

The influence of age, gender and other information technology use on young people's computer use at school and home.

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Young people are exposed to a range of information technologies (IT) in different environments, including home and school, however the factors influencing IT use at home and school are poorly understood.

Objective: The aim of this study was to investigate young people's computer exposure patterns at home and school, and the factors impacting on their computer use such as age, gender and the types of IT used.

Method: 1351 children in years 1, 6, 9 and 11 from 10 schools in metropolitan Western Australia were surveyed.

Results: Most children had access to computers at home and school, with computer exposures comparable to TV, reading and writing. Total computer exposure was greater at home than school, and increased with age. Computer activities varied with age and gender and became more social with increased age, at the same time parental involvement reduced. Bedroom computer use was found to result in higher exposure patterns. High use of home and school computers was associated with each other. Associations varied depending on the type of IT exposure measure (frequency, weekly, usual and longest duration)

Conclusion: The frequency and duration of children's computer exposure were associated with a complex interplay of the environment of use (school and home), the participant's age and gender and other IT activities.

Keywords: ergonomics; human – machine interface; exposure; children; school; home

1.0 INTRODUCTION

Young people today are reported to live “media saturated lives” (Ramos et al. 2005), with a recent review of ninety studies, across 539 independent samples, finding that youths are likely to use TV, computer and electronic games for 25% of their waking hours (Marshall et al., 2006). Information technology (IT) use by young people includes reading and writing with paper based media, and interacting with electronic based media such as computers, television (TV), electronic game devices and mobile (cell) phones.

Computer use is an important type of IT with young people using desktop and laptop computers to play games, write documents, complete learning programs, work with pictures and music in multimedia programs, surf the internet and communicate by email and chat rooms. The range of computer activities is expanding, with Roberts et al. (2005) reporting that 50% of the types of computer activities surveyed in 2004 which were not even surveyed in 1999 (instant messaging, graphics and online gaming), are now used daily by many young people. Computer use is growing rapidly, both in the proportion of children using computers and in their daily exposures. For example, Roberts et al. (2005) found that computer exposure had doubled from 27 mins/day in 1999 to 62 mins/day in 2004.

Young people use computers in a variety of environments, with school and home the most common. Nearly all children in affluent communities use computers at school and the majority use computers at home. The USA Census Bureau found that in 92% of children enrolled in school used a computer at school (UCB, 2008) and in Australia 90% of school aged children used a computer at school (ABS, 2007). Within the home environment, 70% of Australian households had access to a computer, with 60% also having internet access. The USA Census Board reported that, in 2003, 76% of households with school children had computer access and 67% had internet access (UCB, 2008).

As previous studies have identified a potential impact on young people's health and development with exposure to computers, consideration of exposure patterns in both home and school environments is required to understand the impact of computer use.

Computer use has been reported to impact on children's health and development in a number of areas. Cognitive functions, such as visual attention and spatial representation skills, have been reported to be enhanced by playing computer games and home computer use has been related to improved academic performance (Borzekowski and Robinson 2005, Li et al. 2006, Subrahmanyam et al. 2000, 2001). Conversely, Fuchs and Wößmann (2005) analysed data from 15 year olds in 32 countries (n= 174000 for literacy and n= 96855 for mathematics) and found that when they controlled for family and school characteristics, the use

of computers at home was negatively related to student performance in literacy and mathematics, and there was no significant relationship between performance and school computer access. However the nature of computer exposure was found to be important as there were positive relationships between student performance at school and communication and education related tasks at home and frequency of computer use at school.

Psychosocial function is reportedly influenced by computer use. Some research suggests increased aggressive behaviour with violent game playing (Olson et al. 20, 2007), and issues with social relationships, loneliness and psychosocial well being with videogames and internet use (Subrahmanyam et al. 2000).

Conversely, Orleans and Laney (2000) suggested that home computer use provided an opportunity for positive socialization. This is particularly important for those who may usually lack social skills or opportunity due to geography or physical limitations (Straker and Pollock, 2005).

Musculoskeletal discomfort has been reported with children using and carrying laptop and tablet computers (Harris and Straker 2000, Sommerich et al, 2007) and with home computer use (Jacobs and Baker 2002). Additionally, it has been suggested that children's screen time activities may reduce physical activity participation and contribute to increased childhood obesity rates (Olds et al. 2006, Wake et al. 2003). The evidence for these links is mixed, and it appears

that while screen time activities may displace physical activity for some children, this is not necessarily associated with increased obesity.

Few studies have investigated the impact of both home *and* school computer exposure on young people's health and development. Kent and Facer (2004) surveyed 1800 students in England in 2001 and 2003 to explore the differences in young people's IT use at home and school. The influence on exposure (as measured by frequency of specific computer tasks), due to age, gender and socio-economic status (SES) was reported, however the interplay of age and gender on exposure patterns in each environment was not. Computer use was found to be more frequent in older boys, with gender also influencing the types of computer activities performed. SES influenced access to home computers. More recently, Li et al (2006) conducted a randomised control study with 122 American children. Positive associations with both home and school computer use for school readiness, and some aspects of cognitive development were found, although measures of exposure were limited to frequency only. Duration of computer use at home and school was investigated in a study of 476 young Americans to examine potential musculoskeletal outcomes (Ramos et al. 2005) however associations with the use of other IT types were not clear.

Exposure measures used in past studies have often been limited to a single aspect of exposure, potentially resulting in inadequate characterisation of exposure. The importance of investigating more than one aspect of exposure

was demonstrated in Fuchs & Wößmann (2005) where different results were found when comparing access to computers versus frequency of computer use. Further, duration of use rather than frequency of use has been related to physical discomfort (Harris and Straker 2000, Jacobs and Baker 2002).

Age and gender are reported to influence young people's IT exposure patterns, including IT types, computer activities and duration of use in different environments (Kent and Facer 2004, Olds et al. 2006, Roberts et al. 2007). However, research exploring the interplay of age and gender on computer exposure patterns at home and school, across school ages is limited. For example, Kent & Facer (2004) report the impact of age and gender on home and computer tasks separately. Additionally, as IT exposure patterns have been shown to impact the health and development of children as young as 5 years (Straker et al. 2006), the inclusion of the whole range of school aged children in exposure studies is warranted.

Computer use is just one, albeit important, component of IT use by children. Recent studies investigating young people's exposure to a variety of IT have shown some associations between IT activities. For example, Cummings et al (2007) found that adolescent video game players spent less time with paper based IT such as reading and homework, whereas Borzekowski et al (2005) found that younger students (mean= 8.5years) using a range of electronic media (including computers) reported more time doing paper based IT and homework.

These studies however have not considered the association of young people's home and school computer use with other IT activities.

Computer use is clearly a rapidly growing activity for many children. Current evidence suggests it may have important influences on child physical, mental and social health and development. However our current understanding of these influences is limited due to: inadequate characterisation of exposure patterns, inadequate assessment of the interaction effect of age and gender and inadequate consideration of the impact of exposure to other IT. As technology continues to develop and young people increase their use of computers, a sound understanding of the exposure of children to computers is a prerequisite to understanding and managing the influences of computers on child health and development. The aim of this study was therefore to provide a detailed analysis of the computer exposure patterns of young people at school and home including exposure measures of frequency and duration, interplay of age and gender and other IT activities.

2. 0 METHODS

2.1 Sample

1351 students (792 boys and 559 girls) from eight primary and five secondary schools (10 schools in total as some schools had both primary and secondary) in Perth, Australia, participated in the study. Schools from local government, Catholic education and independent private education systems were approached

to participate with the aim of an even gender mix, broad socioeconomic range and Year 1 to 11 coverage. 150 Year 1 children, and 350 children from each of Years 6, 9 and 11 were organized to be surveyed during 4th term of 2005.

Participating children numbers and mean (SD) ages is shown in Table 1.

Discrepancies between proposed and actual numbers were due to some parental questionnaires not being returned, some children being absent on the day of testing and one school requesting all Year 9 children be surveyed.

Table 1. Sample demographics

	Proposed sample	Sample	Mean age (years)	SD (years)
Year 1	150	146	6.8	0.7
Year 6	350	350	11.3	1.0
Year 9	350	563	14.2	1.2
Year 11	350	292	16.3	1.2

Informed consent was gained prior to commencement with ethics approval provided by the Curtin University of Technology Human Research Ethics Committee.

2.2. Survey Tool

The survey tool was based on the Young People’s Activity Questionnaire (YAQ) (Harris and Straker 2000), with the addition of extra questions regarding IT types and activities at home and school. This YAQ-IT was completed by children in Years 6, 9 and 11, with a simplified version (Year One’s Activity Questionnaire-YOAQ), being completed by Year 1 parents. Both questionnaires were divided into 3 sections. Section One related to questions about the participant, their

school, general activity levels, and pre-existing musculoskeletal conditions. Section Two asked participants about their use of a range of activities, including monthly frequency, usual duration and longest duration of watching TV, writing / drawing, reading, using mobile phones, playing electronic games, using computers at home and school, playing musical instruments and physical activities. In Section Three each participant's teacher completed questions about the children's academic performance, and each child was then weighed and measured by the researcher. As the aim of this paper relates to exposure of computers at home and school, results relating to SES, physical, psychological variables and musculoskeletal disorders and outcomes will be made available in subsequent papers.

2.3 Survey Procedures

The parents of participants in Year 1 completed their questionnaire at home and returned the questionnaires to their teachers for collection. The researcher attended the class on a different day to collect the measurements and teacher assessment information. For all other participants the questionnaire was completed at school during class time with the researcher and relevant teacher present. For these children measurements and teacher assessments were collected at the time of questionnaire completion.

2.4 Data Analysis

Descriptive statistics were used to demonstrate the relationships with children's IT exposure and patterns of IT use in different environments. Independent *t*-tests (*t*), Wilcoxon Signed Rank test (*W*), Kruskal-Wallis (*H*), McNemar Tests (χ^2), Mann-Whitney U-tests (*U*), Spearman Rank Correlation Coefficients (r_s) and Chi squared (χ^2) analysis were used to examine the influence of gender and Year level on IT exposure. SPSS v15 was used for all analyses, with a critical alpha level of .01 used to balance type 1 and type 2 errors.

3. 0 RESULTS

3.1 Computer Use at School

All schools surveyed had computers and internet access. 97.8% of participants reported computer use at school in the last month. Computers were reported to be used for 2.4(sd=3.3) hours per week at school by participants (Years 6, 9 and 11 only as durations of computer use at school was not reported by parents for Year 1 participants). Computers were used in laboratories by 82.2% and in normal classrooms by 62.7%. Both laptop and desktop computers were used at school by 24.5%, with 74.2% using only desktops and 1.3% using only laptops. None of the participating schools issued their students with their own computers, or required students to supply a laptop.

Hours of computer use at school increased with Year level from 1.5(1.8) hours/week in Year 6 to 2.4(3.5) in Year 9 and 3.3(4.1) in Year 11 ($H(2) = 71.4$, $p < .001$), and this was true for both boys ($H(2) = 52.0$, $p < .001$) and girls ($H(2) = 21.6$, $p < .001$). Over Years 6, 9 and 11, boys had greater weekly hours of school computer use (2.6 [3.9] hrs) compared to girls (2.1 [2.2] hrs) and whilst the pattern was consistent across all years the difference was only significant at Year 9 (Yr6 $U = 13761$, $p = .854$; Yr9 $U = 28510$, $p = .012$; Yr11 $U = 7983$, $p = .252$). Weekly hours of computers use at school was positively correlated with frequency ($r_s = .555$, $p < .001$) and duration (usual duration, $r_s = .218$, $p < .001$, and longest duration, $r_s = .214$, $p < .001$) of computer use at school.

Table 2 demonstrates the percentage of participants performing different computer activities at school at different frequencies. Year level was associated with frequency of all computer activities ($\chi^2(12) > 91.0$, $p < .001$). The frequency of all computer activities at school increased with higher Year levels, except using learning programs where Year 6 participants had the highest frequency of use. More boys had a increased frequency of playing computer games ($\chi^2(4) > 54.6$, $p < .001$), using multimedia ($\chi^2(4) = 9.7$, $p = .046$), learning programs ($\chi^2(4) = 10.3$, $p = .035$), surfing the internet ($\chi^2(4) = 10.2$, $p = .037$) and other computer activities ($\chi^2(4) = 10.6$, $p = .032$) at school.

Table 2. Percentage of participants using different activities: School and home.

Frequency of Use	Play games	Multimedia	Write Letters	Learning Programs	Surf Net	Email	Chat rooms	Other
			School					

Not at all	43.2	34.9	35.2	42.6	14.7	43.4	75.3	37.8
1 x month	22.5	25.7	34.7	22.5	20.8	21.7	12.8	20.7
1 x week	20.5	22.5	21.8	22.1	30.4	18.3	5.9	25.2
2-3 x week	9.7	12.8	6.9	11.0	24.2	11.7	2.9	11.5
Daily	4.1	4.2	1.5	1.8	10.0	5.0	3.2	4.9
Home								
Not at all	29.4	29.1	43.3	65.0	9.2	19.3	34.9	11.1
1 x month	16.1	21.1	29.2	18.1	15.9	18.4	16.3	18.2
1 x week	19.3	20.0	17.1	10.4	16.7	15.8	9.1	21.6
2-3 x week	22.4	17.2	7.9	4.9	28.8	22.1	17.1	29.9
Daily	12.7	12.6	2.4	1.6	29.4	24.3	22.6	19.2

In the school environment 69.7% reported usually being with friends and 82.8% reported usually talking with friends when using a computer. Additionally, 25.9% reported usually being with teachers and 7.5% reported usually talking with teachers while using a computer at school. 5.7% of participants reported usually having no-one with them when they used a computer at school. Using a computer alone was associated with Year level, with Year 6 participants more likely to be alone ($\chi^2(3)=16.7$ $p<.001$), but was not associated with gender (although a trend for more boys to be on their own at school was evident $\chi^2(1)=2.8$, $p=.096$). There were no associations between frequency of school computer activities and being alone, however trends for increased frequency for email ($\chi^2(4)=8.6$ $p=.073$) and multimedia ($\chi^2(4)=7.9$ $p=.096$) activities were evident.

3.2 Computer Use at Home

98.9% of participants reported having access to a computer at home with 95.9% reporting internet/email at home. 95.7% of participants used a computer at home in the last month. Computers were reported to be used for 7.2 (sd =9.6) hours per week at home by participants in Years 6, 9 and 11. At home the most

common location for computer use (53.7%) was a shared room (eg living room, shared study). 26.3% reported using a computer in their own bedroom or study area, and other areas were reported by 4.7 – 10.3%. A desktop computer was used at home by 82.5% of participants, a laptop computer by 33.8% and 2.1% reported using other types of computers.

Hours of computer use at home increased with Year level from 1.8 (2.1) hours/week in Year 1 to 4.1 (6.1) in Year 6 to 8.0 (9.0) in Year 9 and 11.8 (13.1) in Year 11 ($H(3) = 278$, $p < .001$) and this was true for both boys ($H(3) = 153$, $p < .001$) and girls ($H(3) = 128$, $p < .001$). Across all Years boys had greater weekly hours of home computer use (8.2 [10.9]hrs) compared to girls (5.6[7.0] hrs) and this pattern was consistent at all Year levels (Yr 1 $U = 1665$, $p = .054$ Yr6 $U = 10734$, $p = .036$; Yr9 $U = 25418$, $p = .014$; Yr11 $U = 6880$, $p = .002$). Weekly hours of computer use at home was positively correlated with frequency ($r_s = .704$, $p < .001$) and duration (usual, $r_s = .632$, $p < .001$, and longest, $r_s = .589$, $p < .001$) of computer use at home.

Table 2 demonstrates the percentage of participants performing different computer activities at home at different frequencies. All computer activities at home were associated with an increased frequency of activity with higher Year levels ($\chi^2(12) > 66.0$, $p < .001$), except playing games and using learning programs which Year 6 participants used most frequently. Boys had a higher frequency of playing computer games ($\chi^2(4) = 113.6$, $p < .001$) and surfing the internet ($\chi^2(3) =$

9.6, $p=.049$) than girls; girls had a higher frequency of using email ($\chi^2 (3) = 23.4$, $p<.001$) than boys. Computer activities of playing games and chat room showed a bi-modal distribution.

32.3% reported usually being with a sibling or friend when using a computer at home. Sibling/ friend presence was associated with Year level, with younger participants more likely to be with friends or siblings ($\chi^2 (3) = 81.6$ $p<.001$), but was not associated with gender. Email, writing stories, chat room, surfing the net and multimedia activities were less frequent when with others ($\chi^2 (3) > 10.5$, $p=.033$). There was no association between the frequency of playing computer games or using learning games and the presence of siblings or friends.

11.3% reported that their parents were usually with them when using a computer at home. Parent presence was associated with Year level, with younger participants more likely to report parents with them ($\chi^2 (3) = 253.9$ $p<.001$), but was not associated with gender. Less parental presence was associated with increased frequency of playing games, surfing the net, email, use of chat rooms, writing stories and use of multimedia ($\chi^2 (4) > 28.1$ $p<.001$). There was no association between learning activities and parent presence.

58.0% of participants reported usually having no-one with them when they used a computer at home. Using a computer alone was associated with Year level, with older participants more likely to be alone ($\chi^2 (3) = 205.7$ $p<.001$), but was not

associated with gender. There was an increased frequency of using multimedia, writing stories, surfing the net, emailing and using chat rooms and a decreased frequency of playing computer games when participants were on their own.

Participants who used a computer in their own bedroom (26.3%) had an increased frequency and duration of home computer use ($\chi^2(4) > 44.7$, $p < .010$), and an increased frequency of all home computer activities except writing letters and learning programs. Weekly hours of home computer use was higher for those participants with a computer in their bedroom (10.8[sd 13.0] hours) than those without (5.8[sd 7.4] hours) ($t(411) = 6.6$ $p < .001$). This difference was found to be significant for both boys (12.4 [sd 14.6] hours vs 6.4[sd 8.1] hours $t(276) = 5.7$ $p < .001$,) and girls (7.8 [sd 8.8] hours vs 5.0 [sd 6.3] hours, $t(148) = 3.2$ $p < .001$). Whilst increased use was related to age, and age was related to having a computer in their bedroom, access to a bedroom computer was found to be an additional effect on increased hours of use ($\chi^2(3) = 50.2$ $p < .001$).

At home participants report talking with no-one (39.2%), talking to friends (22.7%), siblings (29.4%), and parents (12.1%) when using computers.

3.3 Comparison of Computer Use in School and Home Environments

Mean hours of home computer use was greater than school use ($W = -21.23$, $p < .001$). This was true for Year 6 ($W = -8.17$, $p < .001$), Year 9 ($W = -15.75$, $p < .001$)

and Year 11 ($W = -11.36$, $p < .001$) and for both genders at each Year level ($W > -12.1$, $p < .001$).

Spearman's rho correlations between measures of monthly frequency, duration (usual and longest) and weekly hours of computer use at school and at home ranged from .704 (frequency of home computer use and total weekly duration of home computer use) to .081 (frequency of home computer use and longest duration use at school). All correlations were positive and significant at the 0.01 level and tended to be larger within each environment (home/school) and within the same exposure measure (frequency/duration/hours).

Figures 1a & 1b: Percentage of Boys and Girls Performing Computer Activities at Least Monthly at Home and School.

Figure 1a: Boys

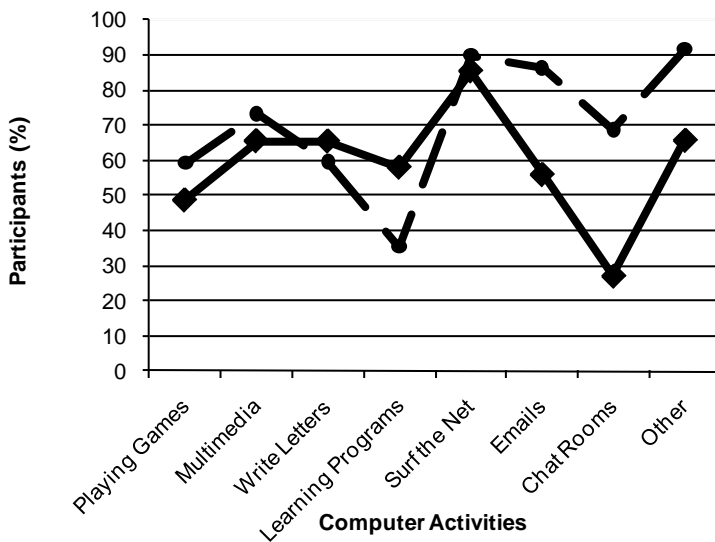
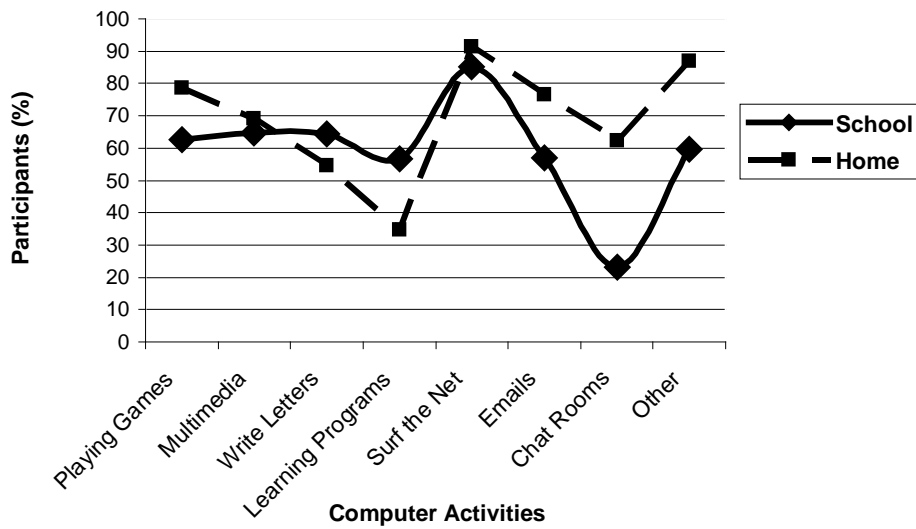


Figure 1b: Girls

As illustrated in Figures 1a and 1b, computer activities that could be deemed less structured and more social (surfing the internet, emailing, playing games, using multimedia and chat rooms) were performed at least monthly by more boys and

girls at home compared with at school ($\chi^2 > 7.8$, $p < .010$ except multimedia for boys $p = .072$ and surf net for girls $p = .015$). Learning programs and writing stories and letters were used at least monthly by more boys and girls in the school environment ($\chi^2_{(4)} > 10.33$, $p < .035$).

60% of participants reported always being able to choose their computer activities at home, compared to 5% in the school environment. At school 75% of participants reported that the teacher usually decided the computer activities, whilst at home 10% reported that their parents usually choose the computer activities. In both environments approximately 2% reported friends or others usually choose the computer activities. There was an association with frequency of own choice of IT activity and Year level in both home and school environments, with an increased frequency of choice with increased Year level. Gender was not associated with frequency of choice.

90% of participants reported sitting at a desk for computer work at home and school. Although minimal, more variation of postures occurred in the home, with an increase of participants using postures of lying down (3.2 % vs 1.0%) and sitting on the floor (2.6% vs 1.3%) and sofa (5.6% vs 1.2%).

3.4 Computer use related to other IT types

Participants reported using a range of IT other than computers, including screen based activities of TV, electronic games and mobile (cell) phone and paper-based activities of reading books and magazines and writing with pen and paper.

3.4.1 Frequency of IT Tasks. IT use varied from 99.6% of all participants for watching TV at least monthly, to 68.4% of all participants playing electronic games at least monthly (see Table 3). 97.8% of participants used computers at least monthly at school and 87.1% at least weekly. At home 95.7% of participants used computers at least monthly, and 91.2% used computers at least weekly. 70.0% of all participants used mobile phones at least monthly, with half using them daily.

Table 3. Percentage of participants using different IT types: Frequency and usual duration.

Frequency of Use	Watching TV/DVDs	Writing drawing	Reading	Mobile phones	Electronic games	Computer at school	Computer at home
Frequency of Use							
Not at all	0.4	4.1	4.6	30.0	32.6	2.2	4.3
1 x month	1.6	5.1	8.4	8.6	19.1	10.6	4.5
1 x week	7.7	7.0	15.1	9.6	18.2	32.3	14.2
2-3 x week	24.7	15.4	27.1	18.4	21.0	42.6	33.9
Daily	65.5	68.4	44.8	33.4	9.2	12.2	43.1
Usual Duration of Use							
< 30 minutes	9.4	27.2	41.1	62.2	35.2	30.3	20.1
30-60 minutes	28.7	20.5	27.3	13.0	32.0	58.3	34.9
1-2 hours	33.3	15.9	16.3	9.0	21.5	9.4	24.4
2-5 hours	17.4	15.8	9.1	8.0	8.0	1.1	14.6
> 5 hours	11.2	20.6	6.2	7.8	3.3	0.8	6.0

Frequency of home and school computer use were positively correlated to frequency of use of mobile phones and watching television (see Table 4). Frequency of home computer use was negatively correlated to frequency of reading. There was no correlation between frequency of home or school computer use and frequency of electronic game playing or writing tasks. Usual and longest duration of all tasks are positively correlated to each other. Weekly hours of home computer use was positively correlated to all electronic IT, negatively correlated to reading frequency and not correlated with writing frequency.

	School computer use				Home computer use			
	Frequency	Usual duration	Longest duration	Weekly hours	Frequency	Usual duration	Longest duration	Weekly hours
TV / DVD frequency	.079(**)	.048	.058	.014	.166(**)	.122(**)	.089(**)	.124(**)
TV / DVD usual duration	.071(*)	.131(**)	.035	.101(**)	.231(**)	.334(**)	.219(**)	.251(**)
TV / DVD longest duration	.051	.048	.195(**)	.017	.191(**)	.246(**)	.399(**)	.239(**)
Writing and drawing frequency	.046	.046	.059(*)	.034	.038	-.023	-.010	-.008
Writing and drawing usual duration	.035	.138(**)	.112(**)	.066(*)	.092(**)	.129(**)	.084(**)	.071(*)
Writing and drawing longest duration	.069(*)	.119(**)	.213(**)	.053	.066(*)	.084(**)	.188(**)	.060(*)
Reading frequency	.040	-.030	.001	-.055	-.117(**)	-.160(**)	-.142(**)	-.186(**)
Reading usual duration	.107(**)	.128(**)	.078(**)	.031	.033	.097(**)	.033	.041
Reading longest duration	.087(**)	.061(*)	.168(**)	.013	.032	.070(*)	.159(**)	.063(*)
Mobile phone frequency	.118(**)	.229(**)	.112(**)	.172(**)	.351(**)	.264(**)	.241(**)	.339(**)
Mobile phone usual duration	.115(**)	.251(**)	.134(**)	.179(**)	.338(**)	.316(**)	.267(**)	.359(**)
Mobile phone longest duration	.107(**)	.207(**)	.164(**)	.143(**)	.311(**)	.298(**)	.319(**)	.347(**)

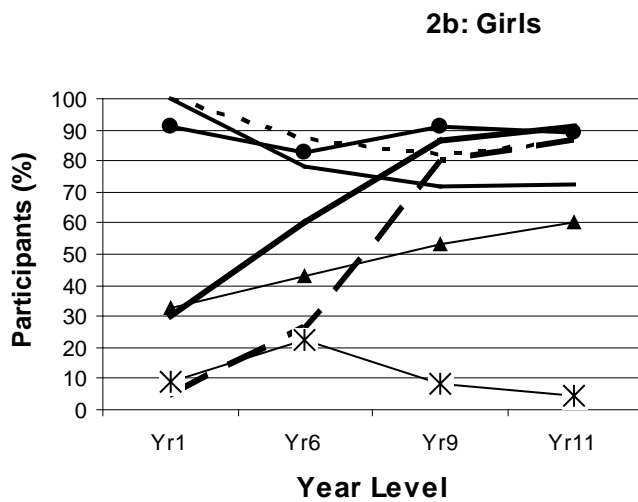
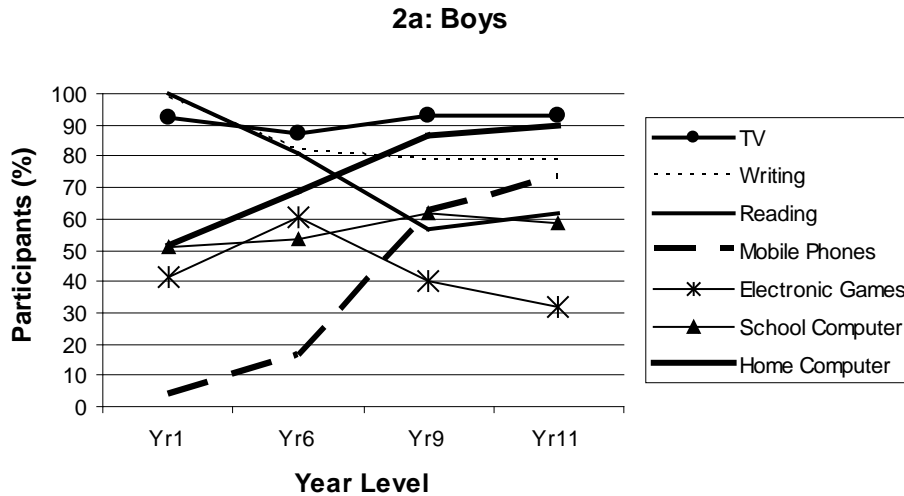
Electronic games frequency	.050	-.009	.012	-.020	.046	.088(**)	.127(**)	.067(*)
Electronic games usual duration	.098(**)	.143(**)	.119(**)	.097(**)	.203(**)	.402(**)	.371(**)	.326(**)
Electronic longest duration	.093(**)	.090(*)	.187(**)	.055	.181(**)	.367(**)	.462(**)	.282(**)

Frequency of IT type was associated with Year level for all IT types (see Figures 2a and 2b). Computer use at home, ($\chi^2(12) = 261.4, p < .001$) and school ($\chi^2(12) = 91.3, p < .001$) and mobile phone use ($\chi^2(12) = 635.0, p < .001$) increased with Year whereas reading frequency decreased with Year ($\chi^2(12) = 171.0, p < .001$). When examined separately for boys and girls, the same pattern of frequency (increasing or decreasing for different year levels / IT types) was reflected for both boys and girls, except for boys watching TV, where there was no association with Year level ($\chi^2(12) = 15.3, p = .223$).

Table 4. Correlations (Spearman's rho) between Home and School computer use and other IT types in the last month.

Frequency of IT types use was also associated with gender for all IT types except watching TV / DVDs (see Figures 2a and 2b). A greater percentage of boys used computers at home and school and electronic games more frequently than girls, and a greater percentage of girls used mobile phones, read books and wrote more frequently than boys. There was a trend for younger boys to use computers at school more frequently than girls ($\chi^2(4) = 12.5, p = .014$). Frequency of computer use at home was similar for both genders in older participants, however more boys in Years 1 and 6 used computers frequently at home.

Figure 2a & 2b: Percentage of boys and girls performing IT types at least 2-3 x weekly

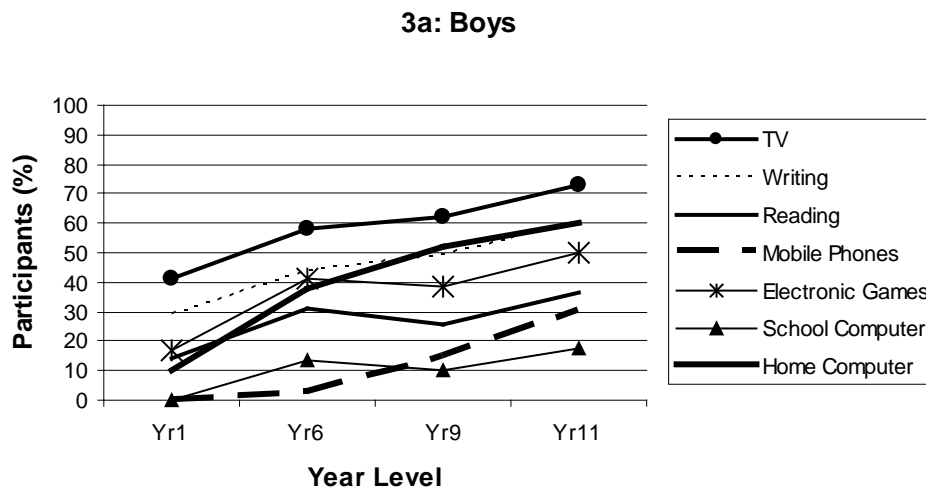


3.4.2. *Duration of IT Type.* 61.2% of participants usually watched more than 1 hour of TV each day, compared with only 32.8% playing electronic games for this duration. School use of computers rarely exceeded 1 hour, whereas 45.0% of participants used a computer at home for more that 1 hour each day. See Table 3.

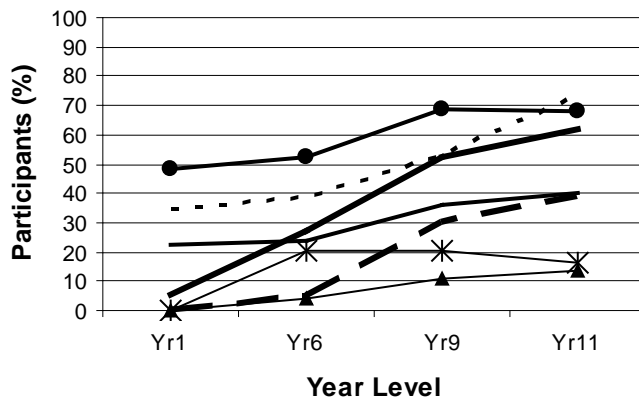
Correlations between usual duration of home or school computer use and other IT activities were all significant and positive. Correlations between longest duration of home or school computer use were also significant, and positive for all IT types.

Usual duration of use was associated with Year level for all IT types. When examined separately for boys and girls, increasing usual duration of IT use was significantly associated with higher Year level for both genders for all IT tasks except girls and playing electronic games ($X^2(12)=24.8, p=.019$) (see Figures 3a and 3b).

Figure 3a & 3b: Percentage of boys and girls IT types usual duration.



3b: Girls



Usual duration of IT use was associated with gender for reading, writing and drawing, use of mobile phones, using electronic games and computer use at home. More girls reported reading for more than 1 hour a day at all Years except Year 6 ($X^2(5)=6.9$, $p=.225$). More girls reported using mobile phones for more than 1 hour a day at all Years except Year 1 ($X^2(2)=1.2$, $p=.500$). Boys at all Years reported longer usual duration of playing electronic games ($X^2(12) =36.6$, $p<.001$). More boys in Years 1 and 6 reported using a computer at home for more than 1 hour a day ($X^2(12) =85.8$, $p<.001$). There was no association overall between gender and usual duration of watching television / DVD's and using computers at school ($X^2(4) =4.7$ $p=.032$). Boys reported longer durations overall for all IT types than girls.

4. 0 DISCUSSION

Weekly computer use was found to be comparable to young people's exposure to reading, writing or television, reinforcing the importance of computers in young

people's daily life. However, this study's more detailed exposure analysis has identified that exposure patterns vary with home versus school location, gender and age.

Previous studies have shown mixed results with exposure at home versus school, with some studies indicating that young people are typically exposed to computers more in the school environment (Olds et al 2006). The current findings have clarified that whilst the proportion of children with access is similar at home and school, total exposure is greater at home, with increased frequency, duration and mean weekly hours of computer use across Years and genders. When educators, parents and health professionals are assisting young people with health and development issues associated with computer use, it is now clear that the home environment must also be considered in assessment and intervention.

It has previously been reported that boys use computers at home more than girls. This study confirmed this in terms of overall exposure, but also identified that whilst this is true across all Year levels, both genders increased their use with age. Additionally, in terms of frequency of use this study confirmed that older (Yr 9 & 11) girls and boys had a similar frequency of home computer use. Different computer activities were found to be used by different genders, with boys performing more gaming and surfing the net, and girls more email. Additionally, bi-modal distributions of home computers activities suggest that there may also be sub-groups of children using computers with different computer patterns.

Home computer use has previously been found to include a range of educational and recreational activities and involve parents, siblings, friends or students on their own. This study confirmed a range of activities were used at home, particularly social activities. It also clarified that the nature of computer use was influenced by age and gender. Exposure to computer activities increased with age, except gaming and learning programs which peaked at age 10 years of age. Younger students were more likely to involve others including parents, and older students were more likely to use computers on their own. Orleans & Laney (2000) reported that adolescents whose parents were less involved in their children's computing were more likely to socialize using the computer. The use of email, more often by girls and surfing the internet, more often by boys, were found to be the most frequently used home computer activities that increased with age. Kent & Facer (2004) also found more frequent use of social IT activities at home with older children, suggesting this occurs to allow students to continue their social networks.

Increased access to personal media has previously been reported to increase TV and electronic game exposure and have effects on young people's health and development (Borzekowski and Robinson 2005, Marshall et al. 2006, Olson et al. 2007, Roberts et al. 2005). Current findings show that increased access to computers, in this case a bedroom computer, was associated with increased home computer use in terms of frequency, duration and types of most social

activities being performed for both genders for older (Year 9 and 11) students. Increased exposure, in addition to risks associated with less supervision and potentially more sustained and awkward postures, mean special attention should be given to bedroom computer use.

Previously it was understood that school environment constraints such as curriculum, resources, timetables and teacher direction would impact on young people's computer use, but detailed exposure patterns were not clear. Our findings show all students were exposed to computers at school, and that school computer use had an educational focus, with an increased frequency of learning programs and writing activities. School computer time constraints were reflected in reduced computer durations (11.3% > one hour in a usual sitting at school, 47.7% > one hour at home) and frequencies (55% 2-3 x week at school vs 77% 2-3 week at home) compared to home use. This study did however demonstrate that despite these constraints young people's characteristics, as depicted by the interaction of their Year and gender, influenced their school computer exposure (including mean hours, frequency and duration) for some activities. For example the Year 9 and 11 boys had an association with school computers use for gaming activities. Given the increased use of school computers, understanding exposure patterns in this environment is also important for children's health and development.

Some aspects of computer exposure were similar at school and home, for example for boys and girls exposure increased with age in conjunction with their ability to choose how they spend their time on computers. Similarly boys had greater frequency and longest duration of computer use and exposure to gaming, multimedia, learning programs, and surfing the internet at home and school. Therefore some health and education concerns and interventions may apply across both environments.

Prior evidence suggested that heavy users of one type of IT are often heavy users of other types (Borzekowski and Robinson 2005, Roberts et al, 2005). This study confirmed that home and school computer use were positively associated with each other for all exposure measures, and this was true for both genders. However the more detailed analysis also showed a more complex interplay of age and gender. For example, older students demonstrated an association with school and home use only within the same measure, for example school and home frequencies, but not school duration and home frequency. Similarly, while older students may not have the highest frequency of an IT type, when they do participate they have longer durations, for example boys using electronic games. The relationships between home and school computer use and other IT types demonstrate the importance of using a range of exposure measures. Whilst duration measures (usual and longest) of IT use (TV, writing, reading, mobile phone and electronic game) were positively correlated with each other, frequency of IT types were not always positively correlated (electronic games and home

computer were associated with **decreased** frequency of reading). Strategies to manage exposure to IT should therefore be age and gender specific, targeting exposure practices in home and school environments.

5.0. LIMITATIONS and FUTURE RESEARCH DIRECTIONS

Whilst different numbers of boys and girls were sampled at different Year levels, the analysis by gender and Year level ensured this did not bias the results. An examination of the sample Index of Relative Socioeconomic Advantage Disadvantage (IRSAD) (ABS, 2007) showed a good range of SES in the sample. SES is likely to have an influence on IT exposure and this is currently being examined with data from this study. Given the sampling frame, the pattern of computer exposure reported here is likely to be representative of contemporary children in an Australian metropolitan context. Further research should explore these patterns in samples from other cultures and rural and remote locations. Whilst a parent / child report of IT exposure was suited to gaining the large data set required, future research should attempt cross validation of exposure measures using electronic computer activity monitoring.

6.0 CONCLUSION

The current findings show that young people's computer exposure is influenced by the environment of use, their age and gender. Their computer exposure is also related to other IT exposure. A greater understanding of young people's

computer exposure will assist in understanding and managing the impact of computer use on young people's health and development.

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7.0 ACKNOWLEDGMENT

Many thanks to participating students and their parents for their efforts to complete the survey questionnaires and for their consent to participate in the research and for publication of their results. Thanks also to the staff at the schools for their organization of students and support to allow access to the participants during the school term

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