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Balancing opportunities and risks in teenagers' use of the internet: the role of online skills and internet self-efficacy

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Abstract

Many hopes exist regarding the opportunities that the internet can offer to young people as well as fears about the risks it may bring. Informed by research on media literacy, this article examines the role of selected measures of internet literacy in relation to teenagers' online experiences. Data from a national survey of teenagers in the UK (*N* = 789) are analyzed to examine: first, the demographic factors that influence skills in using the internet; and, second (the main focus of the study), to ask whether these skills make a difference to online opportunities and online risks. Consistent with research on the digital divide, path analysis showed the direct influence of age and socioeconomic status on young people's access, the direct influence of age and access on their use of online opportunities, and the direct influence of gender on online risks. The importance of online skills was evident insofar as online access, use and skills were found to mediate relations between demographic variables and young people's experience of online opportunities and risks. Further, an unexpected positive relationship between online opportunities and risks was found, with implications for policy interventions aimed at reducing the risks of internet use.

Key words

internet, literacy, online risks and opportunities, skills, teenagers

Introduction

The many hopes and fears regarding the opportunities that the internet can offer to children and young people, along with its attendant risks, have attracted considerable

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attention (Buckingham, 2004; Kaiser Family Foundation, 2005; Wolak et al., 2006). The result is a series of pressing questions for policy makers, regulators, industry and the public about whether, in practice, young people are taking up these opportunities, whether some are benefiting more than others and which factors might facilitate the beneficial uses of the internet in an equitable manner.

These opportunities are widely judged to include learning, communication, participation, creativity, expression and entertainment – a heterogeneous set of activities for which there is considerable optimism and public/private sector provision (Jackson et al., 2007; Livingstone, 2004; Norris, 2001). Equally pressing, however, are the questions regarding whether young people are encountering risks online, whether some are particularly at risk and which factors might mitigate against the risks of internet use. These risks, also encompassing a heterogeneous set of intended and unintended experiences, include encountering pornographic, self-harming, violent, racist or hateful contents online, inappropriate or potentially harmful contact via grooming or harassment and, attracting recent attention, problematic conduct among peers such as bullying, 'happy slapping' or privacy invasions of one kind or another (Liau et al., 2005; Livingstone and Haddon, 2008; Ybarra, 2004).

To be sure, there is considerable scope for interpretation and contestation, both conceptually and between adults and children, regarding the allocation of specific activities to the category of opportunities or risks. Nonetheless, it appears widely assumed that these categories are to be conceptualized as mutual opposites, with academic, policy and popular discourses asserting that, for example, increasing opportunities will distract children from exploring risky activities; or that policy should aim to reduce risks and increase opportunities; or that children's desire to evade adult-approved activities will lead them towards online risk taking.

In the main, take-up of opportunities has been the focus of the digital divide or, more recently, digital exclusion debate, where inequalities in the nature and benefits of internet use have attracted particular attention (Norris, 2001; van Dijk, 2005). In a parallel and often unrelated research literature, an examination of the nature and incidence of online risks has sought to identify vulnerable or 'at risk' youth and the conditions and consequences of potentially harmful experiences (Berson and Berson, 2005; Mitchell et al., 2003). Both traditions have, until now, concentrated on demographic factors – age, gender, socioeconomic status, and others – but recently both are turning their attention to questions of and whether online skills, competences or other sociopsychological factors may influence the range of opportunities taken up or risks encountered (Durndell and Haag, 2002; Eastin and LaRose, 2000; Leu et al., 2004).

Crucially, it is increasingly recognized that these skills are also unevenly distributed. In other words, although young people are often in the vanguard when it comes to using, and developing new uses for, the internet, compared with many adults (Dutton et al., 2005; Livingstone and Helsper, 2007b; Ofcom, 2006), there is good reason to question the popular assumption that children and young people are 'cyber experts'. It seems that they do not always find online contents and services easy to access and use in a manner that both meets their needs and avoids the attendant risks. For example, many young people have yet to learn adequate techniques for accessing and searching content, and their critical and creative skills remain rudimentary and often little practised (Facer and Furlong, 2001; Hargittai, 2002; Pew, 2004; although see also Pew, 2007).

In this article, we specifically seek to examine the experience of opportunities and risks in the same study, in order to ask whether those with more online skills take up more opportunities and, further, avoid more risks (see Livingstone and Helsper [2007a] for a study of the role of other sociopsychological factors). The skills and competences required for effective internet use are increasingly theorized in terms of literacy, often by drawing on and adapting to new circumstances in the long tradition of research on media literacy and media education (Buckingham, 2004; Potter, 2004; Tyner, 1998; Warnick, 2002). Some take as their starting point the attempt to identify the basic skills and techniques required to go online, while others focus on the end point – an ambitious specification of the interpretive and critical abilities required of online experts. In the present analysis, we draw theoretically from the concise and widely adopted definition of media literacy developed in a key conference a decade ago, namely that media literacy is the ability to access, analyze, evaluate and create messages in a variety of forms (Christ and Potter, 1998).

Thus, we define internet literacy as a multidimensional construct that encompasses the abilities to access, analyze, evaluate and create online content. These abilities, we suggest, have substantial continuities with older forms of literacy, but the discontinuities are likely to occasion more difficulty for users (for example, knowing how to access and search online content is very different from finding a book in a library or a programme on television). These four components together constitute a skills-based approach to media literacy, with each supporting the others as part of a non-linear dynamic learning process. It is expected that gaining the skills to access content aids the analysis of content produced professionally by others; that critical skills encourage the user to create their own content; and that experience of content creation facilitates further access to content tools and techniques, and so forth (Buckingham, 2004).

The advantage of a skills-based definition of internet literacy is that it offers a viable research strategy, postponing for present purposes the important intellectual, semiotic and political debates over the relation between literacy as an individual skill and a social or societal approach to literacy (see Livingstone, 2004; Snyder, 2001; Warnick, 2002). It also opens the way for researchers to tackle the difficult task of measuring internet literacy in terms of constitutive skills, for even this is not easy (Hargittai, 2005; Hobbs and Frost, 2003; Stanley, 2003). Qualitative work reveals the forms of internet literacy at stake in varying social contexts of use (Bakardjieva, 2005; Ribak, 2001; Valkenburg and Soeters, 2001; van Rompaey et al., 2002), while surveys examine the distribution and, in part, the consequences of such expertise (Kaiser Family Foundation, 2005; Lenhart, 2005). There is ongoing research developing measures for the specific skills involved, permitting reliable differentiation among internet users (for example, Potosky, 2002; Spitzberg, 2006; Torkzadeh and van Dyke, 2002; Yang and Lester, 2003). Developing skills both draws on and encourages confidence in using the internet: Eastin and LaRose (2000) have applied the concept of 'self-efficacy' to the internet, since work on self-efficacy in educational contexts (Bandura and Locke, 2003; Bandura et al., 2001) shows that belief in one's own skills can be as important to academic achievement as one's actual skills.

Understanding the nature (e.g. dimensions or aspects of skills and competences), antecedents (e.g. domestic context, conditions of access) and consequences (e.g. range or

sophistication of uses) of internet literacy is complex and still developing. Hence, we begin simply by examining two commonly discussed measures of the access dimension of internet literacy: first, a measure of online (access-related) skills; and, second, a global measure of internet self-efficacy. Conducted as part of a multipurpose survey of teenagers' online usage, our aim is to explore any links among demographic, skill/self-efficacy, opportunity and risk variables as a contribution to the broader understanding of the role of internet literacy in mediating the consequences of internet use.

Research questions

This article reports on analysis of a national survey of 1511 children and young people aged 9–19 years old in the UK where, in 2004, three-quarters of households with children in the UK had domestic internet access and 98 percent of 9–19-year-olds had used the internet (92% at school, 75% at home and 64% elsewhere; Livingstone and Bober, 2005). Focusing on the data for teenagers (12–17 years, $N = 789$), we examine two research questions: 1) do online skills and self-efficacy facilitate the take-up of the range of online opportunities available? and, 2) do online skills and self-efficacy reduce the breadth of risks experienced online? Additionally, since demographic and household factors are also likely to influence teenagers' opportunities and risks online, the relations between these factors and those of skill, self-efficacy, opportunities and risks are also systematically examined.

Recent research has identified a number of relations among these different contextual factors, providing grounding for the present analysis. This shows, first, that three traditional measures of inequality – age, gender, socioeconomic status (SES) – influence access, use and online skills. Thus, boys and older children gain earlier/better access to computers and the internet (Durndell and Haag, 2002) and use it more and are more skilled online (Facer et al., 2001; Livingstone and Helsper, 2007b [although for adults, age and skills are negatively correlated]; Fallows, 2005). SES also affects the adoption and use of new technologies (Calvert et al., 2005; Norris, 2001). Second, and fairly obviously, access is a prerequisite for use and for the development of online skills. More importantly, it is widely assumed, although less often demonstrated, that better quality access (e.g. more access locations, fast connectivity, more powerful machines, and so on) facilitates greater use and perhaps further skill or self-efficacy (e.g. encouraging confidence, exploration and learning; Facer and Furlong, 2001).

One should note here that the argument that access, in and of itself, enables greater online opportunities is, of course, at the heart of policy interventions designed to provide hardware and connectivity for children who are otherwise disadvantaged, although note, too, that these interventions rarely discuss the implications for the experience of risk. It is likely that access to a broader range of access locations relates to more unsupervised access and thus more independent use of the internet (Helsper, 2007). Therefore, a larger number of access locations are likely to be related to higher skill levels and to broader use of the internet in terms of both opportunities and risks. Further, as hinted in the foregoing, the literature assumes a positive and mutual association between use and various measures of literacy, although we only find evidence supporting this assumption for adults (Dutton et al., 2005; Pew, 2004) and in relation to television rather than the

internet (Mangleburg and Bristol, 1998). Moreover, Kraut et al. (2006) found no evidence that 'mere' use brings about internet literacy among children.

There is evidence that demographic factors directly influence young people's experience of online opportunities and risks. Older children, it seems, both take up more opportunities (educational, civic, communicative, creative, etc.; see Livingstone and Bober, 2004) and encounter more risks (possibly because they are more adventurous, less obedient or less supervised; see Berson and Berson, 2005; Mitchell et al., 2003). Although there is little evidence regarding gender differences in opportunities (Subrahmanyam et al., 2001; but see also Helsper, 2007), it does seem that boys take more risks online (Jackson et al., 2001; Weiser, 2000, although see Mitchell et al., 2003). Finally, there is evidence that those from higher SES homes not only have better internet access, but also that they take up a greater range of opportunities online (Kaiser Family Foundation, 2005; Livingstone and Helsper, 2007b), not least because these same children are more likely to use the internet. However, as yet, there is little or no evidence linking SES and risk.

Where does internet literacy fit into the explanation of the consequences of use, both opportunities and risks? Though only examined here in terms of basic online skills and self-efficacy, for practical reasons concerning available measures and the limits of survey administration, it may be supposed that beginners who are inexperienced in the skills required to access online contents and services are missing out on the benefits that the internet can offer. More advanced users, by contrast, are expected to have the skills and confidence required to access and benefit from these opportunities (Facer et al., 2001). As regards the risks, more skilled users are also expected to know how to avoid the risks or problems of the internet (Berson and Berson, 2005; Machill et al., 2004; Spitzberg, 2006), while those who encounter problems may be said to lack internet literacy. It is this rationale that results in policy makers targeting most safety information at beginners (Internet Crime Forum, 2000).

Clearly, there is some – more or less convincing – evidence to link most of the factors traditionally used to measure the antecedents and consequences of children and young people's internet use. Because research projects commonly include just a few of these variables, it is hard to grasp the overall pattern of interrelationships. It is also hard to identify any indirect effects or yet more complex paths of influence, the focus generally being on the direct effects of one variable on another. To address the complexity of internet use, we propose a sequentially ordered structural model, as shown in the path diagram (Figure 1).

In this path diagram, arrows leading from the exogenous (or predictor) variables to the endogenous (or predicted) variables represent the relationships between them (Bollen, 1989; Kline, 2005), with the sign (+ or –) indicating whether the relationship is a positive or negative one. Thus, the demographic variables are here assumed to be causally prior to variables measuring internet access and use. Similarly, it is proposed that access precedes internet use and literacy. However, no causal priority can be asserted between use and literacy, as each is likely to influence the other. Lastly, it is hypothesized that the breadth of opportunities and risks experienced by teenagers on the internet will be accounted for by a combination of these variables. In addition to these direct relations, mediated relations consist of an indirect link between two variables, depending on an

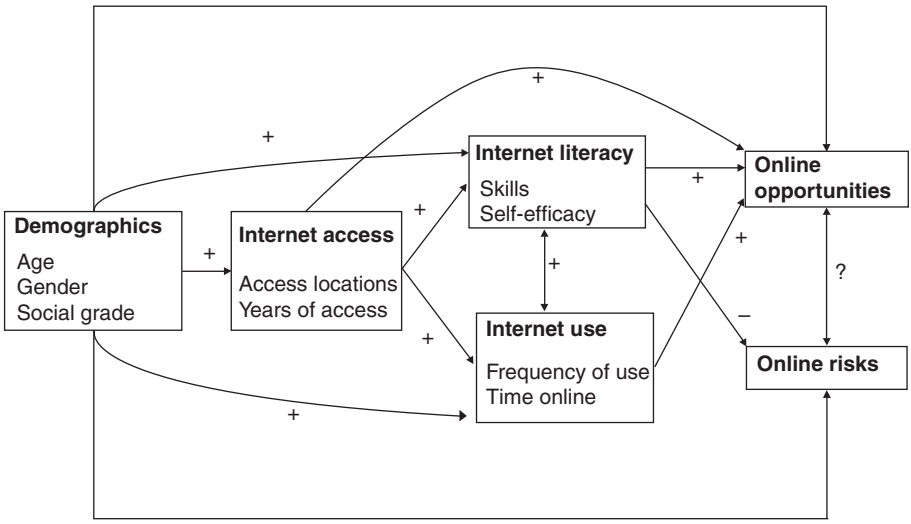

Figure 1. Hypothesized path model

intermediate variable. For example, the model proposes that demographic variables have both a direct influence on internet literacy and also an indirect effect via their effect on access. The reasoning is that older children are likely to have greater online skills, but that, in addition, older teenagers have greater access and that greater access leads to higher internet literacy and to more unsupervised use (i.e. to more opportunities and risks). Given the paucity of relevant research, no a priori relation is postulated for the relationship between opportunities and risks.

Method

A national survey was conducted via an in-home, face-to-face interview with 1511 children and young people aged 9–19 using 'random location' sampling across the UK between January and March 2004.[1] Following the design and piloting of the survey questionnaire by the research team, fieldwork was carried out by a reputable market research company using computer-assisted personal interviewing. Informed consent was obtained from all respondents and their parents. Sensitive questions (for example, relating to viewing pornographic or hate websites or meeting people online) were contained in a self-completion section to ensure privacy (from researcher and parent).

In the analyses that follow, only responses from the 12–17-year-olds who use the internet at least once per week are included ($N = 789$), as all variables were measured only for these teenagers.[2] The sample comprised 49 percent girls and 51 percent boys, with an average age of 14 years ($SD = 1.75$). The household SES, measured using standard UK market research categories (Reynolds, 1990), was 30 percent AB (upper middle class), 26 percent C1 (lower middle class), 21 percent C2 (skilled working class) and 24 percent DE (unskilled working class/not working). Other measures employed were as follows:

Table 1. Take-up of online opportunities

Item (Do you/have you …?)	%	Item (Do you/have you …?)	%
Do work for school/college	97	Use a chatroom	24
Look for info on other things	95	Vote for something/someone	23
Send/receive emails	77	Look for info on computers	23
Play games	75	Visited websites about protecting the environment	22
Use instant messaging	64	Look for news	22
Download music	49	Contribute to a message board	19
Do a quiz	46	Send pictures or stories	19
Look for cinema/theatre/concert listings	41	Visited websites about human rights/gay rights/children's rights	16
Tried to set up a web page	41	Visited a government website	16
Look for info on careers/further education	39	Look at other people's personal homepages	14
Look for products or shop	36	Visited websites about improving the conditions at school	13
Do something that someone else has asked you to do	34	Offer advice to others	10
Watch/download video clips	30	Fill in a form about yourself	9
Send an email or text message to a site	27	Sign a petition	9
Visited websites about a charity/ organization that helps people	25	Plan a trip	8
Average number of opportunities: 10			

Base: UK 12–17-year-olds who use the internet at least once per week (*N* = 789).

- *Access*: This was measured in two ways. *Access locations* (total out of 10) calculated the number of locations the respondent had ever used to access the internet (computer at school/college, computer/laptop at home, computer/laptop in someone else's home, computer in public library, computer in an internet cafe or kiosk, computer at parent's work, computer in your own workplace, digital television at home, mobile/WAP phone and games console at home). *Years of access* was calculated by subtracting the age when respondents first gained access from their present age.
- *Use*: This was measured in two ways. *Frequency* measured respondents' frequency of internet use on a scale ranging from eight (uses more than once per day), to five (uses once per month), to one (never uses). *Time online* was a composite measure based on the respondent's judgement of how much time they spent online on an average weekday and weekend day (options: 1 = none, 2 = about 10 minutes, 3 = about half an hour, 4 = about an hour, 5 = between one and two hours, 6 = between two and three hours, or 7 = more than three hours).
- *Internet literacy*: This was measured in two ways. *Skills* (total out of 7, Cronbach's $\alpha = .70$) calculated the specific activities the respondent claimed to be good at (options: finding the information they needed on the web, setting up an email account, sending an instant message, downloading and saving an MP3 [music]

Table 2. Experience of online risks

Item (Do you/have you …?)	%	Item (Do you/have you …?)	%
Give info about yourself to be able to win a prize on the internet	72	Visited a site with violent or gruesome pictures on purpose	14
Give info about yourself to another person that you have not met face-to-face	46	Ended up accidentally on a site that was hostile or hateful to a group of people	10
Seen pop-up adverts for a porn site while doing something else	44	Been sent porn by someone you know	9
Ended up on a porn site accidentally when looking for something else	41	Visited a porn site on purpose	9
Know someone that you only talk to online using email, IM or chat	36	Met anyone face-to-face that you first met on the internet	9
Ever had someone say nasty or hurtful things to you	33	Been sent porn from someone you met online	3
Received pornographic junk mail by email/instant messaging	28	Visited hostile or hateful site on purpose	3
Ended up accidentally on a site with violent or gruesome pictures	27		
Average number of risks: 4			

Base: UK 12–17-year-olds who use the internet at least once per week (*N* = 789).

file, setting up a filter for junk mail or pop-up adverts, getting rid of a virus on their computer or fixing a problem by themself when something goes wrong). *Self-efficacy* was measured on a four-point scale (Eastin and LaRose, 2000) by the respondents themselves on their online skills as either beginner, average, advanced or expert.

- *Opportunities*: A composite measure that calculated the total number of opportunities that each respondent had taken up online (total out of 30, $\alpha = .76$). To cover the range of young people's online activities, response items were drawn from research and opinion surveys of internet use (e.g. Dutton et al., 2005; Kaiser Family Foundation, 2005; Ofcom, 2006; Pew, 2004). For the full list of items, see Table 1.
- *Risks*: A composite measure that calculated the total number of risks that each respondent had encountered online (total out of 15, $\alpha = .74$). Designed to cover the range of risks occasioning public concern, response items were drawn from research and opinion surveys (for example, the European SAFT survey; see Larsson, 2003; and the American Youth Internet Safety Survey; see Mitchell et al., 2003). For the full list of items, see Table 2.

Results

Table 3 shows the means and standard deviations for all measures and the Pearson product-moment correlation coefficients among them.[3] Tables 1 (online opportunities)

Table 3. Correlation matrix for key variables

	1	2	3	4	5	6	7	8	9	10
1 Gender (X = 1.50, *SD* = .50)	1.00									
2 Age (X = 14.39, *SD* = 1.75)	–.02	1.00								
3 SES (X = 2.55, *SD* = 1.15)	–.03	.06	1.00							
4 Access locations (X = 3.19, *SD* = 1.47)	–.08*	.13**	.24**	1.00						
5 Years online (X = 3.66, *SD* = 1.82)	–.09*	.34**	.09*	.16	1.00					
6 Frequency of use (X = 3.54, *SD* = .50)	–.05*	.15**	.04**	.19**	.10*	1.00				
7 Time online per day (X = 3.92, *SD* = 1.51)	–.03	.20**	.08**	.29**	.15**	.42**	1.00			
8 Online skills (X = 3.01, *SD* = 1.88)	–.05	.27**	.14**	.44**	.21**	.36**	.43**	1.00		
9 Internet self-efficacy (X = 2.41, *SD* = .64)	–.05	.12**	.08*	.20**	.19**	.30**	.32**	.48**	1.00	
10 Opportunities online (X = 10.15, *SD* = 4.60)	.01	.29**	.15**	.44**	.22**	.34**	.40**	.58**	.33**	1.00
11 Risks online (X = 3.91, *SD* = 2.78)	–.15**	.26**	.08*	.36**	.19**	.24**	.32**	.47**	.24**	.55**

Note: Responses based on 12–17-year-olds who use the internet at least once per week (*N* = 789) *$p < 0.05$ **$p < 0.01$.

and 2 (online risks) show that the average number of opportunities taken up by those who use the internet at least weekly is 10 out of the 30 asked about in the survey, while the average number of different risks encountered by 12–17-year-olds who use the internet at least weekly is nearly four out of the 15 asked about in the survey.[4] As the incidence of each item shows, not all opportunities or risks are equally common.

Correlations among all variables in the hypothesized model (Figure 1) reveal systematic relations among demographic variables, internet access and use, online skills and self-efficacy, and online opportunities and risks.

Specifically, the statistically significant correlations confirm research findings regarding differential access and use of the internet depending on demographics (see Livingstone and Helsper, 2007b). Older teenagers, boys and those from higher SES households have greater access to the internet (measured by number of access locations and years online). Further, SES affects amount of use, with middle-class teenagers using the internet more frequently and for longer on an average day; similar findings hold for age, with older teens using the internet more. However, boys do not differ from girls in amount of use (measured by frequency of use and time spent online on an average day). As regards online skills and self-efficacy, these were positively associated with age and SES, as expected; again, gender differences were not significant.

In terms of opportunities, older and middle-class teenagers took up more online opportunities, although there were no gender differences.[5] Meanwhile, older teens and boys were shown to encounter more online risks, as too, unexpectedly, did middle-class, compared with working-class, teenagers.[6]

Complicating matters, these different measures were themselves interrelated. Thus, internet access was positively associated with internet literacy and internet use. Internet use was also positively associated with internet literacy and with online opportunities and risk. Furthermore, internet literacy was positively related to online opportunities. Unexpectedly, however, internet literacy was positively associated with online risks. This suggests that the greater the young person's online skills and self-efficacy, the more – rather than the fewer – risks they encounter online. Last, and also unexpectedly, online risks and opportunities were themselves positively correlated; indeed, this is the highest correlation in the table.

Path analysis

Correlations do not indicate whether relationships between variables are direct or indirect. Path analysis assesses the relative importance of direct and indirect causal paths to the dependent variable(s). Thus, it can determine whether the model shown in Figure 1 can explain the pattern of correlations shown in Table 3. The statistical program AMOS5 was used to test the hypothesized path model using the variables in Table 3.

The final path model ($\chi^2(24) = 61{,}26$, $p = .00$), shown in Figure 2 and Table 4, was constructed from a base model in which variables were related to other variables based on the sequence as modelled in Figure 1.

Given the relative lack of prior literature on the relation between opportunities and risks, we had not initially hypothesized any directional relationship between them. However, based on the simple correlations showing that skills, self-efficacy, years and

time online are all more strongly correlated with opportunities than with risks, together with statistical analyses showing that the relationship with skills and expertise was stronger for the direction from opportunities to risks than vice versa, a path was added from opportunities to risks. Consistent with this, we note that the published literature provides little rationale for supposing that seeking risks might lead to opportunities (hence, we did not directly test this direction), while the reverse direction (which we find to be strongly present) is more plausible, following the argument that it is more likely that opportunities are causally prior to risks; that is, young people need to be online and do a variety of things online before they encounter risks.

Non-significant paths were then fixed to zero. The model fit was considered acceptable based on the following indicators for complex models: RMSEA values of lower than .05 (with a confidence interval in its entirety under .10) and a CFI value higher than .9 (Kline, 2005).[7] The order of the variables and the direction of the connections among them in the model were based on the theory and hypotheses presented earlier. Note that not all variables influence each other to an equal extent and that some influence each other only indirectly through other variables (see Figure 2 and Table 4). We examine the findings for each variable in turn, working from the left hand side of the model to the right hand side (our main focus).

- *Age*: Age has a direct positive influence on access and use; older teenagers have better quality of access and use the internet for longer. They also have better online skills (but not self-efficacy). Age also has a direct influence on teenagers' online opportunities, over and above the beneficial influence of better access, use and skills. There is no direct influence of age on online risks. The indirect paths, all significant at $p < .05$ according to the Sobel test (Sobel, 1982), are also noteworthy. The extent to which older teens are more skilled online and use the internet for longer stretches of time is mediated by quality of access. Thus, teenagers with poorer access have lower confidence in their skills and use the internet for shorter periods of time than their peers with better access. Further, since older teenagers have better access, they tend to be more internet literate than younger teenagers. In addition to a direct influence of age on opportunities, there is an indirect influence of age on opportunities as mediated by access, use and skills. This suggests a virtuous circle of benefits gained both by older children and, comparing within age group, by those with better access. Although these variables do not directly predict risks, since opportunities and risks are positively related, the positive effect of age on opportunities is accompanied by a greater likelihood of risky encounters.
- *Gender*: As with age, the correlation matrix showed gender to be associated with several measures of quality of access, use and literacy. However, in the path analysis, the only direct effect of gender is on risky encounters; boys more than girls encounter online risks. There is no direct effect of gender on opportunities taken up (although the type of opportunities varies; see Livingstone and Helsper, 2007b), and there was only one direct effect on the years they have used the internet; boys have been online for longer. However, there are no direct effects of gender on access, frequency of use or skills/efficacy. This offers little support for the popular

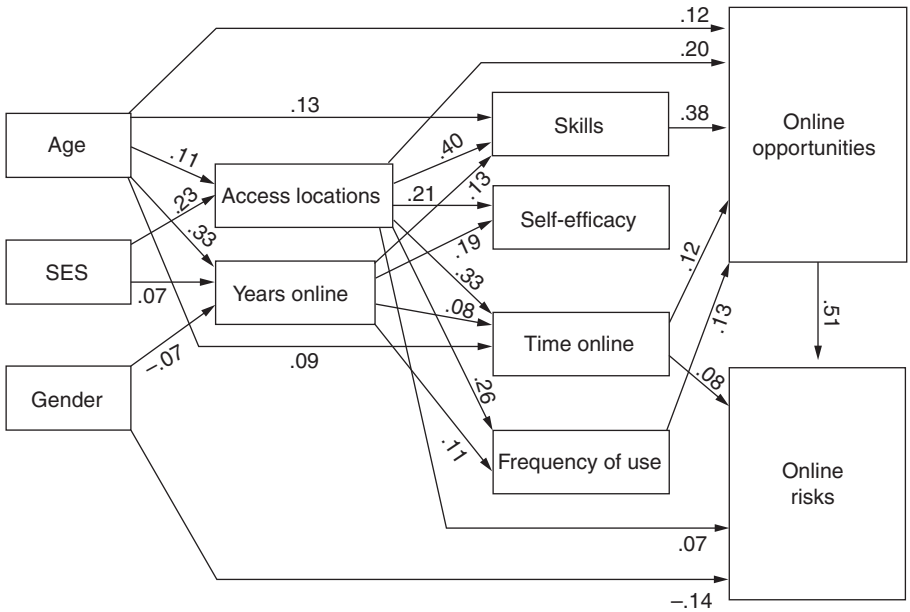

Figure 2. Path model for online opportunities and risks

Base: UK 12–17-year-olds who use the internet at least once per week (N = 789).
Note I: X2(24) = 61.26, p = .00, RMSEA = .04 (confidence interval .03 to .06); CFI = .98.
Note II: For clarity, covariances were estimated between use, between literacy and between access variables, but omitted from the figure (see Table 4).
Note III: For clarity, non-significant paths that were fixed to zero were omitted from the figure.

idea that girls are less interested, confident or skilled online. Indeed, we conclude that there are few gender differences in the online experience, with the notable exception of online risks; this seems largely accounted for by boys encountering more pornography (Table 2).[8]

- *Socioeconomic status*: With the exception of a direct influence of SES on access, the path analysis showed that the effects of SES on the other variables in the correlation matrix are all indirect. The various benefits of higher SES on teenagers' use, literacy and opportunities are, therefore, indirectly (and crucially) mediated by access. Those who differ in SES, but have equivalent access, do not differ in skills/self-efficacy. Conversely, those similar in SES who differ in access also differ in skills/self-efficacy. This is not to say that there is no SES gap overall in the population, but that access is the determining factor (rather than, say, other factors associated with SES, such as parental education or disposable time spent with children).
- *Access*: Quality of access (access locations and years online) is positively related to both amount of use and literacy. Thus, over and above the direct effects of age and SES, teenagers with better access (especially more access locations) make more use of the internet and gain more online skills and self-efficacy. The number of access locations, but not the number of years online, also has a significant

Table 4. Path coefficients for Figure 2

Predictor variable		Predicted variable	b	se	p
Gender	→	Years online	–.26	.12	.03
Gender	→	Online risks	–.80	.16	**
Age	→	Years online	.34	.04	**
Age	→	Access locations	.09	.03	**
Age	→	Time online	.08	.03	**
Age	→	Skills	.15	.03	**
Age	→	Online opportunities	.34	.07	**
SES	→	Access locations	.31	.04	**
SES	→	Years online	.12	.06	.03
Access locations	→	Skills	.56	.04	**
Access locations	→	Self-efficacy	.10	.02	**
Access locations	→	Frequency of use	.13	.02	**
Access locations	→	Time online	.37	.04	**
Access locations	→	Online opportunities	.66	.10	**
Access locations	→	Online risks	.14	.06	.03
Years online	→	Self-efficacy	.07	.01	**
Years online	→	Skills	.14	.04	**
Years online	→	Frequency of use	.04	.01	**
Years online	→	Time online	.07	.03	.03
Frequency of use	→	Online opportunities	.89	.22	**
Skills	→	Online opportunities	.90	.08	**
Time online	→	Online opportunities	.35	.10	**
Time online	→	Online risks	.13	.06	.02
Online opportunities	→	Online risks	.30	.02	**

Covariances			b	se	p	r
Access locations	↔	Years online	.31	.09	**	.14
Online skills	↔	Self-efficacy	.56	.04	**	.50
Online skills	↔	Frequency of use	.60	.05	**	.50
Time online	↔	Self-efficacy	.32	.04	**	.33
Time online	↔	Frequency of use	.50	.04	**	.48
Time online	↔	Online skills	1.06	.10	**	.40
Frequency of use	↔	Self-efficacy	.17	.02	**	.38

*$p < 0.05$ **$p < 0.01$

The following non-significant paths were fixed to zero and omitted from the table:

Gender → Access locations; Skills; Self-efficacy; Time online; Frequency of use; Opportunities

Age → Self-efficacy; Opportunities

SES → Skills; Self-efficacy; Time online; Frequency of use; Risks; Opportunities

Years online → Opportunities; Risks

Skills → Risks

Self-efficacy → Opportunities; Risks

Frequency of use → Risks

direct influence on the take-up of online opportunities and risks (except indirectly through the relation with online opportunities; see below). Whether this is the effect of 'mere' access or whether those with more access also benefit from other forms of support associated with access (better resourced schools, more community support, more expert friends, more independent unsupervised access, and so on), cannot be established here. Lastly, although spending more years online does not result in more opportunities in and of itself, this is associated with greater online skills and self-efficacy and so has an indirect relationship with online opportunities.

- *Use*: Time online per day and frequency of use both increase the opportunities taken up. Although time spent online is directly (and positively) related to risks, frequency of use is not. It seems that the link between use and risks is largely indirect; thus, use → opportunities, and opportunities → risks. Additionally, the relationship between use and opportunities is indirect, mediated by that between use and skills. In other words, those who use the internet more and are high in skills take up more opportunities than those who use it an equivalent amount, but are lower in skills (note that risks are not mediated by use in this way).
- *Internet literacy*: The two literacy variables are strongly related to each other, yet they work differently in the path analysis. Online skills (a self-assessment of specific skills) have a positive influence on online opportunities (and, thus, an indirect influence on risks). Self-efficacy (a global self-assessment of skills and self-confidence) has no direct influence on either opportunities or risks.
- *Opportunities and risks*: The path analysis shows that the strong correlation between online opportunities and risks is positive: the more opportunities a teenager takes up, the more risks she or he is likely to encounter. Thus, online opportunities appear to encourage teens to do more on the internet, which may result in more risk, either deliberately or inadvertently. Since boys' base level of risks encountered is higher than that of girls (compare boys' risk-seeking behaviour; Slater, 2003), but their base level of opportunities does not differ, the eventual uptake of opportunities is equivalent for boys and girls.

Discussion and conclusions

This article has found that teenagers are benefiting from a considerable range of online opportunities, although there are still some they miss out on, hinting at considerable scope to encourage the depth and breadth of their online opportunities. Consistent with previous evidence, it was found that older and middle-class teenagers are benefiting from a broader range of opportunities than are younger children and those from a working-class background. It is particularly noteworthy that the experience of online opportunities and risks – so often researched and discussed quite separately, as if unrelated, while frequently discussed in policy circles as if mutually opposed – was instead found to be strongly positively related. In short, the findings show that those who take up more opportunities encounter more risks and vice versa. Further, those groups inclined to gain more opportunities (older middle-class boys) also encounter more risks (compared with younger working-class teens and girls).

Our analysis has examined potential mediators of these relationships between demographics and outcomes, as modelled in Figure 1. The emergent picture (Figure 2) reveals the importance of indirect or mediated relations as well as direct relations among the variables. Thus, the above summary must be qualified in important ways. Age directly influences opportunities, but it only indirectly influences risks: older teenagers do more things online because they are older, but the reason they encounter more risks online is not because they are older, but because they tend to have better access, use the internet more and/or have greater online skills, and it is this that leads them to seek a wider range of online opportunities. SES has no direct influence on either opportunities or risks, but only influences access, resulting in inequalities that have indirect but significant consequences. The policy implication here is intriguing; while middle-class parents often provide better access for their children, for those middle- and working-class children with equivalent access, there are few or no further direct effects of SES on use, literacy or opportunities. Enhancing quality of access (i.e. more sites of access) for less privileged teenagers could, therefore, reduce the digital divide that exists at present among young people.

The gender divide that existed for computers (Durndell and Haag, 2002; McIlroy et al., 2001) does not appear to carry over to the internet, although boys, irrespective of access or skills, tend to encounter more risks, especially pornography (Valkenburg and Peter, 2006; Valkenburg and Soeters, 2001). This is a direct relation, unmediated by boys having better access or skills or confidence online (which they do not). This invites future research on other gender-related factors such as the social norms that encourage boys and prevent girls from engaging in risky activities or the peer pressure that encourages boys to look at pornography.

The present analysis of mediating factors shows that a simple framework linking online activities to demographic factors is insufficient in explaining the observed variation in teenagers' experiences of the internet. Further, the tendency in research to study either opportunities or risks, often as part of quite separate research literatures, misses the important connection between the desirable and risky outcomes of internet use. In short, a more complex model is required to account for teenagers' online experiences, with access, use and literacy all playing a role in mediating between demographic factors and opportunities/risks.

While the digital divide literature has recognized the mediating role of access and, more recently, use, this article has especially focused on the potential role of internet literacy, drawing on the framework developed for research on media literacy. The present examination of at least some aspects of internet literacy (capturing some of the online skills required as well as the confidence needed to self-identify as a competent user) shows that online skills make a positive contribution to online opportunities; they also mediate between demographic factors and access and between access and opportunities. In other words, while demographics and access have a direct and beneficial influence on opportunities, being more skilled also helps. This suggests that, in addition to interventions designed to equalize access, interventions targeted at increasing specific skills will also enhance the take-up of online opportunities. This offers support to the growing policy demand for teachers, educational providers and even the industry, child welfare and other organizations to establish and expand digital literacy programmes so as to increase children's internet-related competences and thereby benefit from the opportunities.

Contrary to the literature (Eastin and LaRose, 2000), self-efficacy did not mediate this relationship. This may have been because self-efficacy was subject to a social desirability bias or because just a single response measure was used or because confidence among teenagers is not strongly related to actual ability. The composite measure of *Skills*, although also based on self-report, indexed concrete skills and techniques not especially important to self-identity. Hence, it may be less vulnerable to self-report biases and so provide a better measure of young people's online skills. In future research, an approach based on the measurement of skills may prove more effective than a global self-efficacy measure (see also Hargittai, 2005), although Bandura's multiple indicator of self-efficacy developed for educational contexts might help to fine tune the measurement of self-efficacy (Bandura et al., 2001).

Online skills are themselves influenced directly by age; irrespective of access or use, older teenagers are more skilled and so take up more opportunities. This suggests that although some online skills are internet-specific, other aspects of these skills are likely to draw on social and technical knowledge acquired in other contexts. As suggested in the introduction, internet literacy may draw on media literacy (e.g. skills derived from experience with print, critical knowledge or technical expertise). Indeed, how the different forms of literacy interact and support each other is a key question for future research, given today's complex and convergent media and information environment.

Few studies to date have sought the 'big picture' in identifying the multiple and interrelated influences on young people's internet use. Particularly, research on media or internet literacy has focused more on matters of definition and measurement than on examining the antecedents and consequences of internet literacy. While parsimony might suggest that demographic factors are sufficient to account for the online opportunities and risks experienced by teenagers, the present analysis shows that internet literacy plays a key role in mediating the online experience and should, therefore, be included in future research on access, use, opportunities and risks online.

In conclusion, it is neither the case that those who benefit from more opportunities are more likely to avoid online risks, nor that those with greater internet literacy have found a way to avoid the risks as they pursue the opportunities. Taking up online opportunities is proving, for many teenagers, an experience associated with some degree of risk. The strong positive association between opportunities and risks points up the dilemma that parents and regulators face. Increasing opportunities increase the risks. Restricting internet use so as to reduce the risks is also likely to restrict the opportunities. It appears that, as with print literacy and other skills (social skills, practical skills), an increase in skills cannot ensure that the activities thereby enabled are socially approved. Learning to read or to make friends may result in approved reading or approved friends or quite the contrary. Similarly, online skills (and internet literacy conceived more broadly) enable young people to take up new online opportunities and, thereby, encounter more risks.

Since the range of risks investigated in this study includes both intentional and unintentional exposure to problematic content or contact, we suggest that further research is needed to clarify the nature of risks that are positively, rather than negatively, related to online skills. We note, further, that the definition of risks and opportunities here largely accords with 'approved' definitions, particularly as employed in policy debates: to teenagers, some of the activities classified as risks here are often seen rather as opportunities

(e.g. making new friends online, giving out personal information or even, for some, viewing pornography).

A next step for research, surely, would be to develop a more subtle account of online opportunities and risks, either better distinguishing them or acknowledging their inevitable overlap, as suggested here. Last, we note that, as yet, clear findings regarding the tangible benefits or actual harms consequent upon the experience of these youthful opportunities and risky activities remain elusive. Much research, as in this article, has been concerned to explore the conditions and correlates associated with these activities, as these are amenable to exploration via self-report methods (whether surveys or interviews). It is possible that by employing longitudinal or observational methods, the next challenge for research in this field will need to tackle the consequences, whether beneficial or harmful, of such activities.

Notes

1 In random location sampling, interviewers have little choice in the selection of respondents. Respondents are drawn from a small set of homogeneous streets selected with probability proportional to the population after stratification by their postcode characteristics and region.

2 Percentages were weighted to data in BMRB's Target Group Index and Youth surveys. The weighting efficiency was 91%. Raw sample sizes and SEM analyses are based on unweighted data.

3 A confirmatory factor analysis was conducted to check that the skills items were distinct from the items used to assess online opportunities and risks. The three-factor solution showed a better fit than a one-factor model ($\chi^2D(3) = 545.40$, $p < .001$). The measures used for opportunities and skills pointed to distinct underlying factors ($\chi^2D(1) = 166.05$, $p < .001$), indicating that the treatment of skills, risk and opportunities as separate scales was justified.

4 These risk assessments are based on the children's survey. When parents were surveyed, reported levels of risk encountered by children were lower; parents may be unaware of their children's activities or they may define risk differently (Livingstone and Bober, 2005).

5 These averages mask some variation in the particular activities online; compared with boys, girls were more likely to visit civic sites, use email and get career and educational information, while boys were more likely to download music and videos, play games, shop, look for news or information on computers, or make a website. Also, compared with younger teens, older teens were more likely to do a range of interactive activities, visit civic sites, use instant messaging and email, shop or look for leisure or career information and news; playing games was the only activity undertaken more by younger than older teens. SES made a difference in several ways. Middle-class teenagers were more likely to contribute to message boards, vote or sign a petition online, visit civic sites, use instant messaging, shop, look for leisure information and news. Working-class teenagers were only more likely to use chatrooms (see Livingstone et al., 2005).

6 Specifically, for online risks, boys are more likely to encounter online pornography, both accidentally and on purpose, and more likely to seek out violent or gruesome content. Although boys are more likely to give out personal information online, girls are more likely to have been bullied online. Most risks are also more commonly encountered by older than younger teens, including content, contact and privacy risks. SES makes less difference here, although middle-class teens are more likely to encounter pornographic or hate content accidentally (see Livingstone et al., 2005).

7 In other words, more than one model fits the data, but this is the simplest fitting model that significantly explains the relationships between all the variables and in which all individual relationships are significant.

8 The relationship between gender and risks could not be omitted because the model would not fit statistically without it. The inclusion of the relationship between gender and opportunities was not necessary to reach good model fit. The relationships between gender and skills, use and access were not significant in explaining online opportunities and risks (although they were themselves interrelated). Thus, in explaining why teenagers experience risks and opportunities, the relationship between gender and these intermediating variables does not contribute significantly to model fit.

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