

“Preventative” vs. “Reactive:” How Parental Mediation Influences Teens’ Social Media Privacy Behaviors

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ABSTRACT

Through an empirical, secondary analysis of 588 teens (ages 12 – 17) and one of their parents living in the United States, we present useful insights into how parental privacy concerns for their teens and different parental mediation strategies (direct intervention versus active mediation) influence teen privacy concerns and privacy risk-taking and risk-coping privacy behaviors in social media. Our results suggest that the use of direct intervention by itself may have a suppressive effect on teens, reducing their exposure to online risks but also their ability to engage with others online and to learn how to effectively cope with online risks. Therefore, it may be beneficial for parents to combine active mediation with direct intervention so that they can protect their teens from severe online risks while empowering teens to engage with others online and learn to make good online privacy choices.

Author Keywords

Adolescent online behavior; parental involvement; privacy

ACM Classification Keywords

K.4.1 [Public Policy Issues]: Ethics, Human safety, Privacy

General Terms

Human Factors; Theory; Design.

INTRODUCTION

According to Pew Research, 95% of American teens between the ages of 12 and 17 are online [34], and 81% of online teens use some kind of social media, such as Facebook or Twitter. These teens are sharing more personal information about themselves through social media sites than ever before, yet report relatively low levels of privacy

concern [33]. In contrast, 81% of their parents are “somewhat” to “very” concerned about their teens’ online privacy [31]. In this paper, we explore the co-influences of parental privacy concerns and mediation strategies on teens’ privacy concerns and social media privacy behaviors, including both risk-taking and risk-coping behaviors. We do this through a secondary analysis of the 2012 Pew Research Center’s Internet and American Life Project’s *Teens and Privacy Management Survey* of 588 teen (ages 12 – 17) and one of their parents living in the United States. The nationally representative data were collected from July 26 to September 30, 2012 [31-34].

Through an empirical analysis of this large-scale survey data, we developed useful insights into how parental privacy concerns for their teens and different parental mediation strategies may influence teen privacy concerns and social media privacy behaviors on Facebook. We identify and examine two types of parental mediation strategies from the 2012 Pew survey: 1) *direct parental intervention* through the use of parental controls and/or reading and setting up a teen’s social media privacy settings for him or her; and 2) *active parental mediation* which includes talking with the teen about what he or she posts, reviewing information the teen posts, and/or commenting on or responding to posts made by the teen on Facebook. We found that parental privacy concerns are significantly and positively associated with teen privacy concerns, as well as both types of parental mediation strategies.

We also examine two types of teen social media privacy behaviors: 1) *privacy risk-taking behaviors*, which include teens’ sharing of *basic information* (e.g. photos, real name, birth date, and relationship status), sharing of more *sensitive information* (e.g. videos of him or herself, cell phone number, email address, etc.), and partaking in *risky interactions* (e.g. online communication with strangers, regrettable information disclosures, and automatic location sharing); and 2) *privacy risk-coping behaviors*, which include *seeking advice* from others and taking

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remedy/corrective measures, such as posting fake information, deleting posted content, blocking or deleting individuals, and/or deactivating one's account.

We found that direct parental intervention is significantly and negatively associated with teens' basic information disclosures and remedy/corrective behaviors, but positively associated with advice-seeking. This suggests that when parents are directly involved in teens' social media disclosure decisions, teens tend to be more risk-averse in disclosing basic information online and seek more advice on how to manage their online privacy, thereby preventing the need to take remedy or corrective actions. In contrast, we found parental active mediation to be positively associated with teens' disclosure of sensitive information and remedy/corrective behaviors. This suggests that active parental mediation may afford teens a higher level of autonomy to make more risky disclosure decisions but also encourages teens to learn from their mistakes and take corrective actions to protect their online privacy in a more reactive fashion. We further compare and contrast the apparent "preventative" versus "reactive" motivations behind these two parental mediation strategies and investigate how they influence teen outcomes. Our results suggest that the use of direct intervention alone may have a suppressive effect on teens, reducing their exposure to online risks but also their ability to engage with others online and to learn how to effectively cope with online risks. Therefore, it may be beneficial for parents to combine active mediation with direct intervention so that they can protect their teens from severe online risks while empowering them to benefit from online engagement and make good online privacy choices.

BACKGROUND

Technology use and the coordination of use within the context of families and between parents and teens have become important areas of interest within the CSCW community [1]. For instance, CSCW researchers have examined how teens use instant messaging for interpersonal communication [18], how teens interact with social media [25], how and why teens use video chat [7], what teens ask their online social networks [16], and how parenting influences teen moral judgments regarding various online behaviors [46]. A common theme that emerges across all of these studies is that teens benefit from technology use and online engagement; however, doing so also exposes them to privacy-related risks. In terms of privacy, the CSCW community has also established that a fundamental social-technical gap exists between how individuals manage the dissemination of personal information in everyday social situations versus how this is done explicitly through the use of technology [2]. Systems do not provide the flexibility, nuance, or ambiguity inherent in normal social situations and instead often require users to make intentional and complex disclosure decisions [2].

This gap only widens when socially developing adolescents are the ones making difficult information disclosure decisions when they engage with others through social media. Researchers have confirmed a disconnect or "privacy paradox" between teens' stated privacy concerns, level of awareness, and the vast amounts of information they continue to share through social media [4, 25]. Yet, relatively few CSCW studies have solely focused on understanding the extent of this privacy gap and finding ways to address it. The majority of studies in this space [7, 16, 18] employ qualitative approaches with small samples of teens to understand more generally how teens use various communication technologies and report privacy implications as one of their many nuanced findings. Thus, we extend the extant literature by conducting an in-depth analysis specifically to examine teens' privacy concerns and social media privacy behaviors in relation to parental privacy concerns and mediation strategies.

Even outside of the CSCW community, relatively few U.S.-based, large-scale, nationally representative surveys have been conducted to understand adolescent online privacy risks and online disclosure behaviors and experiences. One of the most recent and notable surveys was the *Teens and Privacy Management Survey* conducted by Pew Research Center's Internet and American Life Project in 2012 [31-34] that focused on teens' social media privacy management behaviors. Data were originally obtained through Random Digit Dial (RDD) telephone interviews with a sample of 802 teens aged 12 - 17 years, and their parents living in the United States. To ensure a nationally representative sample, the data were collected to match national parameters for both parent and teen demographics [31].

This survey collected dyadic-level data from both parents and teens regarding social media use, privacy concerns, parental mediation strategies, and teen social media privacy behaviors [31-34]. Pew Research's initial reports mainly focused on descriptive characteristics of the teen data and the parental data separately; however, they did uncover some initial trends between parent and teen factors. For instance, parents of younger teens were more concerned about their teens' online privacy than parents of older teens and were also more likely to employ the use of parental controls [31]. Meanwhile, younger teens were more likely to seek advice from their parents on how to manage their online privacy than older teens [32]. However, to date, Pew Research has not published an in-depth report on how parental privacy concern and mediation strategies relate directly to teen privacy concerns and social media privacy behaviors. Fortunately, given the dyadic-level data published publically by Pew Research, we were able to further analyze this data set to understand how parental factors are related to teen social media privacy concerns and behaviors.

CONCEPTUAL FRAMEWORK

To group items from the Pew survey conceptually and build an empirically testable framework, we drew from relevant constructs previously explored in adolescent online safety and developmental psychology literature. Building from that understanding, we performed data reduction techniques on the survey responses to build statistically stable factors [44] that were consistent with past theoretical constructs. Factors that were statistically robust were added as constructs to our research framework below and kept for further analysis; items that did not load sufficiently with the emergent factors or that lacked clear theoretical basis were removed from our analysis. In this section, we present the conceptual foundations of our framework. Later, in the methodology section, we will provide further details on how statistically robust constructs were developed to empirically test the salient relationships between constructs in our conceptual framework.

Privacy Concern

Privacy concern has often been measured in privacy research as a proxy measure for information privacy and shown to be one of the strongest predictors of privacy-related behavior [12, 35, 41, 47]. However, very few studies have examined how parental and/or teen privacy concerns about technology use relate to teens' subsequent online behaviors. While past literature consistently suggests that parental concerns over teen online safety are high [19, 31, 42] and teen privacy concerns are low relative to those of their parents [33], very little research helps explain how privacy concerns relate to parental mediation strategies or teen online privacy behaviors. For example, Crossler et al. found no evidence of a relationship between parental concerns for information privacy and their awareness of privacy regulations or perceived privacy risks for their teens [8]. Thus, in our model, we wanted to explore the relationship between parental and teen privacy concerns, different parental mediation strategies, and teen social media privacy behaviors in more depth.

Parental Mediation Strategies

Most of the *parental mediation strategies* examined in past research were originally derived from Valkenburg et al.'s parental mediation strategies for regulating children's television viewing. These included instructive (active) mediation, restrictive mediation, and social co-viewing (monitoring) [45]. With respect to online interactions, *active mediation* has been adapted to mean interaction and discussions between parents and teens regarding online activities; *restrictive mediation* occurs through rules and limits placed on a teen's online activities; and *monitoring* is non-interactive surveillance of a teen's online activities, such as checking text messages or web browser history [28]. Some studies have also included *technical mediation* as a mediation strategy, for example the use of parental monitoring software applications [14, 28].

In our model, we examine two types of parental mediation strategies. The first strategy is *direct parental intervention* through the use of parental controls and/or reading and setting up a teen's social media privacy settings for him or her. Direct parental intervention strategies reflect more *restrictive* parenting and the use of *technical mediation* in order to proactively and directly intervene in teens' social media privacy decisions.

The second type of parental mediation strategy we examine is *active mediation*, which includes parents talking with their teens about what they post, reviewing information teens post, and/or commenting or responding to posts made by their teens on Facebook. These strategies tend to reflect *more instructive (active)* and *monitoring*-based strategies used by parents as a way to guide their teens' online behaviors as these behaviors occur. Parental active mediation allows teens to be more experiential and reflective because their parents are not attempting to directly control their social media privacy behaviors.

We expect that direct parental intervention and active mediation will function to influence teen privacy behaviors in different ways. For instance, past research has found that active mediation is more effective than restrictive mediation because it allows teens to better interpret their media experience [11], and it better educates teens as media consumers, especially in highly interactive environments such as the Internet [23]. We also note that parents may choose to employ none, one, or both of these parental mediation strategies when attempting to mediate their teens' online privacy behavior. Therefore, we later explore the potential interaction effects for when these two strategies are used in isolation or combined.

Teen Privacy Risk-Taking Behaviors

Teens are by nature sensation-seeking and more likely to take greater risks than children and adults [26]. Therefore, a number of studies have focused on ways parents can mitigate teen risk-taking behaviors and experiences, thus viewing adolescent online safety through a lens of risk-adversity, or shielding teens from online risks. As such, the two most prominently studied dependent variables in this stream of research include attempting to reduce teens' propensity to disclose personal information online and limiting their exposure to online risks. Many past studies have been interested in understanding how parental mediation can reduce teen exposure to online risks; teen risk experiences examined in past research include but are not limited to exposure to unwanted sexual materials or pornographic imagery, harmful user-generated content, sexual solicitations, and online harassment or cyberbullying [13, 30, 36-38, 40].

However, the Pew survey focused specifically on teens' privacy-related risks in social media. Therefore, in our framework, we specifically examine three types of teen privacy risk-taking behaviors in social media: *Basic*

information disclosures include basic information sharing, such as sharing one's real name or relationship status through social media. *Sensitive information disclosures* involve more intimate disclosures, such as personal videos and direct forms of contact information, such as cell phone number and email address. We also examine *risky interactions* that teens report experiencing through social media, such as communicating online with strangers, viewing inappropriate ads, automatic location sharing, and other regrettable interactions.

Some past studies have discovered interesting associations between parental mediation strategies and teens' information disclosure decisions. For instance, explicit parental restrictions against giving out personal information online have actually been associated with a higher likelihood that teens disclose such personal information [29]. Shin et al. [40] confirmed from a sample of parents and teens in Korea that parental mediation was not significantly related to tweens' (ages 9 – 12) willingness to disclose personal information online, although the larger the discrepancy between parental and tween perceptions of online restrictive mediation, the more willing tweens were to make online disclosures.

The relationship between parental mediation strategies and the risky interactions teens engage in through social media have also been examined, but often in conjunction with other types of risk exposure. Livingstone and Helsper [29] found that parental mediation strategies were ineffective or non-significant in terms of reducing teen online risk exposure, including exposure to pornography, violence, privacy, and contact-related risks. Later, Dürager and Livingstone [13] actually found a positive correlation between parents talking to their teens about their online safety and various types of teen risk exposure, including pornography, cyberbullying, contact with unknown others; they suggest that these discussions may have occurred as a consequence of risk exposure, not as a causal agent. Also, active mediation of Internet use and restrictive mediation were found to be negatively associated with teen risk exposure; however, restrictive mediation reduced risk exposure by limiting the overall time a teen spent online, thereby also reducing potential opportunities that teens may garner from online engagement [13]. Technical monitoring was found to have either a non-significant [13] or relatively weak negative association with online risk exposure, reducing risk exposure but also potentially reducing teen Internet proficiency [30].

These past studies tend to frame teen online risk experiences using a broader conceptualization of risks as exposure, which implies a sense of teen victimization or lack of agency. However, our research focuses specifically on teens' social media privacy-related risk-taking behaviors, which include their self-reported basic information disclosures, sensitive information disclosures, and risky interactions. Given the conceptually varied and

often counter-intuitive results found in past research regarding teen online risk experiences, we believe that further examination of how parental mediation strategies are related to these specific teen social media risk-taking privacy behaviors is warranted.

Teen Privacy Risk-Coping Behaviors

In literature, very few studies have attempted to better understand teen online protective or risk-coping behaviors that occur in response to risk exposure, as opposed to attempting to prevent teens' exposure to online risks. D'Haenens et al. [10] was one of the first studies to point out that teens' exposure to online risks did not necessarily equate to harm. In fact, the ways in which teens responded to or chose to cope with negative online experiences ultimately influenced whether or not they were bothered by online risk exposure. They found that teens who took *risk-coping behaviors*, such as talking to someone or taking proactive, problem-solving approaches when confronted with a problem tended to be less upset about a negative online experience than teens who took a more fatalistic or passive approach [10]. This finding is consistent with developmental psychology theory, which explains that resilience is the process of overcoming negative effects of risk exposure and successfully adapting, despite challenging or threatening circumstances. Importantly, resilience cannot be expressed without risk [43]. From this perspective, restricting teens' risk experiences too drastically might actually be detrimental, stunting their developmental growth [5-6].

Similarly, parents cannot shield their teens from all negative online experiences without also limiting the potential for positive online experiences that promote their teens' developmental growth. Therefore, instead of focusing on teen risk-taking behaviors as our dependent variable of interest, we focus on factors that may contribute to teen risk-coping behaviors when confronted with online risks. The Pew survey focused specifically on teens' privacy-related risks in social media. Therefore, we examine two types of privacy risk-coping behaviors: The first is *advice-seeking*, which is a communicative process wherein teens solicit advice from others on how to manage their online privacy; the second is *remedy/corrective behaviors*, which are problem-solving actions teens take to protect their online privacy.

Figure 1 depicts a summary of the constructs represented in our conceptual framework. From extant literature, we know very little about the salient relationships among parental privacy concerns, parental mediation strategies, teen privacy concerns, and teen privacy risk-taking versus risk-coping behaviors. Because past research has provided very few consistent insights regarding the potential significant relationships between our constructs and because our goal was to develop a conceptual framework through an exploratory analysis of the data, we did not hypothesize specific relationships between our constructs prior to our

analysis. However, we do expect to see some general trends based on past research findings. For instance, consistent with more traditional risk avoidance approaches to adolescent online safety, we expect direct parental intervention to be associated with fewer teen risk-taking behaviors. Conversely, we expect active mediation to function more reactively, being triggered by teens' risk behaviors and encouraging teens to take more risk-coping measures in order to mitigate these risks. We test these general propositions in our empirical analyses.

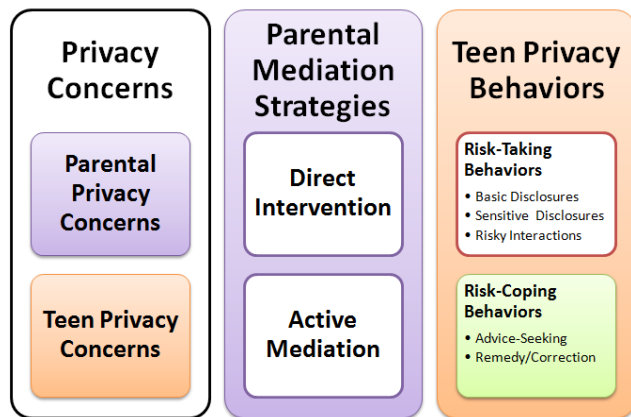


Figure 1: Conceptual Framework

METHODOLOGY

Pew Data Set

We conducted a secondary analysis of an existing, open-source data set¹ collected from July 26 to September 30, 2012, prepared by the Princeton Survey Research Associates International, and provided publicly by the Pew Research Center's Internet and American Life Project [31]. The Pew data set included paired responses from parents and teens regarding general Internet usage, social media usage, privacy concerns, parental mediation strategies, teen online privacy management behaviors, demographic variables, and more. Many of the questions were specific to various privacy management strategies teens employed for different social media platforms, such as Facebook, Twitter, and Instagram. Ninety-four percent of teens reported having an active Facebook account, followed by 26% with a Twitter account, 11% with an Instagram account, and so forth [31]. Given the high prevalence of teens with active Facebook accounts, our analysis eliminated responses from teens who did not report having a Facebook account and focused on privacy behaviors associated with their Facebook usage.

Operationalizing Constructs

A latent factor of parental privacy concern was constructed based on relevant ordinal-level items, and the Cronbach's

alpha was reported as an indication of internal consistency [27, 44]. To construct factors of the other dichotomous items ("yes" or "no" questions) measuring parental mediation strategies, teen privacy risk-taking behaviors, and teen privacy risk-coping behaviors, we utilized categorical principal component analyses (CATPCA). Similar to classic principal component analysis, CATPCA is used specifically for assessing the dimensionality of dichotomous or categorical variables [20]. To assess the reliability of these factors, Eigenvalues were reported and compared to the standard CATPCA criterion of being greater than one [22, 27]. After confirming that the resulting CATPCA factors were robust and aligned with past theoretical conceptualizations, we created additive indices for each factor and used these indices in our structural analysis.

Privacy Concerns

Parental privacy concern was measured with four questions asking parents how much they were concerned (on a 4-point scale from "not at all concerned" to "very concerned") about their teens' technology usage when it came to how their teens managed their reputation online, how much information third parties could learn about their teens, how their teens interacted with strangers, and how their teens' online behaviors might affect their academic or employment future. A reliability test indicated acceptable internal consistency among the four-item measurement, with *Cronbach's* $\alpha = 0.77$. As such, a scale of parental privacy concern (ranging from 1 to 4) was created and used for further analyses. **Teen privacy concern** was measured in the survey by asking one question to teens regarding the degree (on a 4-point scale from "not at all concerned" to "very concerned") of personal concern over the information that they share on the social media that might be accessed by third parties without their knowledge.

Parental Mediation Strategies

The Pew data set included six questions regarding parental mediation strategies for teen technology use, including whether or not the parent had previously read at least one privacy policy of a website that the teen was using; searched the teen's information online; used parental controls to block, filter or monitor the teen's online activities; helped the teen set up privacy settings; talked with the teen about concerns with their online postings; or commented or responded directly to the teen's online postings. Using parental strategies delineated in past research as our theoretical justification, we reduced these six items using CATPCA [20] into two distinct factors: **Direct Intervention** (including items of reading privacy policy; using parental controls; and setting up privacy settings), which resulted in an Eigenvalue of 2.04, and **Active Mediation** (talking with teens; searching teens' information; and responding directly to teens' online posts), with an Eigenvalue of 1.21. For both direct parental intervention and active parental mediation factors, we

¹<http://www.pewinternet.org/datasets/september-2012-teens-and-online-privacy/>

created additive indices based on the number of different strategies parents reported having used (“yes”) in the past (each ranging from 0 to 3).

Teen Privacy Risk-Taking Behaviors

Teens’ risk-taking behaviors were measured with a variety of questions in the Pew survey, and three major dimensions were revealed: The dimension of *basic information disclosures* (Eigenvalue = 2.24) consisted of six items including posting real name, birth date, school name, relationship status and photos online; the dimension of *sensitive information disclosure* (Eigenvalue = 1.47) consisted of eight items, such as posting sensitive information including cell phone number and email address, personal interests, something which “later caused a problem” or “got [the teen] in trouble at school,” or other types of “sensitive” information; and the dimension of *risky interactions* (Eigenvalue = 1.55) consisted of five items, including online postings/sharing that the teen later regretted; automatically sharing location; viewing inappropriate content; being contacted by strangers; and meeting someone they first met online, offline. Again, we created additive indices for these three factors based on the number of behaviors teens reported having taken in the past (ranging from 0 to 6, 0 to 8, and 0 to 5, respectively).

Teen Privacy Risk-Coping Behaviors

Teen’s risk-coping behaviors emerged as two dimensions; the first dimension labeled as *advice-seeking* (Eigenvalue = 2.66) was measured by asking whether the teen had ever sought advice about managing their online privacy from a friend or peer, a sibling, a parent, a teacher, or online resources. The second dimension of teen risk-coping behaviors was labeled *remedy and corrective behaviors* (Eigenvalue = 1.64) and were measured with eight items asking whether the teen had blocked someone, deleted someone from their friends’ list, removed tagging of themselves, deleted comments from others, deleted or edited their own posts, posted fake information in order to protect their privacy, shared inside jokes or coded messages between friends, and deleted or deactivated their account. We created additive indices for these two risk-coping behaviors (advice-seeking and remedy/corrective behaviors) based on the number of strategies teens reported having taken in the past (ranging from 0 to 5 and 0 to 8, respectively).

Data Analysis Approach

After the constructs for our model were established, covariance-based structural-equation modeling (CB-SEM) tests were conducted using Amos 22.0 [3] to explore the

relationships between parental privacy concern, parental mediation strategies, teens’ privacy concern, and teens’ risk-taking and risk-coping behaviors. We began our analysis by testing a semi-saturated model, which included all possible paths between the parental constructs and teen constructs in our model (**Table 1**) [17]. Next, similar to a backward stepwise regression [44], but also taking into account relevant theory [24], we fitted the model by iteratively trimming insignificant paths between our constructs and adjusting the model based on suggested modification indices until all paths that remained were significant. Therefore, our final model (**Figure 2**) represents all significant paths between the constructs and implies that all paths not drawn in our final model were found to be insignificant.

Descriptive Statistics

Missing data were removed and data were also filtered to only retain parent-teen dyads with teens who specified having an active Facebook account. Thus, the final dataset that was used for analyses consisted of 588 teens (292 males and 296 females) and one of their parents. A majority (77.6%) of the respondents were Caucasian, with teens on average aged 15 and parents on average aged 47. Approximately 37% (N = 217) of the parents who responded to the telephone interview were male, while approximately 50% (N = 292) of the teens were male. About 70% of the parents indicated having some college education, including an associate’s degree or higher. Also, 55% of parents reported having a household income equal to or higher than the U.S. average household income for the year 2011 (\$50,000 and above). They were also adequately technology-savvy, as 69% reported having experience using social networking sites.

RESULTS

Structural Model Results

In order to examine the relationships between the constructs in our model, a series of analyses were conducted. First, a semi-saturated model was tested in order to examine the influences between parental and teen factors. The semi-saturated model indicated a good fit of the model to the data, $\chi^2 = 3.86$, $DF = 8$, $p = 0.87$; $CMIN/DF = 0.48$, $CFI = 1.000$, $RMSEA = 0.000$ (Note: A “good” model fit is characterized by a χ^2 that is not statistically significant, or p -value > 0.05; $CMIN/DF$ < or approaching 1; CFI > 0.90; and $RMSEA$ < 0.05 [39]). **Table 1** reports the standardized estimates of the path coefficients for the semi-saturated model.

<i>Path Analyses</i>	<i>Standardized β</i>	<i>p-value</i>
Parental Privacy Concern → Parental Direct Intervention	0.226***	0.000
Parental Privacy Concern → Parental Active Mediation	0.208***	0.000
Parental Privacy Concern → Teen Privacy Concern	0.134**	0.001
Parental Direct Intervention → Teen Basic Information Disclosures	-0.101*	0.014
Parental Direct Intervention → Teen Sensitive Information Disclosures	-0.013	0.737
Parental Direct Intervention → Teen Risky Interactions	-0.010	0.797
Parental Direct Intervention → Teen Privacy Concern	-0.062	0.137
Parental Direct Intervention → Teen Advice-Seeking	0.135**	0.002
Parental Direct Intervention → Teen Remedy/Correction	-0.091*	0.014
Teen Basic Information Disclosures → Parental Active Mediation	0.058	0.142
Teen Sensitive Information Disclosures → Parental Active Mediation	0.106**	0.010
Teen Risky Interactions → Parental Active Mediation	0.042	0.288
Parental Active Mediation → Teen Privacy Concern	0.019	0.616
Parental Active Mediation → Teen Advice-Seeking	-0.037	0.397
Parental Active Mediation → Teen Remedy/Correction	0.100**	0.007
Teen Basic Information Disclosures → Teen Sensitive Information Disclosures	0.289***	0.000
Teen Sensitive Information Disclosures → Teen Risky Interactions	0.308***	0.000
Teen Risky Interactions → Teen Privacy Concern	0.097*	0.017
Teen Basic Information Disclosures → Teen Advice-Seeking	0.003	0.941
Teen Sensitive Information Disclosures → Teen Advice-Seeking	-0.031	0.478
Teen Risky Interactions → Teen Advice-Seeking	0.069	0.104
Teen Privacy Concern → Teen Advice-Seeking	0.188***	0.000
Teen Basic Information Disclosures → Teen Remedy/Correction	0.034	0.339
Teen Sensitive Information Disclosures → Teen Remedy/Correction	0.110**	0.003
Teen Risky Interactions → Teen Remedy/Correction	0.457***	0.000
Teen Privacy Concern → Teen Remedy/Correction	0.103**	0.003
Teen Advice-Seeking → Teen Remedy/Correction	0.117***	0.000

Table 1. Parameter Estimates of the Semi-Saturated Structural Model.

As noted in **Table 1**, a number of paths in this model were non-significant; therefore, a parsimonious model was created by omitting all paths that were found non-significant in the semi-saturated model, which also yielded a good model fit, $\chi^2 = 22.21$, $DF = 19$, $p = 0.27$, $CMIN/DF = 1.69$, $CFI = 0.994$, $RMSEA = 0.017$. Therefore, the results from this more parsimonious model are illustrated in **Figure 2** and discussed in the sections that follow. Due to the non-significant paths that were removed, there may be slight differences between the path coefficients shown in Table 1 and Figure 2; however, the overall results remain the same. Our final model explained 5% of the variance in teens' advice-seeking behaviors and 32% of the variance in teens' remedy/corrective behaviors. The recommended threshold of 10% is considered an indication of substantive explanatory power in social sciences [15].

Effects of Teens' Privacy Concern and Risk Behaviors

Although we are most interested in how parental factors contributed to teens' risk-coping privacy behaviors, we also controlled for differential effects of teens' own privacy concern and risk-taking behaviors on their risk-coping strategies. Such effects became useful in understanding the effects of the parental factors that followed. *Teen privacy concern* was positively associated with both types of risk-coping behaviors: *advice-seeking* ($\beta = 0.19$, $p < 0.001$) and *remedy/corrective actions* ($\beta = 0.10$, $p < 0.01$). The more

concerned teens were about their online privacy, the more likely they were to seek advice from others and take remedy/corrective actions to protect their online privacy.

In terms of teen risk-taking behaviors, we found that less "risky" teen disclosure behaviors were likely to contribute to more "risky" teen behaviors. For instance, teens' online *basic information disclosures* were positively associated with their disclosure of *sensitive information*, ($\beta = 0.29$, $p < 0.001$); in turn, disclosure of *sensitive information* was positively associated with *online risky interactions*, ($\beta = 0.31$, $p < 0.001$). Consequently, *teens' privacy concern* increased as a result of such *risky interactions* ($\beta = 0.10$, $p = 0.017$). The more "risky" privacy behaviors also tended to be the ones that were significantly and positively associated with teens' remedy/corrective behaviors. Specifically, teens who disclosed more *sensitive information* about themselves through social media ($\beta = 0.12$, $p < 0.001$) and engaged in more *risky interactions* ($\beta = 0.46$, $p < 0.001$) online tended to also take more *remedy/corrective measures* to protect their online privacy. However, none of the teen risk-taking behaviors were significantly related to teen advice-seeking. Though, when teens *sought advice* from others, they were more likely to take *corrective/remedy actions* ($\beta = 0.12$, $p < 0.001$).

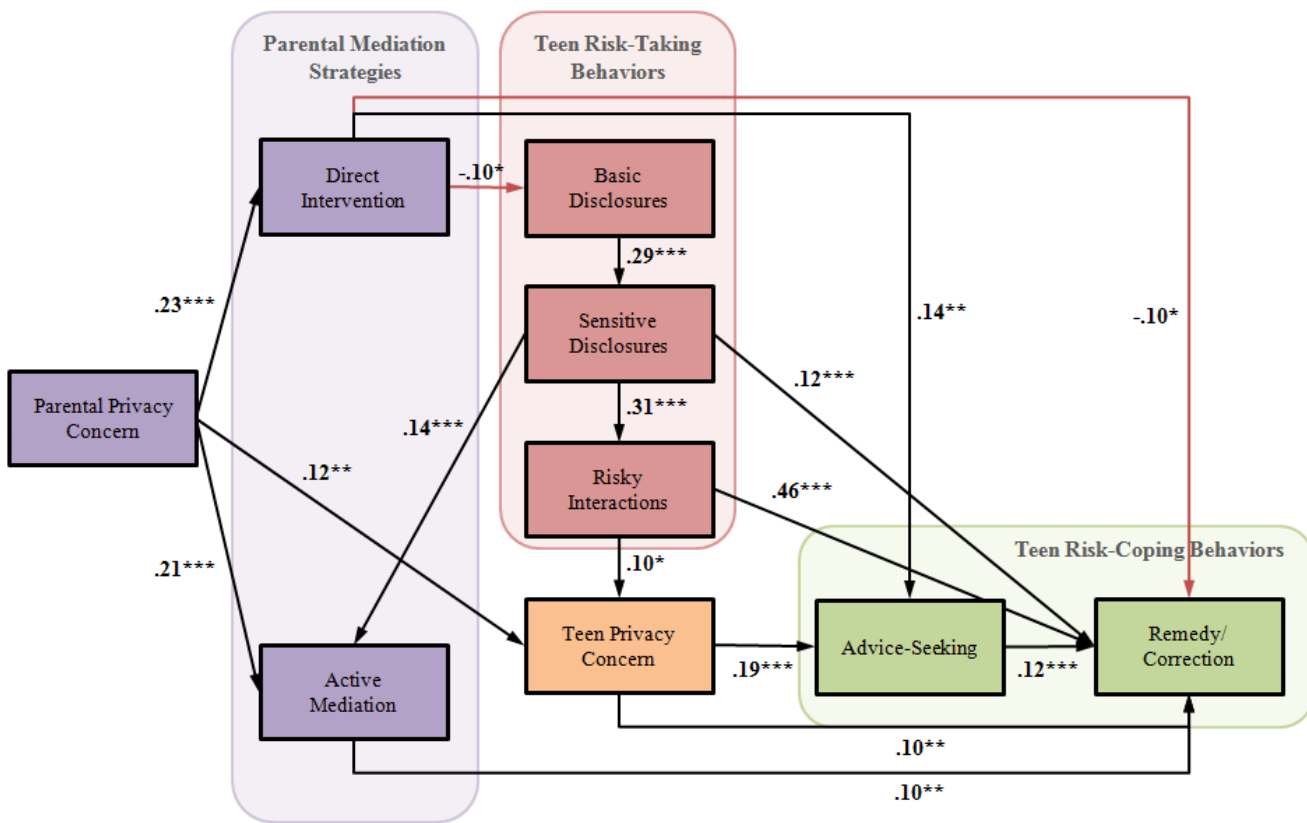


Figure 2: Structural Model. Statistically significant paths are shown with standardized coefficients and *p*-values indicated (* ≤ 0.05 , ** ≤ 0.01 , *** ≤ 0.001).

Effects of Parental Privacy Concern

The extent to which parents were concerned about their teens' online privacy showed significant effects on both parental mediation strategies as well as teens' concern about privacy. Specifically, *parental privacy concern* was positively associated with *direct intervention* ($\beta = 0.23$, $p < 0.001$) and *active mediation* ($\beta = 0.21$, $p < 0.001$). *Parental privacy concern* also was positive related with *teens' privacy concern* ($\beta = 0.12$, $p < 0.01$). Parental mediation strategies and teens' privacy concern, in turn, influenced teens' online privacy behaviors, as discussed below.

Effects of Direct Parental Intervention

Direct Parental intervention appeared to influence teens' risk-coping privacy behaviors both directly and indirectly. For the direct effects, *direct parental intervention* was positively associated with *teens' advice-seeking behaviors* ($\beta = 0.14$, $p < 0.01$) and negatively associated with *teens' remedy/correction behaviors* ($\beta = -0.10$, $p < 0.05$). Direct parental intervention also affected teens' risk behaviors; in particular, the structural model showed that *direct intervention* was negatively associated with *teen's basic information disclosures* ($\beta = -0.10$, $p < 0.05$). The less basic information teens disclosed online, the less likely they would engage in higher-risk, online privacy behaviors,

reducing their need to take remedy/corrective actions. However, direct parental intervention showed no significant direct effects on other types of teens' risk behaviors, such as *sensitive information disclosures* ($\beta = -0.01$, $p = 0.74$) and *risky interactions* ($\beta = -0.01$, $p = 0.80$); nor did it affected *teens' privacy concern* directly ($\beta = -0.06$, $p = 0.14$).

Effects of Active Parental Mediation

Active mediation was found not only positively associated with parental privacy concern, but was also positively associated with teens' sensitive information disclosures. The more *sensitive information* teens disclosed online, the more likely parents were to engage in *active mediation* ($\beta = 0.14$, $p < 0.001$). There were no statistically significant relationships between teens' *basic information disclosures* ($\beta = 0.06$, $p = 0.14$), or *teens' risky interactions* ($\beta = 0.04$, $p = 0.29$), and *active mediation*. The structural model further showed that parental active mediation's influence on teens' risk-coping strategies was only through its direct effect on teens' remedy/correction behaviors. Increased *parental active mediation* appeared to enhance *teens' remedy/correction behaviors* ($\beta = 0.10$, $p < 0.01$). However, no effect of *active mediation* was found on *teens' advice-seeking* ($\beta = -0.04$, $p = 0.40$); or *teens' privacy concern* ($\beta = 0.02$, $p = 0.14$).

Parental Mediation Strategies Post Hoc Analysis

Because direct intervention and active mediation had such divergent influences in our model, we wanted to further understand the potential benefits and drawbacks associated with each parental mediation strategy, as well as the potential interaction effects when they the strategies were used individually or combined. Therefore, prior to discussing the implications of our results, we further explored the relationship between the two parental mediation strategies represented in our model with some of the contextual teen variables that were captured in the data set. To do this, we first dichotomized the two parental mediation strategies (direct intervention and active mediation) into “High” and “Low” categorical variables using median split (Direct Intervention: *Mean* = 1.35, *Median* = 1.00; Active Mediation: *Mean* = 1.34, *Median* = 1.00).

As illustrated in **Figure 3**, of the 588 parent respondents the most frequent categorization for the combined parental mediation strategies was “Low/Low” (blue bar) with 38% of parents exhibiting few direct intervention and active mediation behaviors. However, the second most frequent parental mediation strategy across parents was “High/High” (green bar) direct intervention and active mediation with 27% of parents falling into this category. This suggests that most parents (65%) are consistently low or consistently high on both parental mediation scales.

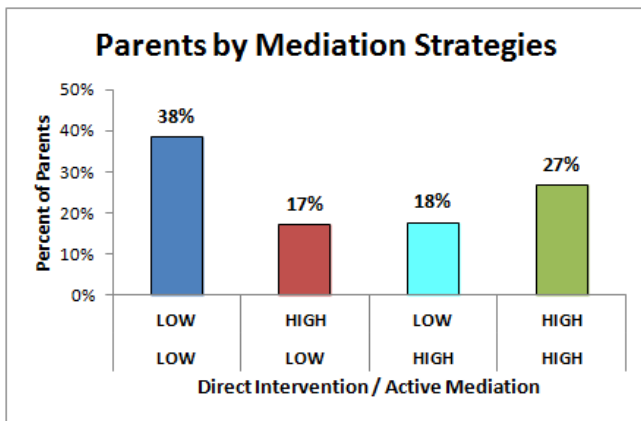


Figure 3: Distribution of Parents by Mediation Strategies

Next, we examined the relationship between parental mediation strategies and teen age. Teen age was categorized in to three levels using a tertiary split: younger teens (12-14-years-old, *N* = 214), mid-teens (15-years-old, *N* = 120), and older teens (16-17-years old, *N* = 254), and chi-square tests were conducted to examine the relationship between teen age and parental mediation strategies. As shown in **Figure 4**, the relationship between direct parental intervention and teen age was relatively linear while the relationship between teen age and active mediation was more nuanced.

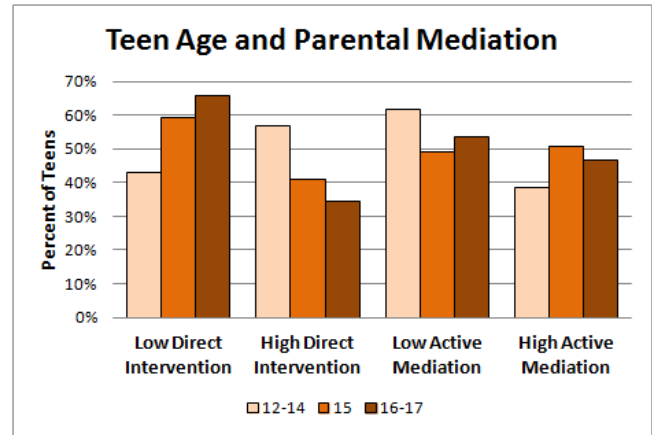


Figure 4: Parental Mediation and Teen Age

A high level of direct intervention was more likely to be observed among parents with younger teens, while a low level of direct intervention was associated with older teens, $\chi^2(2, N = 588) = 24.99, p < 0.001$. Conversely, the relationship between active parental mediation and age seemed almost curvilinear, resulting in only a near-significant chi-square test $\chi^2(2, N = 588) = 5.654, p = 0.06$, which suggests that a high level of active mediation was more generally adopted among parents of older teens. With further examination of **Figure 4**, parents seem to exhibit even higher levels of active mediation for mid-teens (15-year-olds) than for older teens (16-17-year-olds). This suggests that 15 may a pivotal age where teens are becoming more autonomous, parents are beginning to reduce direct intervention, but do so by more actively mediating their mid-teens’ online behaviors. Once teens get older, direct intervention may no longer be an option so parents continue to actively mediate their older teens but to a lesser extent.

We also conducted Analysis of Variance (ANOVA) tests to explore how the combined parental mediation strategies influenced teens’ frequency of SNS use and the complexity of teens’ SNS networks. For teens’ frequency of SNS use, we saw a main effect of both direct intervention and active mediation. Low levels of direct intervention were associated with significantly higher levels of SNS use (*Mean* = 4.88, *SE* = .09) than high levels of direct intervention (*Mean* = 4.61, *SE* = .09), $F(1, 582) = 4.71, p < .05$. In contrast, high levels of active mediation (*Mean* = 4.94, *SE* = .09) were associated with increased SNS frequency for teens compared to a low level of active mediation (*Mean* = 4.54, *SE* = .09), $F(1, 582) = 19.69, p < .01$. The interaction effect on teens’ SNS frequency was not statistically significant, $F(1, 582) = 1.00, p = .32$ (see **Figure 5**, Note: asterisks denote significant differences between levels, such that $A > B$ and $C > D$; bar colors are consistent with parental mediation strategies depicted in **Figure 3**).

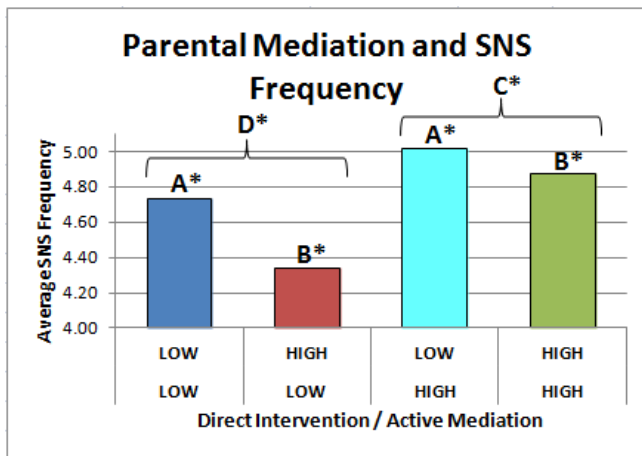


Figure 5: Parental Mediation and Teens' SNS Frequency

Therefore, teens who used SNSs the least frequently (red bar) tended to be those who experienced high levels of direct intervention and low levels of active mediation; teens who used SNSs most frequently (light blue bar) tended to be those under low levels of direct intervention and high levels of active mediation. Therefore, our findings suggest a potential *suppressive* effect where high levels of direct parental intervention (red bar) may reduce teens' SNS frequency of use.

Teens' SNS complexity was measured based on the self-reported network composition of teens' Facebook friends, ranging from closer networks of family and real friends to more open networks, which included acquaintances and strangers. High active mediation ($Mean = 5.24, SE = .08$) was associated with a greater complexity of teens' online social networks than low active mediation ($Mean = 5.00, SE = .08$), $F(1, 584) = 4.70, p < .05$. Direct intervention showed no effect on teens' SNS complexity, $F(1, 582) = .05, p = .82$; however, the interaction effect was approaching statistical significance, $F(1, 582) = 3.20, p = .07$ (see **Figure 6** Note: asterisks denote significant differences between levels, such that $C > D$; bar colors are consistent with parental mediation strategies depicted in **Figure 3**). The near significant interaction effect suggests that, in cases of high direct intervention (B), active mediation had a greater influence on teens' SNS complexity (Given $B, C > D$), but for low levels of direct intervention (A), active mediation showed little influence on teens' SNS complexity. As such, teens with the least complex SNS networks (red bar) tended to be those who experienced high levels of direct intervention and low levels of active mediation, and teens with the most complex SNS networks (green bar) tended to experience both high levels of direct intervention and active mediation. Thus, similar to SNS frequency, we observed a possible *suppressive* effect of high levels of direct intervention coupled with low levels of active mediation (red bar), which may restrict teens' from having a variety of different SNS connections.

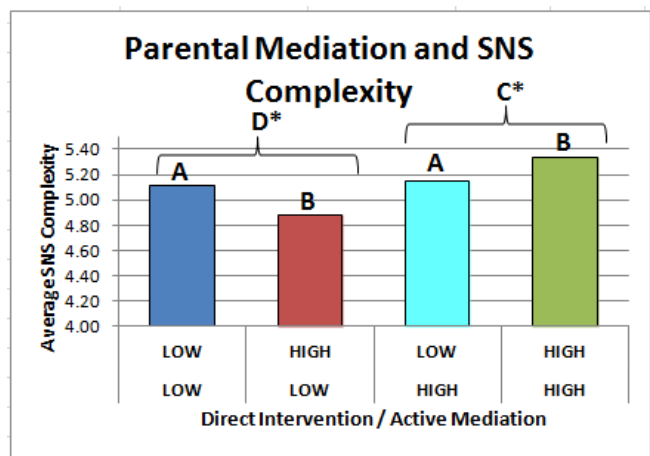


Figure 6: Parental Mediation and Teens' SNS Complexity

However, we also saw a potential *empowering* effect from combining high levels of active mediation with high levels of direct intervention (green bar), which seemed to encourage teens to have a broader range of SNS social connections, despite the increased parental oversight.

DISCUSSION

By focusing on dyadic-level data of both parents and teens, conceptually grouping individual survey questions from the Pew telephone interviews using construct development and statistical factor reduction, and by performing various path analyses, our work provides unique, empirical insights into the salient relationships among parental and teen privacy concerns, parental mediation strategies, and teens' risk-taking and risk-coping behaviors when teens engage with others through social media. We will highlight some of the key insights provided by our findings, discuss implications for design, summarize the limitations of our findings, and discuss potential opportunities to extend our research in the future.

Key Insights

Parental and Teen Behaviors are Multi-Dimensional

Our factor analyses of the Pew data revealed two dimensions of parental mediation strategies (direct intervention and active mediation), three types of teen risk-taking behaviors (basic information disclosures, sensitive information disclosures, and risky interactions), and two distinct teen risk-coping strategies (advice-seeking and remedy/corrective actions). The underlying dimensionality of these various parental and teen behaviors, combined with the differential relationships between each of these factors, highlights the importance of examining parental and teen behavior at more granular levels in order to detect nuanced relationships.

For example, our model found that direct intervention is positively associated with teen advice-seeking but negatively associated with teen remedy/corrective behaviors, even though both were framed as teen risk-

coping behaviors in past literature. If these two dimensions of risk-coping behaviors had been grouped as one latent construct in our model, we would not have uncovered these unique relationships. This finding suggests an important distinction between teen advice-seeking and remedy/corrective behaviors. Advice-seeking appears to be a less autonomous, more dependent teen behavior that is associated with higher levels of direct supervision from parents. In contrast, remedy/corrective behaviors appears to be a more direct risk-coping behavior that teens employ to reactively problem-solve once they encounter online risks. The low explanatory value of our model for teen advice-seeking (5%) compared to the high explanatory value for remedy/corrective behaviors (32%) also suggests that advice-seeking behaviors may not be equivalent to remedy/corrective risk-coping strategies. Neither parental nor teen factors contribute much explanation to whether or not teens seek advice regarding their online privacy, and even though advice-seeking is associated with remedy/corrective actions, seeking advice does not necessarily always translate into actionable privacy behaviors. Therefore, future research may consider treating advice-seeking as a mediating factor of risk-coping instead of as an endogenous dimension of risk-coping.

If we had not performed factor analyses prior to our structural analysis, we may not have uncovered this and other interesting and important differences between the various parental mediation and teen privacy behaviors in our model. Yet, a limitation is that our analysis only focused on the parental mediation strategies, teen risk-taking behaviors, and teen risk-coping behaviors that emerged from our data. Therefore, future studies may want to examine the unique relationships between other parental mediation strategies and teen risk-coping behaviors in more depth.

“Preventative” vs. “Reactive” Parental Mediation Strategies

As previous literature on adolescent online privacy indicated, adults may adopt various mediation strategies in order to protect their teens’ online privacy. Our analyses has revealed a dynamic process through which parents make decisions as to which strategies to implement; the positive relationship between parents’ concern about the teens’ online privacy and both types of mediation strategies provides empirical evidence that parental concern is one of the fundamental reasons parents become involved in their teens’ online privacy management. Our analyses also confirmed that both direct intervention and active mediation influence teen risk-taking and risk-coping behaviors, but they do so in very different ways. **Figure 7** illustrates the different motivations and influences of the two parental mediation strategies.

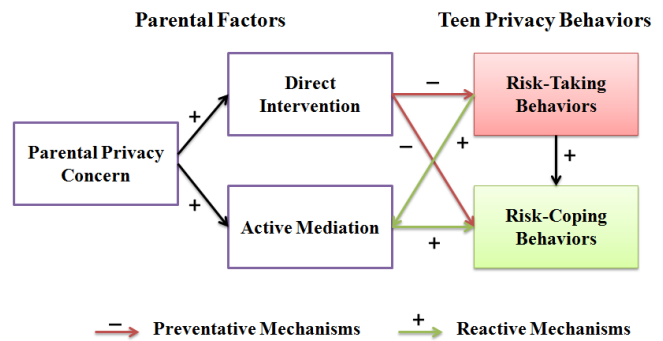


Figure 7: Preventive versus Reactive Parental Mediation

Based on our findings, we characterize direct intervention as a “preventive” parental mediation strategy, where parents use measures such as reading website privacy policy, helping set up privacy settings and using parental monitoring software to filter or block content to prevent their teens from experiencing online risks. Unlike teens who tend to generally be more risk-seeking, parents who mediate their teens through direct intervention tend to be more restrictive and risk-adverse, and this approach is reflected in the privacy behaviors of their teens. Teens who experience higher levels of direct parental intervention tend to be younger, disclose less basic information online, rely on external resources (parent, peer, professionals, or websites) for privacy management advice more heavily, have less extensive SNS networks, and use SNSs less frequently overall. On the other hand, they also have less of a need to take remedy and corrective behaviors because of their limited information revelation and risk experiences.

Alternatively, we characterize active parental mediation as a more “reactive” approach to teen online safety. Parents who actively mediate their teens’ online behaviors may monitor the information their teens post online, talk with their teens, and comment on their teens’ online posts, but they do not necessarily directly intervene in their teens’ online privacy behaviors. Teens who experience higher levels of active mediation tend to be older, have more complex SNS networks, use SNSs more frequently, and disclose more sensitive information online. The positive relationship found between teens’ online disclosure of sensitive information and parents’ adoption of active mediation strategies suggests that this kind of parental involvement may be triggered reactively when parents perceive that their teens’ online behavior has made them particularly vulnerable to privacy risks. Therefore, parents of these teens may be compelled to initiate discussions with their teens when they observe that their teens are disclosing too much sensitive information through social media, and in turn, these discussions may prompt teens to take subsequent corrective measures to mitigate potential risks. This reactive type of parental involvement appears to afford teens more autonomy to take risks but also to take corrective actions to mitigate the risks that they take.

Our findings confirm and extend the results from a smaller, qualitative study of parents and teens that recently found a potential relationship between parents who are actively engaged in what their teens do online, but do not heavily restrict their online activities, and teens who exhibit higher levels of moral judgment in their online behaviors. Similarly, teens who exhibited lower levels of moral judgment online tended to have parents who were either highly restrictive or overly indulgent of their teens' online behaviors [46]. For instance, our post-hoc analysis can be used to categorize these particular parental mediation strategies into four distinct parenting profiles, based on low/high levels of direct intervention and active mediation, respectively. We label these profiles as follows: 1) "*Unengaged Parents*," who exhibit low direct intervention and low active mediation; 2) "*Controlling Parents*," who exhibit high direct intervention and low active mediation; 3) "*Counseling Parents*," who exhibit low direct intervention and high active mediation; and 4) "*Highly Engaged Parents*," who exhibit both high direct intervention and high active mediation.

Overall, "*controlling parenting*" tended to have the most suppressive effect of teens' online behaviors, both limiting online privacy risks through fewer basic disclosures and reducing the need for protective adaptations, but also restricting teens' general online experiences, such as their SNS frequency and network complexity. In contrast, active mediation appeared to have more of an empowering effect, allowing teens to actively engage with others online, experience some level of risk, and form coping strategies for protecting themselves from harm. This effect is particularly evident for teens of "*highly engaged parents*" who still maintained frequent use of SNSs and a relatively complex online social network, despite the restriction from direct parental intervention.

Risk Perception Triggers Concern and Behavior

We found a quite interesting pattern of risk escalation between the three teen risk-taking behaviors, from basic information disclosures, to sensitive information disclosures, to risky online interactions. This highlights an experiential learning process through which teens mitigate online privacy risks by taking protective actions when they feel their privacy boundaries may have been compromised (for a more in-depth discussion on the effects of teens' privacy risk behaviors, privacy concern, and risk-coping behaviors, see [21]). Our combined findings suggest an inherent level of perceived risk that both parents and teens associate with each of these risk-taking behaviors, which seem to trigger subsequent responses.

Our findings further validate and provide additional insights into the apparent "privacy paradox" [4, 25] between teens' privacy concerns and their information disclosure behaviors. For teens, only risky interactions were significantly associated with heightened levels of teen privacy concern, which in turn, was positively associated

with advice-seeking and remedy/corrective risk-coping behaviors. Sensitive information disclosures and risky interactions were associated with more frequent remedy/corrective behaviors, but basic information disclosures were not. A possible explanation is that teens simply do not appraise basic information disclosures online as particularly risky. It is only once these disclosures escalate into regrettable social interactions that teens become concerned about their online privacy and take measures to protect themselves. Thus, teens' privacy behaviors may be less paradoxical than they appear; instead their privacy behaviors may be simply more post hoc or retroactive in nature. This may be, in part, due to how teens choose to cope with the social-technical privacy gap [2] between how they socialize offline and social media privacy affordances online.

While teens' self-reported, risky online interactions, such as connecting to strangers or being contacted in a way that make them feel uncomfortable, was the most alarming type of privacy risk perceived by teens, this risk-taking behavior was not associated with either type of parental mediation. Only sensitive disclosures made by teens were associated with higher levels of active parental mediation. We believe the reason this association is not present in our model is because risky interactions may be less transparent to parents than sensitive information disclosures that can be more readily discovered by actively searching the teens' social media profile. Therefore, parents may be less aware of when their teens are engaged in risky online interactions. Be it that these risky interactions take place beyond parents' monitoring, or that the teens are unable or unwilling to communicate the unease that they have experienced online, this raises a major concern because neither preventative nor reactive parenting approaches appear to be effective in terms of addressing the most "risky" privacy behaviors that teens may engage in online. This is an issue with growing significance, as emerging SNSs and mobile applications (e.g., Snapchat, Secret, Yik Yak, etc.) support more discreet ways of teen communication. Parents will need better ways to understand and/or monitor teens' online activities and gauge teen risk exposure.

Implications for Design

Findings from this study have yielded practical implications for designing measures to improve teens' online privacy safety. For example, the preventive and reactive mechanisms of parental mediation (**Figure 6**) identified in this study provide a conceptual foundation for building more effective parental monitoring software. Currently, parental monitoring software primarily facilitates direct parental intervention strategies of blocking and restricting teen online behavior. However, this approach tends to limit the shelf life of parental monitoring software, as past studies show that such restrictive monitoring is not really a viable option for older (15-16-year old) teens who demand more trust from their parents [46]. Furthermore, our study

suggests that highly engaged parenting, which involves both high levels of active mediation and direct intervention, may be the best approach for mitigating teen online risk exposure while allowing them to engage in meaningful interactions online. Therefore, one potential design implication is a call for parental monitoring software that helps parents engage in conversations with their teens about their online risk-taking and risk-coping behaviors instead of primarily functioning to block any exposure to online risks. In this way, parental monitoring software could be transformed into a tool to teach teens about appropriate online behaviors and to raise parental awareness regarding high-risk teen behaviors.

The effect of teens' sensitive information disclosures on parental mediation, as well as the lack of effect for teens' risky online interactions, highlights the need for more sophisticated mechanisms to detect teens' privacy risks that are less visible to parents. For example, new parental monitoring software features may integrate with the Facebook application platform (or the currently most popular SNS for teens) in order to provide parents with a summary how often and with whom their teens engage online. This becomes a particularly urgent need as many websites and mobile applications increasingly support a higher level of anonymity and ephemerality in teen online communication. Parents need to be educated of emerging technologies and of the risks that are associated with such communication methods. In addition, online safety software could also cater to the needs of teens as end users by making hidden privacy risks more apparent to teens themselves, in order to enhance their privacy awareness and encourage voluntary risk-coping behaviors.

Limitations and Future Research

Even though the Pew data set afforded numerous strengths, such as a large, nationally representative and dyadically paired sample of parents and teens, many of the limitations of our study also come with the secondary data set that we used for analyses. First, the level of measurement used in the Pew telephone interviews was often dichotomous; therefore, limiting, to some extent, the explanatory power of our structural model. Secondly, we were limited to item wording as it was presented to respondents during the Pew telephone interviews. Some of the questions were double-barreled, such as one item that asked parents whether they had ever, "used parental controls or other means of blocking, filtering or monitoring [their] child's online activities." In this case, we had to rely on the data-driven results of the CATPCA, which determined that this item loaded best with Direct Parental Intervention, even though it included an aspect of Active Mediation (i.e., monitoring). Third, teens' privacy concern was measured using a single-item question, which may not fully capture the full extent of teens' privacy concerns.

Given the inherent strengths and weaknesses of analyzing a large, secondary data set, our work both informs future

research directions and motivates the need for follow up studies. For instance, future work can improve measurement accuracy and reliability by adopting established scales from the privacy literature and further examining the empirically validated relationships in our model. Otherwise, subsequent studies may benefit from operationalizing new measures based on existing theoretical conceptualizations, as opposed to deriving factors from existing survey items, as we did from the Pew data. In our future work, we plan to confirm and extend our current findings regarding privacy concerns, parental mediation strategies, teen social media privacy behaviors, and other relevant parent-teen factors by combining both of these approaches.

Finally, the cross-sectional survey methodology used by Pew constrains our capability to confirm causal effects between the various constructs in our model. We have observed a number of correlation relationships between different parental mediation strategies and various teen privacy behaviors, as well as privacy concerns. Therefore, we had to make some analytical decisions based on the given wording of the survey questions and the positive or negative path coefficients produced by our structural model in order to specify the direction of some of the paths in our model. For example, if we had specified in our model that parental active mediation led to more sensitive disclosures made by teens, this interpretation would imply that teens react rebelliously against parental attempt to protect their online privacy. Instead, we chose to acknowledge that parents and teens can influence one another bi-directionally [9], and, in this case, a more plausible explanation is that active parental mediation is a reaction to teens' sensitive information disclosures online. However, future studies should involve either a longitudinal approach or an experimental design to confirm the causal relationships between the various factors in our model. For example, we are currently in the process of conducting a two month diary study of parents and teens in order to understand teens' online experiences and the role of parental involvement.

CONCLUSION

This paper highlights the bi-directional influences between parents and teens when it comes to privacy concern, parental mediation strategies, and adolescent social media privacy behaviors. Parents can employ preventative strategies that protect their teens from initial online risk exposure and reduce teens' need for corrective privacy measures, and/or parents can employ more reactive strategies as a result of their teens' risk-taking behaviors, which encourage teens to take subsequent protective measures. However, parents who implement preventative, restrictive measures without being actively engaged in what their teens are doing online may risk limiting the potential benefits their teens may garner from online engagement. Thus, balancing preventative parental strategies with

reactive strategies may be the best option for protecting teens online while allowing them to learn and benefit from their online experiences. As such, our findings present a unique opportunity for the CSCW community: Helping parents and teens *collaboratively* manage teens' social media privacy behaviors may be one way to narrow the social-technical privacy gap [2] for adolescents, allowing them to safely engage with others online.

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REFERENCES

1. *The 17th ACM Conference on Computer-Supported Cooperative Work & Social Computing Conference Program*. 2014, http://cscw.acm.org/2014/cscw2014_program.pdf.
2. Ackerman, M. S. The intellectual challenge of CSCW: the gap between social requirements and technical feasibility. *Human-Computer Interaction*, 15, 2 (2000), 179-203.
3. Arbuckle, J. L. *Amos SPSS*, City, 2006.
4. Barnes, S. B. *A privacy paradox: Social networking in the United States*, 2006.
5. Baumrind, D. A developmental perspective on adolescent risk taking in contemporary America. *New directions for child development*, 37 (1987), 93-125.
6. Baumrind, D. Patterns of parental authority and adolescent autonomy. *New Directions for Child and Adolescent Development*, 2005, 108 (2005), 61-69.
7. Buhler, T., Neustaedter, C. and Hillman, S. How and Why Teenagers Use Video Chat. In *Proc. CSCW 2013* (2013).
8. Crossler, R. E., Bélanger, F., Hiller, J. S., Park, J.-M., Hsiao, M., Channakeshava, K., Bian, K. and Korbich, E. Determinants of Protection Behaviors for Online Privacy of Children. In *Proc. 39th Annual Meeting of The Decision Sciences Institute* (2008).
9. Cummings, E. M., Bergman, K. N. and Kuznicki, K. A. Emerging Methods for Studying Families as Systems. In *Proc. PSU 20th Annual Symposium on Family Issues* (2012).
10. D'Haenens, L., Vandonink, S. and Donoso, V. *How to cope and build resilience*. EU Kids Online, 2013, <http://eprints.lse.ac.uk/48115/1/How%20to%20cope%20and%20build%20online%20resilience%20%28Isero%29.pdf>.
11. Desmond, R. J., Singer, J. L. and Singer, D. G. Family Mediation: Parental Communication Patterns and the Influences of Television on Children. In J. Bryant (ed.) *Television and the American Family*, (1990), 293-309.
12. Dinev, T., Xu, H. and Smith, H. J. Information Privacy Values, Beliefs and Attitudes: An Empirical Analysis of Web 2.0 Privacy. In *Proc. Proceedings of 42th Hawaii International Conference on System Sciences (HICSS 42)* (2009).
13. Dürager, A. and Livingstone, S. *How can parents support children's internet safety?*, 2012, <http://www.lse.ac.uk/media@lse/research/EUKidsOnline/EU%20Kids%20III/Reports/ParentalMediation.pdf>.
14. Eastin, M. S., Greenberg, B. S. and Hofschire, L. Parenting the Internet. *Journal of Communication*, 56, 3 (2006), 486-504.
15. Falk, R. F. and Miller, N. B. *A primer for soft modeling*. University of Akron Press, Akron, OH, 1992.
16. Forte, A., Dickard, M., Magee, R. and Agosto, D. E. What do teens ask their online social networks?: social search practices among high school students. In *Proc. Proceedings of the 17th ACM conference on Computer supported cooperative work & social computing*, ACM (2014), 28-37.
17. Gefen, D., Rigdon, E. and Straub, W. D. An Update and Extension to SEM Guidelines for Administrative and Social Science Research. *MIS Quarterly*, 35, 2 (2011).
18. Grinter, E. R. and Palen, L. Instant Messaging in Teen Life. In *Proc. Proceedings of the 2002 ACM conference on Computer supported cooperative work* (2002), 21-30.
19. Hasebrink, U., Görzig, A., Haddon, L., Kalmus, V. and Livingstone, S. *Patterns of risk and safety online: indepth analyses*. The London School of Economics and Political Science, London, UK., 2011,
20. IBM. *Categorical principal components analysis (CATPCA)*. 2014, http://pic.dhe.ibm.com/infocenter/spssstat/v20r0m0/index.jsp?topic=%2Fcom.ibm.spss.statistics.help%2Fidh_cpca.htm.
21. Jia, H., Wisniewski, P., Xu, H., Rosson, M. B. and Carroll, J. M. Risk-taking as a Learning Process for Shaping Teen's Online Information Privacy Behaviors. In *Proc. Computer-Supported Cooperative Work and Social Computing* (2015).
22. Kaiser, H. F. The application of electronic computers to factor analysis. *Educational and psychological Measurement*, 20 (1960), 141-151.
23. Klein, P. S., Nir-Gal, O. and Darom, E. The Use of Computers in Kindergarten, With or Without Adult Mediation; Effects on Children's Cognitive Performance and Behavior. *Computers in Human Behavior*, 16, 6 (2000), 591-608.

24. Kline, R. B. *Principles and Practice of Structural Equation Modeling*. The Guilford Press, New York, 2011.
25. Lampe, C., Gurzick, D., Stutzman, F., Yardi, S. and Bruckman, A. Get Off My e-Lawn: Mulching Youth and Technology. In *Proc. CSCW 2010* (2010).
26. Lerner, R. M. *Adolescence: Development, diversity, context, and application*. Prentice-Hall, Upper Saddle River, NJ, 2002.
27. Linting, M., Meulman, J. J., Groenen, P. J. F. and van der Kooij, A. J. Nonlinear principal components analysis: Introduction and application. *Psychological Methods*, 12, 3 (2007), 336-358.
28. Livingstone, S., Haddon, L., Görzig, A. and Ólafsson, K. *Risks and safety on the internet: The perspective of European children*. EU Kids Online, 2011, <http://eprints.lse.ac.uk/33731/>.
29. Livingstone, S. and Helsper, E. J. Parental Mediation of Children's Internet Use. *Journal of Broadcasting & Electronic Media*, 52, 4 (2008), 581-599.
30. Livingstone, S., Ólafsson, K., O'Neill, B. and Donoso, V. *Towards a better internet for children: findings and recommendations from EU Kids Online to inform the CEO coalition.*, The London School of Economics and Political Science, London, UK., 2012,
31. Madden, M., Cortesi, S., Gasser, U., Lenhart, A. and Duggan, M. *Parents, Teens, and Online Privacy*. Pew Research Center's Internet & American Life Project, 2012, <http://pewinternet.org/Reports/2012/Teens-and-Privacy.aspx>.
32. Madden, M., Cortesi, S., Gasser, U., Lenhart, A. and Duggan, M. *Where Teens Seek Online Privacy Advice*. Pew Research Center's Internet & American Life Project, 2013, <http://www.pewinternet.org/2013/08/15/where-teens-look-for-online-privacy-advice/>.
33. Madden, M., Lenhart, A., Cortesi, S., Gasser, U., Duggan, M., Smith, A. and Beaton, M. *Teens, Social Media, and Privacy* 2013, <http://www.pewinternet.org/Reports/2013/Teens-Social-Media-And-Privacy.aspx>.
34. Madden, M., Lenhart, A., Duggan, M., Cortesi, S. and Gasser, U. *Teens and Technology 2013* Pew Internet, 2013, <http://www.pewinternet.org/Reports/2013/Teens-and-Tech/Summary-of-Findings.aspx>.
35. Malhotra, N. K., Kim, S. S. and Agarwal, J. Internet Users' Information Privacy Concerns (IUIPC): The Construct, the Scale, and a Causal Model. *Information Systems Research*, 15, 4 (December 2004), 336-355.
36. Mesch, G. S. Parental Mediation, Online Activities, and Cyberbullying *CyberPsychology & Behavior*, 12, 4 (2009), 387-393.
37. Mitchell, K. J., Finkelhor, D. and Wolak, J. Youth Internet Users at Risk for the Most Serious Online Sexual Solicitations. *American Journal of Preventive Medicine*, 32, 6 (2007), 532-537.
38. Rosen, L. D., Cheever, N. A. and Carrier, L. M. The association of parenting style and child age with parental limit setting and adolescent MySpace behavior. *Journal of Applied Developmental Psychology*, 29, 6 (2008), 459-471.
39. Schermelleh-Engel, K., Moosbrugger, H. and Müller, H. Evaluating the fit of structural equation models: Tests of significance and descriptive goodness-of-fit measures. *Methods of psychological research online*, 8, 2 (2003), 23-74.
40. Shin, W., Huh, J. and Faber, R. J. Tweens' Online Privacy Risks and the Role of Parental Mediation. *Journal of Broadcasting & Electronic Media*, 56, 4 (2012), 632-649.
41. Smith, H. J., Dinev, T. and Xu, H. Information Privacy Research: An Interdisciplinary Review. *MIS Quarterly*, 35, 4 (2011), 989-1015.
42. Sorbring, E. and Lundin, L. Mothers' and fathers' insights into teenagers' use of the internet. *New Media & Society*, 14, 7 (2012), 1181-1197.
43. Stevenson, F. and Zimmerman, M. A. Adolescent Resilience: A Framework for Understanding Healthy Development in the Face of Risk. *Annual Review of Public Health*, 26 (2005), 399-419.
44. Tabachnick, B. G. and Fidell, L. S. *Using Multivariate Statistics*. Pearson Education, Inc., Boston, 1996.
45. Valkenburg, P. M., Krccmar, M., Peeters, A. L. and Marseille, N. M. Developing A Scale to Assess Three Styles of Television Mediation: "Instructive Mediation," "Restrictive Mediation," and "Social Coviewing". *Journal of Broadcasting & Electronic Media*, 43, 1 (1999), 52-66.
46. Wisniewski, P., Xu, H., Rosson, M. B. and Carroll, J. M. Adolescent Online Safety: The "Moral" of the Story. In *Proc. CSCW 2014* (2014).
47. Xu, H., Dinev, T., Smith, H. J. and Hart, P. Examining the Formation of Individual's Privacy Concerns: Toward an Integrative View. In *Proc. Twenty Ninth International Conference on Information Systems* (2008).