Digital literacy and online resilience as facilitators of young people's wellbeing? A systematic review

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Abstract

Previous studies suggest that online resilience, which is the capacity to bounce back from adversity by, for instance, coping with online risks in an effective way, and digital literacy serve as potential safeguards for young people against harmful consequences of negative online experiences. However, research on these factors largely resides in separate bodies of literature. By means of a systematic review, we aim to integrate the literature on young people's online resilience, digital literacy and wellbeing in the context of negative online experiences, and we examine the associations among them. The review of thirty empirical articles shows that negative online experiences undermine young people's wellbeing but are also essential to develop online resilience. While a limited number of studies have focused on the protective roles of online resilience and digital literacy, and on the link between these two factors, the review identified that more research is needed to establish whether this is truly the case. The review enables us to propose guidelines for further empirical research on the relations among young people's digital literacy, online resilience, and wellbeing.

Introduction

Parents, educators, and policy makers have expressed concern about the potentially harmful consequences of online risk experiences, such as cyberbullying and exposure to violent content for children and young people's wellbeing (Lwin, Li, & Ang, 2012). However, not all young people who encounter such experiences on the internet report feeling bothered or upset afterwards (Livingstone, Haddon, Görzig, & Ólafsson, 2011). A recent study showed that on average, only a quarter of European children and young people report having experienced something online that left them feeling bothered or upset (Smahel et al., 2020). The difference between the number of young people that experience online risks and the number of young people that actually report feeling harmed afterwards may at least partially be explained by their level of resilience to negative outcomes from internet use.

Resilience is a concept that finds its origin in developmental and socialization theories and is defined as the "positive adaptation that has been manifested in the face of negative experiences" (Masten & Gewirtz, 2006, p. 22). Resilience hence refers to positive psychological wellbeing in the context of harm after a risk experience. Some children may be more inclined to experience risk due to the presence of certain risk factors, or "measurable attributes of people, their relationships, or contexts associated with risk" (Masten & Gewirtz (2006, p. 22), such as the family context. In the resilience framework (Kumpfer, 2002), particular attention is directed towards promotive and protective factors that contribute to resilience by limiting the harmful outcomes of a negative experience. According to Masten & Gewirtz (2006, p. 22), promotive factors, sometimes also termed resources, are "measurable attributes of people, their relationships or contexts generally associated with positive outcomes or development, regardless of adversity or risk level". These assets are generally valuable for wellbeing, but may also counterbalance the potential effects of negative experiences.

Protective factors are defined as "measurable attributes of individuals, their relationships, or contexts particularly associated with positive outcomes or development in the context of risk or adversity" (Masten & Gewirtz, 2006, p. 22). Protective factors are hence different from promotive factors: promotive factors are resources that have beneficial effects in general, while protective factors have greater effects under risky circumstances than they do under more favorable conditions. As such, they moderate between the negative experience and its impact on the individual (Masten & Gewirtz, 2006). In this study, we seek to examine two factors that may shield young people from the potential harmful outcomes of negative online experiences. First, online resilience, in this study operationalized as the application of coping strategies, is investigated as a protective factor of wellbeing. Second, digital literacy is studied as a promotive factor of wellbeing. In this study, wellbeing is seen as more than happiness, life satisfaction, and positive psychological functioning, and instead concerns the balance point between an individual's resources and the challenges they face (Dodge, Daly, Huyton, & Sanders, 2012).

The first factor under study is online resilience, which has been described as "the ability to deal with a negative experience online" (Vandoninck, d'Haenens, & Roe, 2013, p. 60), or the ability to bounce back from online adversity by, for instance, applying adequate coping strategies, which serve as a protective factor of psychological wellbeing, moderating between the risk

experience and negative outcomes of the experience. Resilience is not a fixed trait but rather a dynamic process, and can only be developed through exposure to relatively stressful (yet ultimately manageable) situations. It is important to note that situations labeled as risky by parents or other adults are not necessarily perceived as negative experiences by the child itself (Livingstone, Mascheroni, & Staksrud, 2015). Following Luthar, Cicchetti and Becker (2000, p. 543), resilience is "a dynamic process encompassing positive adaptation within the context of significant adversity". In other words, the expectation is that initially vulnerable young internet users learn how to cope with negative situations and will gradually improve at adapting to future online stressors (Coleman & Hagell, 2007). These coping strategies are understood as "thoughts and behaviors to adapt to stressful or disturbing situations, in order to protect oneself from further psychological harm" (d'Haenens, Vandoninck, & Donoso, 2013, p. 2). Young people who have problem-solving coping strategies in order to deal with a situation and to protect themselves from future harm are likely to be resilient. These strategies can be communicative (i.e. seeking social support, such as talking to a parent or a friend) or proactive (i.e. strategies aimed at tackling the cause of the problem, such as deleting hurtful messages or reporting the problem). Young people who remain passive after an upsetting online experience, for example by simply closing the window or app on the screen where the experience took place, and hence avoid dealing with the problem, do not get the chance to practise future preventive or protective behaviors and as a result generally report less coping (Vandoninck et al., 2013).

The second factor that might safeguard young people from harm after a negative online experience relates to digital literacy, which is defined as "the skills, knowledge and attitudes that make learners able to use digital media (…) in a critical, responsible and creative manner" (Hatlevik, Gudmundsdottir, & Loi, 2015, p. 346). Digital literacy serves as a valuable resource for wellbeing in different areas in life, by providing opportunities in areas such as social contact or professional development, and which may also protect against potential negative outcomes of online risk experiences on wellbeing. Digital skills make up an important part of digital literacy, and Helsper, Schneider, Van Deursen, and van Laar (2020) distinguish between five types of digital skills in their Youth Digital Skills Indicator (yDSI): technical and operational skills, programming skills, information navigation and processing skills, communication and interaction skills, and content creation and production skills. However, it should be noted that digital literacy is broader than only digital skills, and also comprises more advanced critical, evaluative skills that are commonly referred to in the media literacy literature. While it might be expected that digital skills protect young people from negative online experiences, studies have shown that digitally literate young people generally encounter more – not fewer – risks online, also because they simply spend more time online than less digitally literate peers. Nonetheless, it is commonly assumed that young people can avoid the negative consequences of these risk experiences by acquiring and improving their digital skills, as pointed out by Sonck & de Haan (2014; 2013).

It should be noted that young people's online experiences and wellbeing as a result of these experiences cannot be isolated from their individual, social, and country-level contexts. Firstly, next to online resilience and digital literacy, other individual variables such as personality characteristics may contribute to young people's wellbeing after a negative online experience.

For instance, higher sensation-seeking, which is a personality trait linked to deliberately engaging in risky behavior, is associated to decreased feelings of harm after receiving a sexual message online (Livingstone & Görzig, 2014). Secondly, factors related to their social environment, such as the family composition, socio-economic background, and parental mediation of internet use have emerged as determinants of young people's negative online experiences (El Asam & Katz, 2018; Notten & Nikken, 2016). Lastly, country differences that emerged from previous research suggest that country-level factors (Notten & Nikken, 2016; Sonck & de Haan, 2013), for instance the policy concerning digital literacy, may play a role in young people's experiences of online risk. While the three levels are relevant when looking at resilience to harm from online risk experiences, the current study will predominantly review the evidence on the link between online resilience and digital literacy on the one hand, and wellbeing on the other from the individual-level perspective. Other individual, social, and country-level determinants are beyond the scope of this study.

While considerable scholarly attention has been directed towards young people's digital literacy, their online resilience and their wellbeing in the online environment, these investigations largely reside in separate bodies of literature. As a result, knowledge about the associations among these concepts is scarce, and an integrated framework including these associations is lacking. It is, however, essential to investigate these associations, as society cannot protect young people from online risks without also radically curtailing their online opportunities (Livingstone & Helsper, 2010). Identifying the factors that mediate between risk and harm in ways that minimize harm without impeding opportunities is therefore crucial, and - not surprisingly - considerable efforts are being devoted to developing media (or digital) literacy interventions and building online resilience so as to safeguard children and young people's wellbeing on the internet[1]. The current article aims to synthesize the existing literature on digital literacy, online resilience, wellbeing and online risk, as identified by means of systematic evidence mapping, into an integrated framework to guide further research. The discussion of the findings is guided by four main questions. First, does the experience of online risks predict wellbeing? Second, are there associations between, on the one hand, online resilience and online risks, and other the other hand, digital literacy and online risks? Third, do online resilience and/or digital literacy predict wellbeing in the context of online risks? Fourth, is there an association between digital literacy and online resilience?

Methods

Search strategy

This study adheres to the Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols (PRISMA-P) guidelines (Moher et al., 2015). Searches were performed using the Web of Science, ProQuest and Scopus databases. All searches took place within a two-week period (8th – 19th April 2019). We applied all the possible combinations of two and three of the four following search queries for the concepts of "online resilience", "digital literacy",

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[1] Notably through the European Commission's Better Internet for Kids Programme (originally, the Safer Internet Programme; Staksrud, 2013)

"psychological wellbeing" and "adolescents" (the latter was always included to define the research population), as including all four at once yielded extremely scarce search results:

1. ("online resilien*" OR "online vulnerab*" OR "online coping" OR "online protect*" OR "online victim*" OR "online risk")

2. ("digital litera*" OR "digital skills" OR "internet litera*" OR "internet skills" OR "media litera*" OR "online skills")

3. ("well-being" OR "wellbeing" OR "mental health" OR "social support" OR "self-efficacy" OR "life satisfaction" OR "self-esteem")

4. ("adolescen*" OR "youth" OR "teen*" OR "young people")

Inclusion criteria and data collection

The search queries in the three databases yielded a total of 1,379 studies. All titles and abstracts were reviewed according to the following pre-defined basic inclusion criteria: The studies had to be empirical and written in English; published in a peer-reviewed journal in the last ten years (between January 2009 and April 2019); of relevance to the topics that are studied; and concerned with young people. On this last point, in this study we include young people to be secondary school students (generally aged 12 to 18 years old). Studies that did not meet one or more of these requirements were excluded from further analyses. Sixty-two articles met all inclusion criteria and were subjected to full text review to assess whether they were suitable to answer the research questions. After removing duplicates, theoretical or review articles, and articles that, after full-text review, did not apply to our research questions, a total of 30 articles remained for the final systematic review. The following data were extracted from these articles: Title, author(s), year of publication, journal, study design, sample size, age range, concept(s) studied (digital literacy, online resilience, and/or wellbeing), and findings. Additionally, each study was assessed for its quality using the Weight of Evidence framework (Gough, 2007). Specifically, each study was evaluated based on its methodological trustworthiness and its relevance to the review. An overview of all selected studies is presented in Table 1 in the appendix. Table 2 in the appendix contains the assessment of the weight of evidence of the studies in the review. Table 3 in the appendix contains the checklist that was used to arrive at the quality assessment. Table 4 in the appendix contains an overview of the studies that underwent full-text review, but were ultimately excluded from the systematic review for reasons, along with the reasons for exclusion.

Results

Online risks and wellbeing

Of the thirty studies that were included in this review, nine involved the direct association between online risks and wellbeing. Various measures of wellbeing were employed, and they are worth noting in detail since the concept of wellbeing is widely discussed in relation to youth policy and practice, not always with sufficient clarity. One study captured mental wellbeing in general (McHugh, Wisniewski, Florida, & Rosson, 2017), using the classic Warwick Edinburgh Mental Well-Being Scale which assesses feeling useful, able to handle problems,

and optimism about the future. The remaining articles focused on specific aspects of wellbeing, including depressive mood (Modecki & Barber, 2013; Priebe & Svedin, 2012; Rose & Tynes, 2015), anxiety (Priebe & Svedin, 2012; Rose & Tynes, 2015; Van Den Eijnden, Vermulst, van Rooij, Scholte, & van de Mheen, 2014), self-esteem (Modecki & Barber, 2013; Priebe & Svedin, 2012), happiness (Keipi, Räsänen, Oksanen, Hawdon, & Näsi, 2018), life satisfaction (Keipi et al., 2018), self-coherence (Priebe & Svedin, 2012), and loneliness (Van Den Eijnden et al., 2014). These studies all used subjective indicators of wellbeing, and for the most part, wellbeing is assessed through its obverse, the lack of wellbeing or presence of indicators of mental ill-health. Two studies, by McHugh et al. (2018) and El Asam and Katz (2018), evaluated wellbeing using more objective measures, such as symptoms of post-traumatic stress disorder (PTSD), or potential vulnerabilities of young people that affect their wellbeing.

Overall, the research literature seems to support the hypothesis that there is a negative association between young people's online risk experiences and their wellbeing. This association varies from weak to medium strength in the different studies. Nine studies investigated wellbeing in relation to experiences of online risk in general. Using a diary study, McHugh et al. (2018) provided longitudinal evidence for a negative association between online risk experiences and wellbeing. Specifically, from the 222 online risk events that were reported in their diary study which took place over two months, about a third resulted in clinically diagnosable symptoms of PTSD. This association was weaker in the case of exposure to explicit content, but stronger in the case of cyberbullying. However, the effect was fairly short-lived – a matter of days not weeks, and this is attributable, according to the authors, to resilience among their teenaged sample, thereby arguing against the popular assumption that because young people keep their digital devices near them, they cannot easily escape the adverse consequences of online risk. They also suggest that youth agency is important, and that it is particularly the unwanted or unsolicited risks that result in more distress. El Asam and Katz (2018) studied wellbeing as a predictor for online risk experiences and concluded that young people who experience more offline vulnerabilities, including mental health difficulties, also encounter more risks on the internet. This finding is consistent with research that suggests that online vulnerability or resilience can, in large part, be explained by young people's life circumstances viewed holistically, rather than their online lives viewed in isolation.

Using cross-sectional methods, five of the seven remaining studies found that wellbeing was generally lower in young people who had encountered more risks on the internet. These associations are of weak or medium strength. The risks included sexual solicitations (McHugh et al., 2017), exposure to online hate (Keipi et al., 2018), meeting with strangers (Priebe & Svedin, 2012), exposure to explicit content (McHugh et al., 2017) and cyber-victimization (Keipi et al., 2018; B. McHugh et al., 2017; Modecki & Barber, 2013; Priebe & Svedin, 2012). Apart from the study by McHugh et al. (2018), which focused on general online risks and wellbeing, two additional studies found longitudinal evidence for an association between a specific type of online risks, online victimization, and wellbeing. Van Den Eijnden et al. (2014) concluded that online risks are weak but significant negative predictors for adolescents' subsequent wellbeing. Rose and Tynes (2015) found support for a weak but significant bidirectional association between cyber-victimization and young people's wellbeing. The researchers determined that young people who report higher levels of depression and anxiety

are more likely to be victimized on the internet, and that young people who are victimized report more depressive and anxious symptoms.

Online resilience and coping with negative online experiences

Fourteen out of the thirty studies in this review investigated online resilience, of which three employed qualitative methods (Jacobs, Goossens, Dehue, Völlink, & Lechner, 2015; Nansen, Chakraborty, Gibbs, Macdougall, & Vetere, 2012; Racatau, 2014) and eleven provided quantitative evidence. As for wellbeing, the concept of resilience is often treated rather loosely, and it is noteworthy that only the study by Hinduja and Patchin (2017) employed a validated scale to measure resilience, using a refined 10-item version of the Connor-Davidson Resilience Scale (Connor & Davidson, 2003) by Campbell-Sills and Stein (2007). The majority of studies, however, included the coping strategies that young people employ to prevent or deal with the negative consequences of online risk experiences as an indicator for online resilience. The studies by Vandoninck and d'Haenens (2015) and Vandoninck et al. (2013) employed both measures of perceived harm after an online risk and the use of coping strategies to deal with these experiences. McHugh et al. (2017) and Sonck and de Haan (2013) aimed to capture resilience by measuring the harm that young people reported after an online risk experience. Young people who reported less harm are considered to be more resilient than young people who reported more harm as a result of a negative online experience.

Different authors have suggested that online risk experiences and the coping behaviours used to deal with these experiences are necessary for young people to build their online resilience. Nansen et al. (2012) argued, based on their findings from ethnographic research on children's negative online experiences, that online risk experiences are essential for the development of online resilience. Similarly, McHugh et al. (2017) found that not all young people who are exposed to online risks report negative emotions afterwards. Hence, they argued that these young people may have built online resilience as they have learned coping strategies to reduce the feelings of harm that emerge after an online risk experience (McHugh et al., 2017). The study by Hinduja and Patchin (2017) supported these claims, as they found a medium-strength negative association between online resilience and cyberbullying victimization: young people who are more resilient are less often the victim of cyberbullying. As they conclude, "resilience is a potent protective factor, both in preventing experience with bullying and mitigating its effect" (p.51), leading the authors to identify and advocate for educational interventions to promote resilience (digital and more general) from an early age.

The majority of the studies on online resilience focused on the coping strategies that young people employ to deal with or to prevent the negative consequences of their online risk experiences. Qualitative evidence showed that young people generally are aware of the risks of the internet and have good knowledge about different coping strategies to stay safe online (Jacobs et al., 2015; Racatau, 2014). Ramos-Soler et al. (2018) provided quantitative evidence and concluded that 42% of young people use coping strategies to prevent harm from online risks. Racatau (2014) stated that young people mainly employ proactive coping strategies to avoid harm. However, Vandoninck and d'Haenens (2015) argued that the type of coping strategy used depends on the type of risk young people face. A few studies have focused on coping strategies to deal with specific types of risks. However, these findings seem to be mixed.

Concerning cyberbullying, Hudson et al. (2016) argued that cyber-victimization is weakly and negatively associated with the use of proactive coping strategies. Similarly, Jacobs et al. (2015) found that young people mainly cope with cyberbullying victimization in a passive manner. These findings were contrary to those of Soldatova and Zotova (2013), who determined that most young people preferred to employ proactive coping strategies to deal with cyberbullying. Concerning exposure to risky content, Soldatova and Zotova (2013) argued that young people mainly remain passive when they are exposed to sexual online content. It might be argued that young people react in this way when they feel they have few paths available to them for constructive action, or when they fear punishment or reprisals, and that parents, schools, health services and even digital providers could build their resilience and so mitigate harm by ensuring young people have access to proactive and effective responses to risk.

Digital literacy and negative online experiences

Thirteen out of the thirty studies in this review investigated digital literacy in the context of online risk experiences. In each of these studies, which are all of a quantitative nature, digital literacy was measured using self-report measures. The study by Staksrud et al. (2013) is the only study in this review that employed a unidimensional measure of digital literacy (in effect, a measure of digital self-efficacy) by asking young people to rate the statement "I know lots of things about using the internet" from not at all true to very true. The remaining twelve studies measured digital literacy using multiple items, recognizing the multidimensionality of digital literacy though generally operationalizing it in terms of digital skills. Three studies employed a dichotomous scale where the respondents had to indicate yes or no for each item (Notten & Nikken, 2016; Sevcikova, Serek, Barbovschi, & Daneback, 2014; Vandoninck, d'Haenens, & Donoso, 2010). A majority of studies adapted the Internet Skills Scale (ISS) by Van Deursen et al. (2016), which consists of different items measuring internet skills on a five-point Likert scale (Bahramian, Mazaheri, & Hasanzadeh, 2018; Cabello-Hutt, Cabello, & Claro, 2018; Livingstone, Ólafsson, Helsper, Lupianez-Villanueva, et al., 2017; Rodríguez-de-dios, van Oosten, & Igartua, 2018). Sonck and de Haan (2013) used a similar ten-point scale on which respondents rated their digital skills. Livingstone and Helsper (2010) used two questions to determine the respondents' digital literacy (or self-efficacy): how good the respondents claimed to be at certain online activities and their general rating of their online skills on a four-point scale ranging from beginner to expert. Vandoninck et al. (2013) calculated the mean score of the number of online activities young people took up and the number of online skills they reported to measure digital literacy.

It was expected that digitally literate young people possess the necessary skills to protect themselves from negative online experiences. However, the majority of studies found support for a positive rather than a negative association between digital literacy and online risk experiences: young people that reported higher levels of digital skills generally encounter more risks online. These associations ranged between a weak and medium strength. All researchers that studied digital literacy in the risky online environment agreed that young people with higher digital skill levels encounter more negative online experiences than do young people with lower digital skill levels (Livingstone, Ólafsson, Helsper, Lupiáñez-Villanueva, et al., 2017; Notten & Nikken, 2016; Rodríguez-de-Dios, van Oosten, & Igartua, 2018; Sevcikova et

al., 2014; Sonck & de Haan, 2013; Staksrud et al., 2013; Teimouri, Benrazavi, Griffiths, & Hassan, 2018; Vandoninck et al., 2010). This is likely because those with lower digital skills spend less time online altogether, and may be more cautious in their online activities. Some studies, however, nuanced these findings to help explain the unexpected direction of the association. Cabello-Hutt et al. (2018) and Livingstone and Helsper (2010) argued that the positive association between digital literacy and online risk experiences is indirect. They determined that young people with higher digital skill levels take up more opportunities on the internet, which in turn predicts increased online risk encounters. In other words, because risks and opportunities are themselves linked in the digital environment (for example, because searching or exploring or connecting with others online can be both empowering and hazardous), the digital skills that enable opportunities also, indirectly, result in increased risk exposure. Lee and Chae (2012) argued specifically that digital literacy serves as a moderator in the association between online opportunities and online risks, since their results showed that this association weakens as young people's digital skill levels increase.

Online resilience and digital literacy as protective and promotive factors of wellbeing

Only two studies clarified the link between young people's online resilience and their wellbeing. Using a diary method, McHugh et al. (2017) concluded that most young people are quite resilient to harm as a result of online risk experiences, as the weak and medium strength negative effects of online risks on young people's wellbeing were not enduring: while the young people in this study reported negative emotions immediately after the risk experience, their mood quickly stabilized in the weeks after the negative experience took place. A second study by McHugh et al. (2018), however, nuanced these findings, based on a weekly diary method conducted with teenagers over a two month period. This allowed the researchers to disentangle the direction of the association between reliance and wellbeing. Significantly, the authors found no evidence that the use of coping strategies protects against symptoms of PTSD when online risks are encountered. Instead, the authors concluded that these symptoms serve as predictors of coping: teens who experience greater symptoms engage more in active and communicative coping strategies. In short, they suggest that, consistent with a transactional approach to stress, coping behavior emerges as "a response to PTSD symptoms, rather than as a response to risk exposure" (p.1179).

The findings regarding the association between digital literacy and young people's wellbeing are mixed. Sonck and de Haan (2013) argued that the finding that young people with higher levels of digital literacy also experience more risks on the internet does not automatically imply that they also experience more negative consequences from these risks (in other words, more self-reported harm). Other studies corroborated these findings and found support for a weak positive association between digital literacy and young people's wellbeing: more digitally skilled young people generally report higher levels of wellbeing than less digitally skilled young people (Bahramian et al., 2018; Vandoninck et al., 2010). Staksrud et al. (2013), however, did not find evidence for an association between digital literacy and harm from online risk experiences.

Only a handful of studies have paid attention to the possible (indeed, plausible) association between digital literacy and online resilience. In general, these studies determined that this

association was positive. Young people with higher digital skill levels were found to be better at coping with online risk experiences and hence were more successful at avoiding or dealing with feelings of harm that result from these negative experiences, compared with young people who reported lower levels of digital literacy (Sonck & de Haan, 2013; Vandoninck et al., 2010; Vandoninck et al., 2013).

Discussion

By means of a systematic review, the current article aimed to discuss the state of the art of research on young people's digital literacy, online resilience, and wellbeing within the context of online risk experiences. Additionally, it sought to integrate this evidence to gain insight into whether online resilience and digital literacy function as respectively protective and promotive factors of young people's wellbeing in the face of negative online experiences, as outlined in the resilience framework (Kumpfer, 2002).

We will discuss the findings presented in the previous section guided by four main questions. The first question concerns the association between young people's online risk experiences and their wellbeing. The studies discussing wellbeing point towards the conclusion that negative online experiences undermine young people's wellbeing. Survey studies employing large, representative samples of young people as well as smaller-scale qualitative studies have reported evidence concerning the potential harmful effects of online risks on young people's wellbeing. Yet, this association emerged from the studies as being of weak or medium strength, and no strong association between online risk experiences and wellbeing was reported. For example, exposure to online hate material (Keipi et al., 2018), seeing explicit images (McHugh et al., 2017), or becoming the victim of cyberbullying (Modecki & Barber, 2013; Priebe & Svedin, 2012) were found to be associated with lower levels of wellbeing. Of particular importance is the finding that longitudinal evidence supports these claims, as young people who encounter a negative online experience generally report more mental health difficulties subsequently (Rose & Tynes, 2015; Van Den Eijnden et al., 2014). The bidirectionality of the association between cyber-victimization and wellbeing (Rose & Tynes, 2015) should be emphasized, as previous studies on resilience reported similar bidirectional relationships between the predictor (which in this context is the negative online experience), the competence to adjust, and the adjustment to the situation (Kumpfer, 2002). This conclusion serves as an important basis to explore the roles of digital literacy and online resilience as potential safeguards of young people's wellbeing in the context of online risk experiences, although the reciprocal dynamic found between online risk and wellbeing is also important to keep in mind.

Second, risk exposure seemed essential in the development and manifestation of online resilience in two ways. First, ethnographic and diary research confirmed the importance of exposure to risks as a chance for young people to display the correct coping behaviors that will prevent future harm (McHugh et al., 2017; Nansen et al., 2012). These coping strategies emerged as risk-specific and hence differ depending on the risk experience that young people are facing online (Vandoninck & d'Haenens, 2015). Indeed, the strength of the associations between online risk experiences and coping differed between weak and medium, with weaker associations relating to exposure to potentially harmful content and stronger associations concerning cyber-victimization. Additionally, from this review emerged that digitally literate

young people generally encounter more risks on the internet (e.g. Livingstone et al., 2017; Rodríguez-de-Dios et al., 2018).

Third, we expected that online resilience serves as a protective factor for young people's wellbeing when they are faced with an online risk experience. The studies by McHugh et al. (2018; 2017) confirm that coping with a negative online experiences significantly contributes to young people's wellbeing. Additionally, digital literacy functions as a promotive factor of wellbeing, providing beneficial outcomes in different areas of life but also shielding young people from harm as a result of online risk experiences. Yet, similar to the link between online resilience and wellbeing, the associations between digital literacy and wellbeing varied between weak and medium strength. This may be due to different operationalizations of digital literacy and wellbeing. Hence, while digitally literate young people are not better at avoiding negative online experiences than young people with rather limited digital skillsets, they seem to possess certain skills that allow them to avoid feelings of harm as a result of an online risk experience (e.g. Livingstone et al., 2017; Notten & Nikken, 2016).

The fourth question sought to understand whether digital literacy and online resilience are linked, as to find out whether improving digital literacy could aid young people in coping with negative online experiences. A scarce number of studies in this review introduce the association between digital literacy and online resilience, although this association emerged as rather weak. While digitally literate young people do not encounter less risk on the internet, they seem to be better able to avoid the harm, and hence protect themselves against the harm that can result from these negative experiences. Indeed, their greater digital skillset allows them to display more effective coping strategies that protect against harm to their wellbeing (Vandoninck et al., 2010; 2013).

The conclusions presented above should serve as a basis for further empirical research on the roles of online resilience and digital literacy as protective and promotive factors of young people's wellbeing from harm as a result of online risk experiences. Based on this, we propose three suggestions for further research. First, our systematic search did not yield any articles studying both digital literacy and online resilience as predictors of young people's wellbeing. Investigating these associations is, however, essential, as insights about the strengths of both associations in the same model allow for a comparison of effect sizes. This comparison would provide valuable input for researchers studying this topic and for experts and policy makers in the field, who do not always have the resources to support interventions aimed at improving both young people's digital literacy and their coping skills in order to protect and improve their wellbeing within the context of online risk experiences. Insights into the strengths of the size of the effect on wellbeing of both factors would facilitate decisions about how to prioritize the development of tools and interventions aimed at stimulating one or both factors. Second, only a handful of studies addressed the potential link between young people's digital literacy and online resilience, and suggested that digital skills could contribute to young people's skills to cope effectively with online adversity and hence protect their wellbeing in the face of online risk. However, future research should further explore this association. Third, based on the categorization of digital skills by Van Deursen et al. (2016), researchers should also explore the roles of different types (or dimensions) of digital skills in enhancing online resilience. It

may be that a general measure of digital literacy yields weak or even non-significant associations with online resilience due to opposing forces from different types of digital skills. Insights into the unique contributions of operational, information/navigation, social, creative, and mobile skills to young people's online resilience are now needed.

These findings not only contribute to knowledge but also promise valuable practical consequences. The importance of both online resilience and digital literacy is that they offer an alternative strategy to society's desire to protect, some would say overprotect, children online (Staksrud, 2013). Recognizing that inevitably young people will use the internet more and more and, hence, need ways to understand, evaluate and cope with what they find, this research opens up the possibility for educational and awareness-raising efforts that would support young people's agency online, thereby allowing regulators and industry to focus their protective efforts on mitigating the more severe risks. However, in order to fully support this approach, further research is needed to understand the relation between online resilience and digital literacy, and to be more confident of their role in mitigating any harms associated with online risk. Also important for future research and practice is extending our understanding of which young people are particularly vulnerable to online risks, whether because their initial skills, resilience or wellbeing are relatively low; these young people are likely to face other (i.e. offline) forms of disadvantage, and this should be examined in future research in combination with online factors. Taken together, the resulting knowledge should greatly advance the development of tools and interventions aimed at stimulating young people's online resilience and digital literacy, as experts will know which groups to target specifically.

This review has several limitations. First, searches were limited to articles published in English. Therefore, possibly relevant findings published in other languages are excluded from this review. Second, while we included different widely used terms for "digital literacy", "online resilience", and "wellbeing" in our search queries, it is possible that not all articles studying these concepts were included in the review due to their use of different or less-used terms. Lastly, we refrained from a quantitative meta-analysis due to heterogeneity in the samples, measures, and outcomes of the studies in the review. However, despite these limitations, this study adds a significant contribution to the literature as it is, to our knowledge, the first to integrate the research into a framework linking young people's wellbeing with their online resilience and digital literacy. This framework serves as a crucial step in broadening and deepening the available knowledge on the roles of digital literacy and online resilience in protecting and promoting young people's wellbeing within the context of online risks.

Conclusion

The current study aimed to map the state of the art of research on young people's digital literacy, online resilience, and wellbeing within the context of a risky online environment by means of a systematic review. Thirty articles studying these concepts were included in the review. Four conclusions were drawn. First, online risk experiences pose threats to young people's wellbeing. Second, online resilience and digital literacy were related to online risk experiences. Third, online resilience, or the ability to cope proactively with a negative online experience, seems to protect young people's wellbeing from these threats. Similarly, it is suggested that digital literacy functions as a promotive factor protecting young people's

wellbeing when faced with an online risk. Lastly, a few studies suggested that digital literacy and online resilience may be linked. An integration of the evidence from the review is discussed, together with implications and suggestions for further research and practice.

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Table 1. Overview of studies included in the review

Author(s)	Sample size	Age	Method	Concept(s) studied	Finding(s)
Bahramian et al. (2018)	N = 139	13 to 15 years old	Survey	Digital literacy Wellbeing	- Weak positive correlation (r = .16, p < .05) between digital literacy and wellbeing.
Cabello-Hutt et al. (2018)	N = 1694	11 to 17 years old	Survey	Digital literacy	- Medium positive association (β = .25, p < .01) between digital literacy and online opportunities. - Weak indirect positive association (β = .06, p < .01) between digital literacy and online risks (through online opportunities).
El Asam & Katz (2018)	N = 2988	10 to 16 years old	Survey	Wellbeing	- Medium positive associations between offline vulnerabilities and online risk experiences.
Hinduja & Patchin (2017)	N = 1204	12 to 17 years old	Survey	Online resilience	- Medium negative association (β = -.46, p < .05) between resilience and cyberbullying victimization.
Hudson et al. (2016)	N = 763	14 to 21 years old	Survey	Online resilience	- Weak negative correlations between cyber-victimization and the use of certain privacy settings as coping strategies (limiting visibility of personal information (r = -.09, p < .05) and posts and comments (r = -.16, p < .01)).
Jacobs et al. (2015)	N = 66	12 to 15 years old	Focus groups	Online resilience	- Young people mainly cope with cyberbullying in a passive manner.
Keipi et al. (2018)	N = 1569	15 to 30 years old	Survey	Wellbeing	- Weak negative association (β = -.10, p < .05) between exposure to online hate material and wellbeing. - Weak negative association (β = -.14, p < .01) between online victimization and wellbeing.
Lee & Chae (2012)	N = 566	10 to 15 years old	Survey	Digital literacy	- Digital literacy weakly moderates the association between online activities and online risks (β = -.11, p <

					.01): association weakens for children with higher skill levels.
Livingstone & Helsper (2010)	N = 789	12 to 17 years old	Survey	Digital literacy	- Medium positive association (β = .38, p < .05) between digital literacy and online opportunities. - Weak indirect positive association (β = .19, p < .05) between digital literacy and online risks (through online opportunities).
Livingstone et al. (2017)	N = 6400	6 to 14 years old	Survey	Digital literacy	- Weak positive association (β = .19, p < .05) between digital literacy and online opportunities. - Weak positive association (β = .09, p < .05) between digital literacy and online risk experiences.
Lwin et al. (2012)	N = 537	12 to 19 years old	Survey	Online resilience	- Medium positive association (β = .42, p < .001 between coping self-efficacy beliefs and intention to engage in online protection behavior.
McHugh et al. (2017)	N = 68	13 to 17 years old	Diary method	Wellbeing Online resilience	- Medium positive association (β = .46, p < .01) between cyberbullying victimization and negative affect. - Weak positive association (β = .16, p < .05) between exposure to explicit content and negative affect. - Young people show online resilience: their mood stabilized rather quickly after online risk experiences.
McHugh et al. (2018)	N = 75	13 to 17 years old	Diary method	Online resilience Wellbeing	- Medium positive association (β = .35, p < .01) between online sexual solicitation and symptoms of PTSD. - Declines in wellbeing, instead of risk exposure itself, cause young people to engage in coping behavior.
Modecki & Barber (2013)	N = 1364	12 to 14 years old	Survey	Wellbeing	- Negative association between self-esteem and cyber-perpetration and -victimization. - Positive association between depressed mood and cyber-perpetration and -victimization.

Nansen et al. (2012)	N = 5 (families)	6 to 10 years old	Ethnographic study	Wellbeing Online resilience	- Children feel harmed when others attack them online, which presents risks to emotional and psychological wellbeing. - Experiencing these risks allows for the development of competences to deal with these risks.
Notten & Nikken (2016)	N = 8554	14 to 16 years old	Survey	Digital literacy	- Weak positive association (β = .13, p < .001) between digital literacy and online risk-taking.
Priebe & Svedin (2012)	N = 3432	16 to 22 years old	Survey	Wellbeing	- Positive association (OR = 2.9, p < .001) between cyber-victimization and psychiatric symptoms.
Racatau (2014)	N = 24	9 to 16 years old	Focus groups	Online resilience	- Young people use preventive measures to avoid being harmed by online risks.
Ramos-Soler et al. (2018)	N = 865	10 to 17 years old	Survey	Online resilience	- 42% of young people is part of "the prudent group", who are aware of online risks and take preventive measures to avoid being harmed.
Rodriguez-de-Dios et al. (2018)	N = 1446	12 to 18 years old	Survey	Digital literacy	- Weak positive association (β = .15, p < .01) between digital literacy and online risk experiences.
Rose & Tynes (2015)	N = 559	12 to 18 years old	Survey	Wellbeing	- Bidirectional weak positive relationship between cyber-victimization and depression (cv – dep: β = .15, p < .01; dep – cv: β = .21, p < .01) - Reciprocal weak positive relationship between cyber-victimization and anxiety (cv – anx: β = .10, p < .05; anx – cv: β = .15, p < .01).
Sevcikova et al. (2014)	N = 11712	11 to 16 years old	Survey	Digital literacy	- Positive association (OR = 1.15, p < .01) between digital literacy and exposure to risky sexual content.

Soldatova & Zotova (2013)	N = 1025	9 to 16 years old	Survey	Online resilience	- Most young people prefer active coping strategies to deal with cyberbullying. - Most young people use passive strategies to deal with exposure to sexual content.
Sonck & de Haan (2013)	N = 19406	11 to 16 years old	Survey	Digital literacy	- Weak positive association (β = .09, p < .001) between digital literacy and online risk experience.
Staksrud et al. (2013)	N = 15420	9 to 16 years old	Survey	Digital literacy	- Positive associations (all OR's > 1 and p < .05) between digital literacy and online risk experience. - No association between digital literacy and harm from online risks.
Teimouri et al. (2018)	N = 420	9 to 16 years old	Survey	Digital literacy	- Medium positive association (β = .46, p < .001) between digital literacy and risky online activities.
Van Den Eijnden et al. (2014)	N = 831	11 to 15 years old	Survey	Wellbeing	- Weak positive association between loneliness and online victimization (β = .09, p < .05) and weak negative association between online victimization and loneliness (β = -.13, p < .05).
Vandoninck & d'Haenens (2015)	N = 2046	10 to 16 years old	Survey	Online resilience	- The type of risks young people face online determines the coping strategies they will employ.
Vandoninck et al. (2010)	N = 815	15 to 19 years old	Survey	Online resilience Digital literacy	- Positive association between digital literacy and online risk experience. - Young people mainly use preventive coping strategies.
Vandoninck et al. (2013)		Mean age = 12 years old	Survey	Online resilience Digital literacy	- Association between digital literacy and use of coping strategies for different types of risks. - E.g. negative association (OR = .22) between digital literacy and passive coping after sexting.

Table 2. Assessment of weight of evidence

Author(s)	Methodological trustworthiness	Relevance to the review
Bahramian et al. (2018)	Medium	High
Cabello-Hutt et al. (2018)	High	Medium
El Asam & Katz (2018)	High	Medium
Hinduja & Patchin (2017)	High	Medium
Hudson et al. (2016)	High	Medium
Jacobs et al. (2015)	Medium	Medium
Keipi et al. (2018)	High	Medium
Lee & Chae (2012)	Medium	Medium
Livingstone & Helsper (2010)	High	Medium
Livingstone et al. (2017)	High	Medium
Lwin et al. (2012)	Medium	Medium
McHugh et al. (2017)	Medium	High
McHugh et al. (2018)	Medium	High
Modecki & Barber (2013)	High	Medium
Nansen et al. (2012)	Medium	High
Notten & Nikken (2016)	High	Medium
Priebe & Svedin (2012)	Medium	Medium
Racatau (2014)	Medium	Medium
Ramos-Soler et al. (2018)	Medium	Medium
Rodriguez-de-Dios et al. (2018)	High	Medium
Rose & Tynes (2015)	High	Medium
Sevcikova et al. (2014)	High	Medium
Soldatova & Zotova (2013)	Medium	Medium
Sonck & de Haan (2013)	High	Medium
Staksrud et al. (2013)	High	Medium
Teimouri et al. (2018)	Medium	Medium
Van Den Eijnden et al. (2014)	Medium	Medium
Vandoninck & d'Haenens (2015)	Medium	Medium
Vandoninck et al. (2010)	Medium	High
Vandoninck et al. (2013)	Medium	High

Notes:

Criteria for the assessment of methodological trustworthiness: study design, context, sampling, data collection, data analysis, claims and evidence

Criteria for the assessment of relevance: study one central concept in relation to risks (= medium score), study association between two or more concepts (= high score)

Table 3. Checklist quality assessment (Weight of Evidence)

1. Methodological trustworthiness	
Criteria	Considerations
Design	Is an adequate study design used to answer the research questions? Is the design rigorous?
Context	Is the context in which the research was conducted clearly described?
Sampling	Is the sampling strategy clearly described and appropriate?
Data collection	Is the process of data collection clearly described and appropriate?
Data analysis	Is the data analysis strategy clearly described and appropriate?
Claims and evidence	Are the claims and the evidence to support these claims grounded in sufficient and appropriate data?
2. Relevance to the review	
How relevant is the study to the review? To what extent does the study cover online resilience, digital literacy, or wellbeing in the face of negative online experiences? To what extent does the study cover the associations between online resilience, digital literacy, and wellbeing in the face of negative online experiences?	

For each study, the criteria were considered and an overall score of "low", "medium", or "high" was assigned.

Table 4. Overview of studies subjected to full-text review but excluded from the final review

Author(s)	Title	Reason(s) for exclusion
Barbovski & Marinescu (2011)	Being in contact with strangers: Teenagers' exploration of alternative identities online	- Focus only on risk experience and not association with wellbeing, online resilience, or digital literacy
Cao & Lin (2015)	How do victims react to cyberbullying on social networking sites? The influence of previous cyberbullying victimization experiences	- Focus on bystander reaction strategies to cyberbullying
Ferrari (2013)	DIGCOMP: A framework for developing and understanding digital competence in Europe	- Framework of digital competence; online risks, online resilience or wellbeing not included
Görzig (2016)	Adolescents' experience of offline and online risks: Separate and joint propensities	- Focus on online risk experiences, not association with online resilience, digital literacy, or wellbeing
Hatlevik et al. (2015)	Predictors of digital competence in 7th grade: A multilevel analysis	- Association of digital competence with risk experiences, online resilience, or wellbeing was not tested
Hatlevik et al. (2018)	Students' ICT self-efficacy and computer and information literacy: Determinants and relationships	- Association of digital competence with risk experiences, online resilience, or wellbeing was not tested
Jacobs et al. (2014)	Determinants of adolescents' ineffective and improved coping with cyberbullying: A Delphi study	- Delphi study with experts
James et al. (2017)	New challenges in adolescent safeguarding	- Review article instead of empirical study
Jonsson et al. (2015)	Online sexual behaviours among Swedish youth: Associations to background factors, behaviours and abuse	- Minimum age is 16, does not include larger range of secondary school age (12 to 18)
Lough et al. (2015)	Mapping real-world to online vulnerability in young people with developmental disorders: Illustrations from autism and Williams syndrome	- Review article instead of empirical study
Machackova et al. (2013)	Effectiveness of coping strategies for victims of cyberbullying	- Focus on effectiveness of coping strategies, not on association with digital literacy or wellbeing

Navarro et al. (2018)	Differences between preadolescent victims and non-victims of cyberbullying in cyber-relationship motives and coping strategies for handling problems with peers	- Age of sample is too young (10 to 12 years old)
Pereira & Matos (2016)	Cyber-stalking victimization: What predicts fear among Portuguese adolescents?	- Focus on experience with cyber-stalking, not on association with online resilience, digital literacy, or wellbeing
Pereira et al. (2016)	Cyber-harassment victimization in Portugal: Prevalence, fear and help-seeking among adolescents	- Focus on risk experience, not on association with online resilience, digital literacy, or wellbeing
Resnik & Bellmore (2019)	Connecting online and offline social skills to adolescents' peer victimization and psychological adjustment	- Measure of peer victimization also includes offline victimization
Savimäki & Kaakinen (2018)	Disquieted by online hate: Negative experiences of Finnish adolescents and young adults	- Focus on risk experience, not on association with online resilience, digital literacy, or wellbeing
Singh (2018)	Mapping online child safety in Asia and the Pacific	- Review article instead of empirical study
Soldatova & Rasskazova (2016)	Adolescent safety on the internet	- Sample includes children younger than 12 years old - Focus on risk experience, not on association with online resilience, digital literacy, or wellbeing
Sumter & Baumgartner (2017)	Psychosomatic complaints in adolescence: Untangling the relationship between offline and online peer victimization, psychosomatic complaints and social support	- Focus on psychosomatic complaints rather than psychological wellbeing
Van Ingen & Matzat (2019)	Inequality in mobilizing online help after a negative life event: the role of education, digital skills, and capital- enhancing Internet use	- Minimum age is 16, does not include larger range of secondary school age (12 to 18)
Van Ingen et al. (2016)	Online coping after negative life events: Measurement, prevalence, and relation with internet activities and well-being	- Minimum age is 16, does not include larger range of secondary school age (12 to 18)
Youn (2009)	Determinants of online privacy concern and its influence on privacy protection behaviors among young adolescents	- Focus on concern about risk and not actual risk experience
Zilka (2018)	eSafety and sharing habits with family and friends among children and adolescents	- Focus on digital literacy, not on association with online risk experience, online resilience, or wellbeing