seated Furniture Indoors - Seated Furniture Outdoors - Seated Furniture Home	- Seated Furniture Home
Rooms/Areas in Home	Number and perceived size of up to 14 indoor rooms and 8 outdoor areas Perceived size of overall house and garden	- Livings Rooms - Bedrooms - Indoor Rooms - Outdoor Areas - Total Rooms/Areas			
Outdoor Features	Presence of 10 types of outdoor features in 3 outdoor areas	- Back Garden Features - Front Garden Features - Verge Features - Total Outdoor Features			

Audit Categories – Overall	*Individual Items*	*Item Categories*
Home Features	Type of home	Detached house; semi-detached/townhouse/terrace house/villa; flat/unit/apartment; other (4)
	Number of storeys	one; two; more than two (3)
	Presence of: internal stairs; external stairs	yes; no (2)
	Presence of front fence that encloses garden	yes; no; partially (3)
	Location next to 4 types of public space (public open space; back/side laneway; vacant block; pedestrian cut-through)	yes; no (2)
Questionnaire Items	***Individual Items***	***Item Categories***
Home Equipment	Number of books	0; 1-50; 51-100;101-150;151-200; >200 (6)
	Number of magazines	0; 1-50; 51-100;101-150;151-200; >200 (6)
	Number of DVDs	0;1-25; 26-50; 51-75; 76-100; >100 (6)
	Number of TV channels	0;1-25; 26-50; 51-75; 76-100; >100 (6)
	Number of electronic games	0; 1-10; 11-20; 21-30; 31-40; >40 (6)
	Number of active video games	0; 1-5; 6-10; 11-15; 16-20; >20 (6)
	Number of smartphones	0; 1-2;3-4;5-6; 7-8; >8 (6)
	Type of internet service	No internet access; dial-up modem; wireless broadband (3)
Pet Ownership	Ownership of dog; other pets	yes; no (2)

Appendix 1; Description of HomeSPACE-II Instrument Items and Summary Scores

Swansea University
Prifysgol Abertawe

The HomeSPACE Study

ID No_____

HomeSPACE Home Audit

We are interested in learning more about your home and how it might influence children's physical activity and sitting at home.

This checklist will ask you about the size, space and design of your home, and the types of equipment you have at home. If you have any questions about the checklist or the study please contact the Lead Researcher:

Michael Sheldrick
Email: 708824@swansea.ac.uk
College of Engineering; Swansea University
Bay Campus; Fabian Way; Swansea; SA1 8EN

Thank you for helping us with this study!

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SECTION 1: HOME AUDIT

Instructions

Please walk through each room in your house, garden and garage.
For each room/area please answer the first two questions: "Whose room is this?" and "How big is this room?" by circling the best answer.
Then use the numbered list to indicate which items are in the room by writing the corresponding numbers in the row of boxes (see example below). The numbered list is on the next page and repeated for your convenience on page 8. There are physical activity, media, musical and furniture items on the list. Please write only one item per box.

Also we would like you to use the following list to indicate how accessible each item is, by writing the appropriate letter in the bottom row of boxes

- **A)** Put away and difficult to get to ..... (e.g., A games console kept on top of a cupboard
- **B)** Put away and easy to get to ..... (e.g., A tablet Computer behind a cabinet door)
- **C)** In plain view and difficult to get to..... (e.g., A Table Tennis table stored in the garage)
- **D)** In plain view and easy to get to ..... (e.g., A skateboard on the floor in doorway)

When rating an item's accessibility, you should take into account its condition. For example, a punctured football in plain view should be given a C rating, as it's in plain view but difficult to get to. While a tennis racquet in usable condition should be given a rating of D, as it's in plain view and easy to get to.

Important Notes

1. Please take the time to walk through your home rather than sitting in one place to complete this checklist. Walking through each room will help your memory.

2. If there is more than one of the same item in a room (e.g. two bikes in the garage), write the code number in the top left of the box and the amount of the item in the bottom right of the box (see example below).

3. If there are not enough boxes for all of the items in the room, use one of the "Other" rows and write in the name of the room.

4. Count all items regardless of condition

5. If the room does not apply to your home, write "NA" in the first box for that room.

6. If there is nothing from the list in the room, write "0" in the "Item #" row.

7. If your home has other rooms not mentioned please use one of the "Other" rows and write in the name of the room.

Example: medium sized family lounge room with a piano, two couches, a TV and DVD player.
Room: Lounge Room

children / adults / (everyone)
small / (medium) / large

Item #	20	33 / 2	2	2					
Access #	D	D	D	B					

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Equipment Item Number List

Sports Equipment

1 Balls (e.g. football, rugby, basketball)
2 Bats / racquets
(e.g. cricket, softball, tennis)
3 Frisbee
4 Skipping rope
5 Hula hoop

Transportation Equipment

6 Bicycle
7 Scooter / skateboard / ripstick / skates

Fitness Equipment

8 Stationary (aerobic) exercise equipment
(e.g. treadmill, exercise bike, punch bag)
9 Weights / toning equipment
(e.g. weights bench, sit up machine)

Outdoor Play Equipment

10 Basketball Ring
11 Fixed Play Structure (e.g. swings, slide, climbing, sandpit)
12 Cubby/Tree house
13 Trampoline
14 Pool (in ground or above)
15 Football goal net
16 Swing ball

Indoor Play Equipment

17 Pool/snooker Table
18 Table Tennis Table
19 Table football

Musical Instruments

20 Piano / Keyboard
21 Drums
22 Other Instrument
(e.g. guitar, trumpet, violin, flute)

Media Equipment - Fixed

23 Television
24 VCR / DVD / Blu-ray Player
25 Pay TV (e.g. Sky)
26 TV on Demand (e.g. Apple TV)
27 Desktop Computer
28 Video game system (attached to TV)
(e.g. X-Box, Wii, Playstation)

Media Equipment - Portable

29 Handheld Video Game Player
(e.g. Nintendo DS, Sony PSP)
30 Laptop Computer
31 Tablet Computer
(e.g., iPad, Samsung galaxy)
32 Ipod Touch / Galaxy Player (or similar)

Furniture

33 Couch (2+ seater)
34 Lounge Chair (single seater)
35 Coffee Table
36 Dining / Kitchen Chair
37 Dining / Kitchen Table
38 Office Chair
39 Desk

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ROOMS IN THE HOUSE

Room: Entry / Foyer / Hall
small / medium / large;
children / adults / everyone

Item #									
Accessibility									

Room: Bedroom of Child in study
small / medium / large; _____
children / adults / everyone

Room: Open Plan Living Area
small / medium / large; _____
children / adults / everyone

Item #									
Accessibility									

Room: Bedroom 2
small / medium / large; _____
children / adults / everyone

Room: Kitchen
small / medium / large; _____
children / adults / everyone

Item #									
Accessibility									

Room: Bedroom 3
small / medium / large; _____
children / adults / everyone

Room: Lounge Room (separate)
small / medium / large; _____
children / adults / everyone

Item #									
Accessibility									

Room: Bedroom 4
small / medium / large; _____
children / adults / everyone

Room: Dining Room (separate)
small / medium / large; _____
children / adults / everyone

Item #									
Accessibility									

Room: Games/Activities Room
small / medium / large; _____
children / adults / everyone

Room: Study/Office
small / medium / large; _____
children / adults / everyone

Item #									
Accessibility									

Room: Bathrooms
small / medium / large; _____
children / adults / everyone

Accessibility rating of items: **B=**The item is put away and easy to get to

A=The item is put away and difficult to get to **D=** The item is in plain view and easy to get to
C=The item is in plain view and difficult to get

Room: Other _____ (specify)
small / medium / large; _____
children / adults / everyone

Item #									
Accessibility									

Room: Other _____(specify)
small / medium / large; _____
children / adults / everyone

Item #									
Accessibility									

Accessibility rating of items:

A= The item is put away and difficult to get to **B=** The item is put away and easy to get to

C= The item is in plain view and difficult to get to **D=** The item is in plain view and easy to get to

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Equipment Item Number List

Sports Equipment

1 Balls (e.g. football, rugby, basketball)

2 Bats / racquets
(e.g. cricket, softball, tennis)

3 Frisbee

4 Skipping rope

5 Hula hoop

Transportation Equipment

6 Bicycle

7 Scooter / skateboard / ripstick / skates

Fitness Equipment

8 Stationary (aerobic) exercise equipment
(e.g. treadmill, exercise bike, punch bag)

9 Weights / toning equipment
(e.g. weights bench, sit up machine)

Outdoor Play Equipment

10 Basketball Ring

11 Fixed Play Structure (e.g. swings, slide, climbing, sandpit)

12 Cubby/Tree house

13 Trampoline

14 Pool (in ground or above)

15 Football goal net

16 Swing ball

Indoor Play Equipment

17 Pool/snooker Table

18 Table Tennis Table

19 Table football

Musical Instruments

20 Piano / Keyboard

21 Drums

22 Other Instrument
(e.g. guitar, trumpet, violin, flute)

Media Equipment - Fixed

23 Television

24 VCR / DVD / Blu-ray Player

25 Pay TV (e.g. Sky)

26 TV on Demand (e.g. Apple TV)

27 Desktop Computer

28 Video game system (attached to TV)
(e.g. X-Box, Wii, Playstation)

Media Equipment - Portable

29 Handheld Video Game Player
(e.g. Nintendo DS, Sony PSP)

30 Laptop Computer

31 Tablet Computer
(e.g., iPad, Samsung galaxy)

32 Ipod Touch / Galaxy Player (or similar)

Furniture

33 Couch (2+ seater)

34 Lounge Chair (single seater)

35 Coffee Table

36 Dining / Kitchen Chair

37 Dining / Kitchen Table

38 Office Chair

39 Desk

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OUTSIDE AREA

Area: Back Garden *
small / medium / large; _____
children / adults / everyone

Item #									
Accessibility									

Area: Outdoor Eating Area
small / medium / large; _____
children / adults / everyone

Area: Front garden (including Porch) *
small / medium / large; _____
children / adults / everyone

Item #									
Accessibility									

Area: Garage
small / medium / large; _____
children / adults / everyone

Area: Front Verge *
small / medium / large; _____
children / adults / everyone

Item #									
Accessibility									

Area: Garden Shed
small / medium / large; _____
children / adults / everyone

Area: Other_____ (specify)
small / medium / large; _____
children / adults / everyone

Item #									
Accessibility									

Area: Other_____ (specify)
small / medium / large; _____
children / adults / everyone

Accessibility rating of items:

A= The item is put away and difficult to get to

B= The item is put away and easy to get to

C= The item is in plain view and difficult to get to

D= The item is in plain view and easy to get to

Additional Features of Front garden, Back garden and Verge (if applicable)*

Does the home have any of the following outdoor features? Please circle Yes or No for each item in the back garden, front garden and verge.

Outdoor Features	**Back garden**	**Front garden**	**Verge**
Tree - able to be climbed	Yes / No	Yes / No	Yes / No
Wall - able to throw/kick a ball against	Yes / No	Yes / No	Yes / No
Garden area	Yes / No	Yes / No	Yes / No
Grassed area	Yes / No	Yes / No	Yes / No
Undercover area	Yes / No	Yes / No	Yes / No
Shaded area	Yes / No	Yes / No	Yes / No
Driveway	Yes / No	Yes / No	Yes / No
Paved area	Yes / No	Yes / No	Yes / No
Footpath	-	-	Yes / No
Windows from the home overlook this area	Yes / No	Yes / No	Yes / No

SECTION 2: ADDITIONAL QUESTIONS

Instructions

You are now finished Section 1 - The Home Audit.

Section 2 asks you to complete some additional questions about your home, and your family. This will not take too long to complete.

Please remember that there are no right or wrong answers. We are just interested in what you think.

SECTION 2A: HOME FEATURES

1. Which best describes the home? *(Please tick one box only)*

- Separate House ☐
- Semi-detached / Townhouse / Terrace House / Villa ☐
- Flat/Unit/Apartment ☐
- Other, (please specify) _____ ☐

2. How many storeys does the home have? *(Please tick one box only)*

One ☐ Two ☐ More than Two ☐

3a Does the home have internal stairs? (e.g. between storeys or levels) *(please tick one box only)*

Yes ☐ No ☐

3b Does the home have external stairs (e.g. to get to the front or back door)? *(please tick one box only)*

Yes ☐ No ☐

4 Is there a front fence/gate that encloses the front garden? *(Please tick one box only)*

Yes ☐ No ☐ Partially ☐

5. Are any of the following spaces directly beside/behind the home? *(Please tick yes or no for each)*

	Yes	No
Public open space (e.g. park)	☐	☐
Back/side laneway	☐	☐
Vacant block	☐	☐
Pedestrian cut through	☐	☐

6. What would you say your house is? *(Please tick one box only)*

- Small ☐
- Medium ☐
- Large ☐

7. What would you say your garden is? *(Please tick one box only)*

- Small ☐
- Medium ☐
- Large ☐
- No Garden ☐

SECTION 2B: EQUIPMENT

Please circle one answer for each of the following questions.

1. How many books do you currently have in your home?

0 1-50 51-100 101-150 151-200 >200

2. How many magazines do you have in your home?

0 1-50 51-100 101-150 151-200 >200

3. How many DVDs do you currently have in your home?

0 1-25 26-50 51-75 76-100 >100

4. How many TV channels do you currently have available in your home?

0 1-25 26-50 51-75 76-100 >100

5. How many electronic games (including computer games) do you currently have in your home?

0 1-10 11-20 21-30 31-40 >40

6. How many of these electronic games in your home are **active** video games?

0 1-5 6-10 11-15 16-20 >20

7. How many smart phones do you currently have in your home?

0 1-2 3-4 5-6 7-8 >8

8. What best describes your type of internet service? (please tick one box only)

No internet access ☐

Dial up modern ☐

Wireless Broadband ☐

9. Do you own a dog? *(please tick one box only)*

Yes ☐

No ☐

10. Do you own any other pets? (please specify)

SECTION 3: YOU AND YOUR FAMILY

1. What is your age in years?
   _____

2. What is your gender? *(please tick one box only)*

   Male ☐ Female ☐

3. In which country were you born?
   _____

4. What is the main language spoken in your home?
   _____

5. Which best describes your ethnicity?

   White ☐
   Mixed Race ☐
   Asian or Asian British ☐
   Black or Black British ☐
   Chinese ☐
   Other ☐

6. How many people (including yourself) live in your household?
   _____

7. How many children under 18 years of age live in your household?
   _____

8. What are the ages and gender of the children living in your household?
   (please write the age and circle the gender)

   1. _____ M / F 2. _____ M / F 3. _____ M / F

   4. _____ M / F 5. _____ M / F 6. _____ M / F

9. Which best describes your highest level of education completed? *(please tick one)*

Some Secondary High School ☐

Completed Secondary High School (Year 11) ☐

Trade Qualifications / Apprenticeship ☐

Diploma / Certificate ☐

University Bachelor Degree or Higher ☐

10. What is your approximate annual household income before tax? *(please tick one box only)*

Under £10,000 ☐
£10,000 – £20,000 ☐
£20,000 - £30,000 ☐
£30,000 - £50,000 ☐
£50,000 - £70,000 ☐
£70,000 - £100,000 ☐
£100,000 and above ☐

11. Which best describes your family situation? *(please tick one box only)*

Single Parent Household ☐

Two Parent Household ☐

Other ☐

12. Do you rent or own your home? *(Please tick one box only)* ☐ Rent ☐ Own / Paying Off

13. How long have you been at your current address?

_____

14. Please write today's date

_____day_____month_____year

15. What suburb/area do you live in? _____ What is your postcode? _____

THANK YOU!