Internet and Displacement Effect: Children's Media Use and Activities in Singapore

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Abstract

This paper examines the relationship between Internet use and six activities that are important to childhood development: television viewing, newspaper reading, radio listening, sports and physical exercise, interaction with family, and socializing with friends. Perceived importance of the Internet, television, newspaper, and radio as information sources was also included. A panel of 1,251 secondary-one students was surveyed in 1999, and was revisited in 2000. A total of 817 students remained in the 2000 survey, giving an attrition rate of 34.7%. Results showed that an increase in Internet use depressed television viewing, but stimulated newspaper reading, radio listening, and socializing with friends. However, it had no significant impact on physical activities and interaction with family members. Change in the perception of the importance of the Internet as an information source was also found to be related to the perceived importance of two other media sources. Limitations of the study were included in the discussion section.

Introduction

"the hand that rules the press, the radio, the screen and the far-spread magazine, rules the country."

-- Learned Hand (1942) --

Our main objective in this study was to determine if the Internet displaces other activities. Given the integral role of media in our daily lives and children's constant exposure to various types of media content, the concern over media effects is justifiable. While some are interested in how media shape perceptions, attitudes, and behaviors (e.g., media violence), others are concerned about the potential influence of media on children's development (e.g. cognition and learning).
Time spent on various media becomes an issue since the underlying assumption is that individuals have a limited amount of time, which can be seen as a kind of social capital (Huston, Wright, Marquis & Green, 1999; Larson & Verma, 1999; Neuman, 1991). If an individual increases the time he/she spent on an activity, then he/she will logically have to make sacrifices in other areas (Neuman, 1991). The concern is, of course, apparent when the activities that are cut back are essential to children's development, such as reading and social interaction (Neuman, 1991). Therefore, it is important to invest this limited capital, i.e. time, wisely.

To date, studies on time displacement have been conducted primarily with respect to television, and have spanned five decades (viz., Belson, 1961; Gaddy, 1986; Gortmaker, Salter, Walker & Dietz, 1990; Huston, et al., 1999; Koolstra & van der Voort, 1996; Larson & Verma, 1999; Maccoby, 1951; Mutz, Roberts & van Vuuren, 1993; Parker, 1963; Parker & Paisley, 1965; Riley, Cantwell & Rutteriger, 1949; Robinson, 1969). With the advent of computer-based communication, research on the new medium is also taking place (viz., Johnson-Smaragdi, d'Haenens, Krotz & Hasebrink, 1998; van der Voort et al., 1998).

The literature shows that the displacement hypothesis has conceptual and methodological problems, and the answer is far from being conclusive (Mutz, Roberts & van Vuuren, 1993; Neuman, 1991). For example, the displacement effect of television may be due to its novelty (Neuman, 1991), program content (Huston et al., 1999), social demographics (Gortmaker et al., 1990; Larson & Verma, 1999), viewing environment/culture and parental influence (Huston et al., 1999; Larson & Verma, 1999; Maccoby, 1951; Neuman, 1991), and the nature of competing activities (Huston et al., 1999; Neuman, 1991).

Despite all of the foregoing, the displacement hypothesis remains attractive even though the media landscape has metamorphosed since the early days of television. Its appeal is largely based on its implications for individual cognitive and social developments, such as academic achievement and social competence, as well as on media economics, since changes in usage affect market share and advertising dollars.

The focus of this paper is on Secondary One students, equivalent to seventh graders in the U.S. school system, approximately 13 years of age. Young people at this life stage, often being characterized as stormy and difficult (Balk, 1995; Caplan & Weissberg, 1989; Coleman, 1974; Hamburg, 1998), are required to make a significant amount of adjustment. More often than not, they are going to a new school and making new friends (Balk, 1995; Bloom, 1990; Caplan & Weissberg, 1989); facing surmounting peer pressure and having an increased likelihood of meeting strangers (Bloom, 1990; Caplan & Weissberg, 1989; Collins & Repinski, 1994); having more freedom that is
accompanied by increasing expectations and responsibility (Bloom, 1990; Caplan & Weissberg, 1989; Collins & Repinski, 1994); and experiencing somatic changes (Balk, 1995; Bloom, 1990). Using the Internet may or may not help them cope with such changes.

Against this backdrop, the Singapore Government is systematically and strongly promoting the use of information technology. One of its strategies is to make it compulsory that 30% of the school curriculum to have an information technology component and to be computer-based by 2002 (Infocomm Development Authority of Singapore, 2000; Ministry of Education, 1997). Beginning in 1997, the Government has been training teachers in the area of information technology and providing schools with both hardware and software (Ministry of Education, 1997). Parallel to the heavy promotion of computer use in schools there is also a concerted effort to bring an e-lifestyle and digital economy into this island nation, and to nurture a populace sophisticated with respect to information technology (Infocomm Development Authority of Singapore, 2000). Naturally, the advocacy of Internet use is part of this omnipresent attempt. Young Singaporeans are placed right in the midst of all these changes and soon Internet use will be commonplace given the Government's ubiquitous promotion. What remains to be seen is how the use of the new medium will affect other activities.

This aggressive initiative by the Singapore Government is worth highlighting because it renders the issue of novelty irrelevant. Some scholars have pointed out that a new medium may displace other activities temporarily; once the novelty wears off, the effect disappears (Neuman, 1991). In the Singapore context, we are observing a pervasive effort to sustain Internet use in daily life - from booking a movie ticket to filing income tax.

However, as we know, not all activities are the same in nature, function, and importance. The likelihood of displacement depends on four principles: functional similarity, physical and psychological proximity, transformation, and marginal fringe activities (Neuman, 1991). In other words, activities that have a greater chance of being displaced are those that can satisfy the same needs but less effectively (principle of functional similarity), share the same physical space but provide less satisfaction (principle of physical and psychological proximity), are difficult or unable to be modified to avoid interference with other activities (principle of transformation), and are low in priority (principle of marginal fringe activities).

In this particular study, we target six activities that are deemed important for the cognitive, social, and physical development of children: television viewing, newspaper reading, radio listening, playing sports and exercising, interacting with family members, and socializing with friends. Each is examined based on the four displacement principles.
However, displacement (or reduction in time spent) is merely one possible outcome. The introduction of a new activity, in this case, the Internet, may lead to a reduction in time spent among other activities. Yet, it is also plausible that the use of the Internet leads to no change or even engagement (that is, an increase in time spent) in other activities. As Morgan and Gross (1983) point out in a review, television viewing can stimulate curiosity among children and lead to a higher level of reading activity.

We are interested in knowing Singapore children's general media usage pattern (RQ1). We predict that the Internet displaces television viewing (H1); stimulates newspaper reading (H2); increases radio listening (H3); displaces playing sports and physical exercise (H4); does not affect family interaction (RQ2); and stimulates interaction with friends (H5). The rationale behind these hypotheses will be elaborated below.

Meanwhile, we would also like to know how important the Internet, television, newspaper, and radio are as sources of information (R3). Furthermore, we want to find out if a change in perceived importance of the Internet is related to changes in the perceived importance of television, newspaper and radio (R4).

**Television Viewing**

It is not hard to recognize that television viewing is vulnerable in the age of the Internet, given the four displacement principles. According to the first principle of functional similarity, an activity that can satisfy the same needs but less efficiently stands a greater chance of being displaced. Viewers may derive a variety of gratifications from television, such as entertainment, escapism, cognition and information. They can also achieve such satisfactions from the Internet easily. Furthermore, the Internet may provide them with gratifications, such as interactivity, interpersonal potential (or personalness), and asynchrony, which is lacking in some traditional media (Ruggiero, 2000). Internet users have greater control over the kinds of content they want (which is an example of interactivity), when they want the exposure (i.e., asynchrony), and their ability to communicate with others (i.e., interpersonal potential). Television will have difficulties in satisfying these needs.

In the public domain, the Internet and television rarely occupy the same physical space. At least in Singapore, it seems there are more public places for Internet than television viewing. Children in Singapore can use the Internet at their schools, libraries and cybercafes. Opportunity to watch television outside a home environment is less common (although certain buses are now equipped with television). Hence, the competition between television and the Internet is largely happening at home - and it is rather difficult for a person to
watch television and go online at the same time, especially given the amount of interactivity and involvement needed for the Internet.

At this time, there is no evidence that television has transformed itself and carved out a niche area. Using the Internet and watching television are both primary activities that demand considerable amount of attention.

Furthermore, parents and teachers may perceive television as frivolous and therefore discourage their children from watching it. In fact, many of the early displacement studies are concerned about television's negative impact, that is, in distracting children from wholesome activities (Neuman, 1991). Given the Singapore Government's proactive information technology stance, the Internet is considered educational and children are strongly encouraged to use it. Logically, it seems, Internet use will displace television viewing.

**Newspaper Reading**

The print newspaper is mostly an information source; yet, the amount of information it carries pales by comparison to the Internet. If we look at functional similarity alone, it seems that newspaper will fail to compete with the Internet. However, the use of the newspaper and the Internet does not necessarily share the same physical space. Indeed, individuals can read newspapers at home, but they can also do that on the bus, in the park, at the mall and many other places. Although the technology is interactive and allows the Internet to be accessed at various places, it is not as flexible and cheap compared to the newspaper.

Furthermore, reading newspapers is generally considered a positive habit, which can help in honing language skills and acquiring knowledge about the world. It is not surprising that parents and teachers encourage newspaper reading. In fact, early displacement studies are concerned about television's influence on the habit of reading of books, newspapers, and magazines (Neuman, 1991). Research also shows that children have preconceptions and motivation that influence how they use a particular medium and how much mental effort they will put into processing information (Beentjes, 1989; Beentjes & van der Voort, 1993; Cennamo, 1993; Cennamo, Savenye & Smith, 1991; Cohen & Salomon, 1979; Salomon, 1983a, 1983b, 1984; Salomon & Gardner, 1986; Salomon & Leigh, 1984). For example, children may consider print as "harder" and are more willing to invest mental effort in dealing with printed information, and as a result, learn more (Beentjes & van der Voort, 1993; Cohen & Salomon, 1979; Salomon, 1983a, 1983b, 1984; Salomon & Leigh, 1984).

We therefore do not have a good reason to believe that the Internet will displace newspaper reading. In fact, the reverse may be true.
Radio Listening

Today radio is mainly a source for music entertainment. With a good computer and Internet skills, its users too can download or listen to music on the Internet. Understandably, radio lacks the range of gratifications that Internet can provide, yet it is flexible, portable and cheap. Radio as a medium has undergone a transformation since its earlier days, forced upon it by the emergence of television; it is now predominantly a secondary activity (Neuman, 1991), done in conjunction with other activities (e.g. reading and jogging). Because of this unique characteristic, it is conceivable to go online while playing the radio in the background. Hence, we are likely to observe a positive relationship between Internet and radio use.

Sports and Physical Exercise

At the outset, using the Internet and engaging in sports or physical exercises seem to be rather different activities. The former is cerebral and sedentary, while the latter is physical and active. It seems then the two activities should fulfill different needs and provide different satisfactions. They may or may not share the same physical space; but given the limited living space in Singapore, it is uncommon to have a gym or courts for sports within a home. It seems then, Internet use should not affect sports and physical activities.

However, using the Internet and engaging in sports and physical exercise may share similar functions as a means for social interaction. Singapore children have been reported to use the Internet as a means to interact with their friends, which includes playing competitive online games together (Lee & Chan, 2001). Similarly, most sports require team effort and are competitive in nature. Even physical exercise that requires no partner, such as swimming and jogging, can still be done in a group. Considering the fact that Singapore is a city with limited space for physical activities and the emphasis on brains over brawn, displacement is likely to occur.

Family Interaction

Adolescence is a life stage characterized by an increase in parent-child distance and an increase in social relationship with non-family members (Balk, 1995; Collins & Repinski, 1994). While there is less attachment, greater autonomy, and a potential for parent-child conflict, family relationships are still an important aspect of adolescent life (Collins & Repinski, 1994). Furthermore, the literature shows that adolescents of collectivistic societies do spend a substantial amount of time with their families (Larson & Verma, 1999).
Culture aside, the family is still the main nurturing and socialization force for young people. They are dependent on their families for emotional and financial support. The family continues to shape children's attitudes, values, and behaviors. The prominence of the family during childhood is unshakable. In terms of function, interaction with family fulfills needs that cannot be replaced by the use of the Internet. Because of these reasons, we predict that displacement will not occur.

**Interaction with Friends**

According to child psychologists, friendship is crucial to young people's development. Friends fulfill their needs for companionship, intimacy, and the cultivation of social competence (Buhrmester, 1990, 1996; Collins & Repinski, 1994). These needs are different from the desire for information and entertainment, and they are not something that mass media-including the Internet-can readily provide. However, the Internet is not only a mass medium, but also a vehicle for interpersonal communication.

A recent focus group study found that Singapore adolescents use the Internet as a means to communicate with friends and to arrange face-to-face social gatherings (Lee & Chan, 2001). One may argue that if social interaction goes online, face-to-face meetings will decrease. However, machine-mediated interpersonal communication, such as the telephone, existed long before the arrival of the Internet. In other words, the Internet may not reduce face-to-face interaction any further. In fact, we posit the opposite-that Internet use actually stimulates more face-to-face interaction with friends among adolescents. In the focus group study mentioned earlier, adolescents reported that they preferred the Internet to the telephone because the new medium was more convenient; it allowed one-to-many communication and it made arrangements for face-to-face interaction easier (Lee & Chan, 2001).

**Importance of Information Source**

Besides the issue of time spent, we are also interested in knowing if the Internet will replace other mediated information sources in terms of perceived importance. A person may think something is important, yet devote little time to it, and vice versa. Specifically, if the Internet's status is elevated in the eyes of the adolescents, will other media be considered less important?

**Methods**

**Panel Participants**
In 1999, permission to solicit participation and to conduct surveys in Secondary schools was granted by Singapore's Ministry of Education. Invitations to participate in a panel study were sent to 33 of the 152 secondary schools in Singapore. By the deadline, 19 schools responded favorably and 1,330 Secondary One students filled out a self-administered questionnaire. Out of the 1,330 questionnaires collected, 1,251 were complete and valid. In 2000, the same schools were revisited. Unfortunately, five schools decided not to continue their participation and hence we had no access to their students. In the end, we managed to survey 817 of the original 1,251 panel participants, which gave us an attrition rate of 35.7%. In this paper, our analysis focused on the change in time spent in various activities and perceived important information sources among the members of the panel in 1999 and 2000.

Instrument

The self-administered questionnaire covered numerous aspects of the Internet, ranging from usage patterns to family communication. For the purpose of this paper, only a limited number of variables relevant to the displacement hypothesis were selected for analyses.

Respondents were asked how many hours and minutes in a typical week they spent on using the Internet, watching television, reading newspapers, listening to the radio, playing sports and exercising, interacting with their family members, and socializing with close friends face-to-face outside of school.

They were also asked to indicate, on a 5-point Likert scale (1 = not important at all, 5 = extremely important), how important the Internet, television, newspaper, and radio were as sources of information.

Results

Time Spent on Various Activities

Analyses were conducted only on the 817 panel participants. In 1999, 73.3% (599) of the 817 participants were Internet users. In 2000, the percentage had increased to 87% (711). Further examination showed that 75.8% (619) of the participants were Internet users in both years. Although 43 students gave up using the Internet, another 155 became users.

The means, standard deviations, and paired sample t-test results of each activity for 1999 and 2000 are presented in Table 1. The participants as a group had significantly increased, between 1999 and 2000, their time spent in four media activities, namely Internet use, television viewing, newspaper
reading, and radio listening. Internet use had doubled—from 3.7 hours (SD = 5.1) to 7.9 hours per week (SD = 8.4), \( t \) (816) = 14, \( p \) = .00. Among all four media activities, participants spent the most time watching television—7.9 hours per week (SD = 8.4) in 1999 and 12.3 hours per week (SD = 13.1) in 2000, \( t \) (816) = 8.6, \( p \) = .00. They spent the least time reading newspaper—1.9 hours per week (SD = 3.0) in 1999 and 2.6 hours per week (SD = 3.3) in 2000, \( t \) (816) = 5.2, \( p \) = .00. The hours per week spent on listening to radio had also increased, from 5.3 (SD = 10.1) to 8.4 (SD = 14.0), \( t \) (816) = 6.4, \( p \) = .00.

### Table 1. Mean time spent in hours per week for seven activities for 1999 and 2000.

<table>
<thead>
<tr>
<th>Activity</th>
<th>1999 (( N )= 817)</th>
<th>2000 (( N )= 817)</th>
<th>( t )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internet</td>
<td>3.7 (5.1)</td>
<td>7.9 (8.4)</td>
<td>14.0***</td>
</tr>
<tr>
<td>Watching television</td>
<td>7.9 (8.4)</td>
<td>12.3 (13.1)</td>
<td>8.6***</td>
</tr>
<tr>
<td>Reading newspaper</td>
<td>1.9 (3.0)</td>
<td>2.6 (3.3)</td>
<td>5.2***</td>
</tr>
<tr>
<td>Listening to radio</td>
<td>5.3 (10.1)</td>
<td>8.4 (14.0)</td>
<td>6.4</td>
</tr>
<tr>
<td>Playing sports and exercising</td>
<td>4.3 (5.7)</td>
<td>4.1 (5.0)</td>
<td>0.6***</td>
</tr>
<tr>
<td>Interacting with family members</td>
<td>15.2 (17.9)</td>
<td>17.4 (20.7)</td>
<td>2.9***</td>
</tr>
<tr>
<td>Socializing with friends</td>
<td>5.6 (9.3)</td>
<td>7.9 (11.4)</td>
<td>5.0***</td>
</tr>
</tbody>
</table>

Note. Numbers in parentheses are standard deviations.

***\( p < .001 \).

In addition, results showed that time spent had increased significantly in two of the three non-media activities. Interaction with family had risen from 15.2 hours (SD = 17.9) to 17.4 hours (SD = 20.7) per week, \( t \) (816) = 2.9, \( p \) = .04. Meanwhile socializing with friends had also increased from 5.6 hours (SD = 9.3) to 7.9 hours (SD = 11.4) per week, \( t \) (816) = 5, \( p \) = .00. The hours spent on sports and physical exercises per week were similar in both years—4.3 (SD = 5.7) and 4.1 (SD = 5.0).

In all, the respondents reported spending many more hours in the six activities surveyed within the span of one year, from 1999 to 2000, while they progressed from Secondary One to Secondary Two. It should be noted this is a
period of change in physical and psychological maturity of individual students, as well as in school curriculum and possibly in Internet culture also.

**Time Displacement**

To answer H1-H5 and RQ2, change scores were obtained by calculating the difference between the scores in 1999 and 2000 for each activity. Change in Internet use was used as a predictor of change in six activities: watching television, reading newspaper, listening to radio, playing sports and exercising, interacting with family members, and socializing with friends. The assumption of displacement was that people had limited time, and the variation in one activity would influence others (Neuman, 1991). Due to this relationship, it would be necessary to control for the changes in other activities during analyses (Mutz, Roberts & van Vuuren, 1993).

Table 2 presented a summary of the standardized beta scores, adjusted regression coefficients ($R^2$), and change in $R^2$ for each activity with change in Internet use as a predictor.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Beta</th>
<th>$R^2$</th>
<th>$R^2$ Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Watching television</td>
<td>-0.436**</td>
<td>0.235</td>
<td>0.187****</td>
</tr>
<tr>
<td>Reading newspaper</td>
<td>0.078*</td>
<td>0.124</td>
<td>0.004*</td>
</tr>
<tr>
<td>Listening to radio</td>
<td>0.124**</td>
<td>0.119</td>
<td>0.011***</td>
</tr>
<tr>
<td>Playing sports and exercising</td>
<td>0.054</td>
<td>0.131</td>
<td>0.002</td>
</tr>
<tr>
<td>Interacting with family members</td>
<td>0.057</td>
<td>0.097</td>
<td>0.002</td>
</tr>
<tr>
<td>Socializing with friends</td>
<td>0.083*</td>
<td>0.114</td>
<td>0.004*</td>
</tr>
</tbody>
</table>

*Note: The change in Internet usage is used as a predictor, while controlling for changes in other activities.

Regression coefficients ($R$) are adjusted, and beta scores are standardized.*

*p < .05, **p < .01, ***p < .005

Table 2. Change in Internet use as a predictor of change in six activities in panel sample.

Regression analyses confirmed that an increase in Internet usage predicted a reduction in television viewing (H1), an increase in newspaper reading (H2), a higher level of radio listening (H3), no significant change in family interaction (RQ2), and a rise in socialization with close friends (H5). Meanwhile, the
predicted displacement effect on sports and physical exercise (H4) was found to be nonsignificant.

However, the influence of change in Internet use was not the same for all activities. When change in Internet use was used as a predictor while controlling for other variables, $R^2$ changes were significant for four activities. The $R^2$ change was much larger for watching television, at 18.7%, than reading newspapers (0.4%), listening to radio (1.1%), and socializing with friends (0.4%). Change in Internet use, however, did not explain variations in playing sports and exercising, and in interaction with family members.

**Perceived Importance of Media**

Respondents were asked to indicate on a 5-point scale how important they thought the Internet, television, newspaper, and radio were for 1999 and 2000. Paired sample $t$-tests indicated significant differences for three of the four media: the Internet, television and radio (see Table 3). The Internet was rated 3.8 ($SD = 0.9$) and 4.0 ($SD = 0.9$) in 1999 and 2000 respectively, $t (816) = 5.4$, $p = .00$. The perception of television as an information source also improved significantly, from 3.7 ($SD = 0.9$) in 1999 to 4.0 ($SD = 0.8$) in 2000, $t (816) = 8.3$, $p = .00$. Similarly, the level of perceived importance also rose for radio-in 1999, it was 3.4 ($SD = 1.0$), but in 2000, it was 3.9 ($SD = 0.9$), and paired sample $t$-test was significant at $t (816) = 12.6$, $p = .00$. However, there was no perceptual difference for newspapers as an information source. The panel respondents gave newspapers a 3.7 for both years. Here it is interesting to note that students perceived all media to be more important in 2000 than in 1999 as information sources. It is likely, being Secondary Two students, they were getting to use more of all major media as information sources. Significantly, the Internet scored the highest in importance as compared with the others, in both 1999 and 2000, followed by television. The rating for the newspaper remained unchanged, while radio moved from the last of the four to third. The differences were relatively small, however.
Next, the change in perceived importance of the Internet was used to predict changes in perception for television, newspaper and radio as information sources. Again, when one medium's change was entered as a dependent variable, the changes in the other two were controlled. As summarized in Table 4, results showed that change in the perceived importance of the Internet was a significant predictor for television and newspaper, but not radio. The changes in \( R^2 \) were significant but small for television (2.7%) and newspaper (2.1%), and insignificant for radio.

<table>
<thead>
<tr>
<th>Information sources</th>
<th>1999 ( (N=817) )</th>
<th>2000 ( (N=817) )</th>
<th>( t )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internet</td>
<td>3.8 (0.9)</td>
<td>4.0 (0.9)</td>
<td>5.4***</td>
</tr>
<tr>
<td>Television</td>
<td>3.7 (0.9)</td>
<td>4.0 (0.8)</td>
<td>8.3***</td>
</tr>
<tr>
<td>Newspaper</td>
<td>3.7 (0.9)</td>
<td>3.7 (1.0)</td>
<td>0.4</td>
</tr>
<tr>
<td>Radio</td>
<td>3.4 (1.0)</td>
<td>3.9 (0.9)</td>
<td>12.6***</td>
</tr>
</tbody>
</table>

Note. Perceived importance was measured on a 5-point scale, where 1 is not important at all and 5 is extremely important. Numbers in parentheses are standard deviations.

*** \( p < .005 \)

Table 3. Means of perceived importance of various information sources in 1999 and 2000.

Here is the table representation of the means of perceived importance of various information sources:

<table>
<thead>
<tr>
<th>Media Source</th>
<th>Beta</th>
<th>( R^2 )</th>
<th>( R^2 ) Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Television</td>
<td>0.168***</td>
<td>.216</td>
<td>.027***</td>
</tr>
<tr>
<td>Newspaper</td>
<td>0.151***</td>
<td>.121</td>
<td>.021***</td>
</tr>
<tr>
<td>Radio</td>
<td>0.056</td>
<td>.108</td>
<td>.003</td>
</tr>
</tbody>
</table>

Note. The change of importance of the Internet is used as predictor, while controlling for perceptual change in the other two media. Regression coefficients \( (R^2) \) are adjusted, and beta scores are standardized.

*** \( p < .001 \), ** \( p < .01 \), *** \( p < .005 \).
Discussion

General Pattern of Activity

In a year, the panel participants' time spent on the Internet, television, newspaper, and radio has increased tremendously. This can be attributed to maturity; as they become a year older, their needs (such as for information, cognition, entertainment) have motivated them to invest more hours in the media. Another explanation is that their social environment, including school requirements and governmental efforts, may have increased their exposure to various media. At this particular life stage, many changes occur and therefore it is hardly surprising that besides an upturn in media use, time spent with friends has also increased, given that the development of social relationships is one of the significant markers for the age group (Balk, 1995; Bloom, 1990; Caplan & Weissberg, 1989). It is harder, however, to explain the increase in time spent with family members.

Displacement vs. Engagement

This paper's main objective is to address the issue of Internet use and its potential displacement effect on other activities. By examining change scores, we found that displacement in time spent is not the only possible outcome. In some cases, the opposite occurs, such as in the case of newspaper reading, radio listening, and socializing with friends. Meanwhile, an increase in Internet use predicts a drop in television viewing-and out of six activities, this is the only one that exhibits the displacement effect with a change in Internet use.

The displacement of television viewing as a result of Internet use is not unique to Singapore; other studies have also found a similar effect (Ferguson & Perse, 2000; Kayany & Yelsma, 2000). The general explanation is, of course, that television is not as gratifying as the Internet. Although television provides entertainment and information, it is losing out to the Internet in content variety, interactivity, interpersonal potential and personalness, and asynchronicity. It is also competing head on with the Internet at home. While the Internet has invaded the home, television has not made a prominent entrance to public domains such as schools, libraries and other public places frequented by children. It has not transformed to establish its own uniqueness at this point. Further, the competition between the Internet and television is not on a level playing field, at least in the Singapore context. Internet use has institutional
support (the government and schools), while there is no policy to encourage television viewing. Perhaps due to these reasons the displacement effect is apparent (change in $R^2$ is 0.187).

This study shows that displacement does not apply to newspaper reading and radio listening. In fact, it supports the opposite: a rise in Internet use is associated with an increase in newspaper reading and radio listening. As mentioned in the literature section, the characteristics of newspapers and radio make them more resistant to displacement. In this situation, we are observing an engagement effect. Newspaper and radio use are benefiting from Internet use. The explanation in the case of newspapers is that Internet use arouses intellectual curiosity and other motivations that lead children to read newspapers and listen to radio more. The other reason, peculiar to this particular sample, may be that this is a life stage where children are expected to learn, and newspapers and Internet are two tools that they can use. As for the use of radio, it is quite common that a student will read the newspaper or use the computer while listening to radio at the same time. Naturally, then, an increase in Internet use is linked to more radio listening. However, as pointed out in the results section, while this engagement effect is significant, it is miniscule for newspapers and radio.

It is safe to say that Internet use does not affect their time spent with their families. Children live with their families and are dependent on them for love, affection, guidance, and financial support, and the Internet cannot satisfy these needs. Displacement of family time is also less likely in a society that puts great emphasis on family and family values.

As mentioned earlier, there is evidence that young Singaporeans use the Internet as a means to either interact with friends (e.g., playing online games together) or arrange for social gatherings (Lee & Chan, 2001). Therefore, it is not surprising that a change in Internet use predicts change in time spent with friends. Although an engagement effect is present and significant, the small $R^2$ suggests that the Internet's role is minor.

The hypothesis that sports and physical exercising would be displaced by the use of the Internet was not supported. This could be due the phrasing of the question in the survey. Respondents were asked to report the time spent on sports and exercise. The question did not specify that the respondents should exclude compulsory physical activities at school. Children have no control over mandatory activities, and any change or lack of change cannot be readily attributed to the Internet. If the question had asked for time spent on physical activities outside the school environment, the result could have been different.

**Perception of Importance**
The Internet, television, newspaper, and radio are all important information sources to the respondents in both years. While the prominence of the Internet and television has grown slightly, the perceived importance of newspapers remained at the same level. Radio is not as important as the other media in 1999, but its position has been elevated in 2000.

If children think the Internet is an important information source, will it affect their perception of other media? Regression analyses show that a perceptual change with respect to the Internet predicts the perceived importance of television and newspapers, but not radio.

**Limitations and Future Research**

This paper evoked the concepts of function, need, gratification and satisfaction in an attempt to explain the influence of Internet use on other activities. An activity may provide more than one function, and users can derive different satisfactions from it. However, none of these concepts was operationalized and measured. As such, we can only speculate about the mechanisms that lead to changes in time spent. Future studies may want to take functions, needs, and satisfactions into account since displacement (or engagement) is not limited to time only. We may be observing the same amount of time spent on a particular activity; however, its function may have changed.

Furthermore, time spent in using the Internet says little about the type of activities conducted with the new media or the content of such contact or exposure. Adolescents may engage in online activities that are considered productive, such as for school work. Or they may involve activities that society frowns upon, such as writing flame mails and surfing sexually explicit sites. Hence, there is a need to differentiate the amount of time spent on various types of content and activities in order to understand the impact of the Internet in general, and its displacement effect in particular.

The measurement of time spent on various activities has its problems. This is, however, a common challenge faced by displacement studies (Neuman, 1991). First, self-report is not always reliable. Second, since we do not measure an exhaustive list of activities, we do not know if there is a displacement or an increase in time spent, where the displaced time goes, and where the extra time comes from. Third, we do not know for sure what the overlapping activities are. That is, we do not know if indeed children are listening to the radio while surfing the Internet, or watching television while interacting with the family.

Finally, controlling for extraneous variables and alternative explanations, and determining causal direction are difficult. Again, these problems are common
in displacement studies (Neuman, 1991). Future research may want to control for variables that may affect adolescents' time spent on activities, such as how parents and teachers prioritize activities, their expectations for achievement, and the amount of freedom adolescents have in planning their activities.

**Conclusion**

Overall, the results reveal that an increase in Internet use is associated with decreased television viewing, but is associated with increased newspaper reading, radio listening, and socializing with friends. A change in Internet use, however, does not influence physical activities and interaction with family members.

Although many of the relationships are statistically significant, the explanatory power of the Internet is actually minor in most cases. As discussed earlier, time spent does not equate to quality of attention. Any displacement or increase in activities should not be taken as positive or negative, unless we can determine the change in functions and satisfactions.

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