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## Age differences in privacy attitudes, literacy and privacy management on Facebook

Murat Kezer<sup>1</sup>, Barış Sevi<sup>2</sup>, Zeynep Cemalcilar<sup>3</sup>, Lemi Baruh<sup>4</sup>

<sup>1,2,3</sup> Department of Psychology, Koç University, Turkey

<sup>4</sup> Department of Media and Visual Arts, Koç University, Turkey

### Abstract

*Privacy has been identified as a hot button issue in literature on Social Network Sites (SNSs). While considerable research has been conducted with teenagers and young adults, scant attention has been paid to differences among adult age groups regarding privacy management behavior. With a multidimensional approach to privacy attitudes, we investigate Facebook use, privacy attitudes, online privacy literacy, disclosure, and privacy protective behavior on Facebook across three adult age groups (18-40, 41-65, and 65+). The sample consisted of an online convenience sample of 518 adult Facebook users. Comparisons suggested that although age groups were comparable in terms of general Internet use and online privacy literacy, younger groups were more likely to use SNSs more frequently, use Facebook for social interaction purposes, and have larger networks. Also, younger adults were more likely to self-disclose and engage in privacy protective behaviors on Facebook. In terms of privacy attitudes, older age groups were more likely to be concerned about privacy of other individuals. In general, all dimensions of privacy attitudes (i.e., belief that privacy is a right, being concerned about one's privacy, belief that one's privacy is contingent on others, being concerned about protecting privacy of others) were positively correlated with engagement in privacy protective behavior on Facebook. A mediation model demonstrated that amount of disclosure mediated the relationship between age groups and privacy protective behavior on Facebook. Finally, ANCOVA suggested that the impact of privacy attitudes on privacy protective behavior was stronger among mature adults. Also, unlike older age groups, among young adults, considering privacy as a right or being concerned about privacy of other individuals had no impact on privacy protective behavior.*

Keywords: Privacy attitudes; privacy literacy; privacy management; self-disclosure; Facebook; age differences

### Introduction

With the advent and wide adoption of Social Network Sites (SNSs) as venues for socialization, privacy management has emerged as a key research area in current literature (Joinson, Reips, Buchanan, & Schofield, 2010; Wilson, Gosling, & Graham, 2012; Zhang & Leung, 2014). Self-disclosure and privacy protection constitute two related privacy management strategies (Walrave, Vanwesenbeeck, & Heirman, 2012). As for the predictors of these behaviors, privacy literacy, concerns and attitudes have been identified as salient factors (e.g., boyd & Hargiatti, 2010; Debatin, Lovejoy, Horn, & Hughes, 2009; Krasnova, Spiekermann, Koroleva, & Hildebrand, 2010;

Park, 2011). Yet, there is considerable disagreement as to the respective predictive ability of these factors (e.g., Jensen & Sørensen, 2013; Taddicken, 2014; Van den Broeck, Poels, & Walrave, 2015; Vitak, 2012).

Additionally, given age differences in SNS usage patterns (Van den Broeck et al., 2015) a comparative analysis of the respective influence of privacy literacy, attitudes and concerns on privacy management behavior across different age groups is needed. While extant studies on SNS use have mainly focused on comparison of adults and adolescents (e.g., Livingstone, 2008; Peter & Valkenburg, 2011), relatively less attention has been paid to age differences among different adult age groups, with some recent exceptions (e.g., Steijin, 2014; Van den Broeck et al., 2015).

Given these considerations, this study provides a detailed examination of privacy related behavior of U.S. adults on Facebook. We engage in a comparison of three age groups based on the life cycle theory: young adults (18-40), middle adults (40-65) and mature adults (65+). We compare these groups in terms of their privacy literacy, privacy concerns and attitudes, and investigate how these factors predict their respective self-disclosure and privacy protective behavior on Facebook.

## **Privacy Management and SNSs**

According to the Petronio's Communication Privacy Management (CPM) model (2002), privacy management, which can be defined as people's control over circulation of personal information, comprises utilization of strategies (also called privacy rules) to control individual and/or group boundaries. Accordingly, CPM considers privacy as a dialectical relationship between forces "pulling between and with the needs of being both private through concealing and public through revealing" (p.12) and argues that disclosure and privacy constitute a kind of unity within which both are necessary for each other. The heightened use of SNS sites for socialization has led to a growing number of studies that investigate the two dimensions of privacy management: self-disclosure and privacy protection (e.g., Joinson et al., 2010; Walton & Rice, 2013; Walrave et al., 2012; Yang & Tan, 2012).

Studies have investigated self-disclosure on various social media platforms (Zhang & Leung, 2014), such as online dating sites (Gibbs, Ellison, & Lai, 2011), microblogging platforms like Twitter (Jin, 2013), and SNSs like Facebook (Hollenbaugh & Ferris, 2014; Nosko, Wood, & Molema, 2010). Attention has been paid to identification of factors that influence self-disclosure (for a general overview, see Zhang & Leung, 2014). Gender (e.g., Walton & Rice, 2013), age (e.g., Nosko et al., 2010; Steijin, 2014), and individual differences such as self-esteem, narcissism, and personality traits emerged as potential predictors of disclosure (e.g., Hollenbaugh & Ferris, 2013; Liu, Ang, & Lwin, 2013). Other studies have investigated the relationship between different types of SNS usage motivations and information disclosure. Accordingly, use of SNSs for relationship management purposes (i.e., relationship initiation, development and maintenance) is positively associated with self-disclosure (Krasnova et al., 2010; Yang & Tan, 2012). Relatedly, disclosure of information has been found to be associated with motivations like self-presentation, self-expression and receiving social validation (Almakrami, 2015; Yang & Tan, 2012).

Extant research provides inconsistent results regarding the relationship between self-disclosure and privacy protective behavior as two dimensions of privacy management. On the one hand, studies suggest that users may strategically employ these two approaches to complement each other. For example, Lewis, Kaufman, and Christakis (2008) reports that among U.S. college students, those who had private Facebook profiles were more active. On the other hand, some scholars (e.g. Christofides, Muise, & Desmarais, 2009) suggest that these two types of privacy management approaches are two independent behaviors, influenced by distinct factors.

In general, privacy literacy and attitudes about privacy are two factors that have received considerable attention as predictors of privacy management behavior (e.g., boyd & Hargiatti, 2010; Debatin et al., 2009; Park, 2011). One commonly shared argument has been that people with higher privacy literacy—comprising declarative ("knowing that") and procedural ("knowing how") knowledge (Trepte et al. 2015)—are better at protecting their privacy (e.g., boyd & Hargiatti, 2010). For example, Park (2011) reports that it is positively associated with online privacy protective behavior. Within the context of use of SNSs, studies indicate that having technical skills and familiarity with privacy settings are positively correlated with changing privacy settings (boyd & Hargittai, 2010; Debatin et al. 2009). It should also be noted that, literacy and the accompanying confidence in the ability to

manage one's privacy may also influence the extent to which individuals engage in disclosure by reducing what Turow and Hennessy (2007) name as "fear of disclosure" (p. 305).

Attitudes about privacy may also determine the extent to which an individual engages in privacy management behavior in general (Jensen & Sørensen, 2013; Taddicken, 2014; Van den Broeck et al., 2015; Vitak, 2012). However, in current literature on SNS and privacy behavior, there is substantial disagreement about whether privacy attitudes can predict behavior. For example, the concept of "privacy paradox", initially coined by Barnes (2006), has often been used to refer to a discrepancy between being concerned about privacy and self-disclosure and likelihood of engaging in privacy protection (e.g., Acquisti & Gross, 2006, Dienlin & Trepte, 2015, Taddicken, 2014).

One potential reason for this discrepancy pertains to the users' risk-benefit calculation regarding engagement in SNSs. Specifically, according to the CPM, the decision about level of openness entails a consideration of the expected benefits, such as self-clarification, and relationship development, and the potential "perils of revealing" (Petronio, 2002, p.66). In line with the CPM, what has been named as the *gratifications hypothesis* (Dienlin & Trepte, 2015; Trepte, Dienlin, & Reinecke, 2014) argues that while evaluating the risks and benefits of a privacy related decision (e.g., whether to disclose or not, whether to close one's profile to public) users, despite being aware of the risks, will consider the gratifications to exceed the risks. Hence, the privacy paradox stems from the fact that as SNSs are increasingly embedded in individuals' social lives, self-disclosure becomes somewhat like a necessity even when such platforms do not afford adequate privacy protection (Blank, Bolsover, & Dubois, 2014).

According to Dienlin and Trepte (2015), another reason for the privacy paradox concerns the attitude-behavior gap. Accordingly, there are two important problems in existing measurements of privacy attitudes. First, these measures tend to confound "privacy concerns" with "privacy attitudes". Second, there is a mismatch between the types of behaviors and types of attitudes measured. As Dienlin and Trepte (2015) note, majority of the studies in this field use "a multitude of singular behaviors that did not consider the multidimensional nature of privacy" (p.286). Consequently, they call for the adoption of approaches that account for the multidimensionality of privacy.

Multidimensionality of privacy attitudes becomes even more important to consider in SNS environments. This is primarily because privacy related behavior in the context of SNSs does not take place in isolation but involve the consideration of wider network of others that may be affected by one's actions (Baruh & Popescu, 2015; Marwick & boyd, 2014). Indeed, as CPM suggests, privacy management in networked environments entails sharing of the responsibility in protecting boundaries.

Based on these conceptualizations of privacy as a networked and multidimensional phenomenon, Baruh and Cemalcilar (2014), have constructed a multidimensional privacy orientation scale that measures four distinct dimensions of privacy attitudes. This scale includes measurement of concern about privacy as well as value given to privacy as: (1) belief in value of privacy as a right (i.e., the belief that privacy is a fundamental right that needs legal protection), (2) other-contingent privacy (i.e., the belief that the level of privacy a person enjoys depends on the extent to which other people are careful about protecting their own privacy), (3) concern about own informational privacy (i.e., concern about who has access to information about oneself, how the information is used), and (4) concern about privacy of others (i.e., respecting the privacy of others even when they are not careful about their privacy). All four of these dimensions of privacy attitudes were found to be positively correlated with both online privacy protective behavior in general and privacy protective behavior on Facebook on a sample of US adult users (Mean age 45.7).

In line with the gratifications hypothesis and the CPM, in their recent study, Van der Broeck et al. (2015) argue that given the differences in frequency and type of SNS use across different age groups, privacy related behavior on SNSs may also vary as a function of age. Hence, a comparative analysis that focuses on age differences in relation to privacy attitudes, concerns, privacy literacy, self-disclosure behavior, and privacy protective measures taken within the context of SNSs is imperative.

Current research on self-disclosure and privacy-related behavior has primarily focused on adolescents and children (Van den Broeck et al., 2015). There is only limited data available on the effect of age on SNS use in general (Chang, Choi, Bazarova, & Löckenhoff, 2015) and privacy management behavior in SNSs particularly (Steijn, 2014). Below, we first summarize extant research on age differences in SNS usage patterns and then focus on age differences related to disclosure, privacy attitudes and privacy management behavior.

## **Lifestages and Differences in Self-Disclosure and Privacy**

Over the span of the last decade, SNS usage has become commonplace among all adult populations. According to a 2015 report published by Pew Research Center, while only 7% of all adults in the U.S. were SNS users a decade ago, in 2015 this number increased to 65%. Ninety percent of young adults are currently SNS users and usage among those who are 65 years old or older has tripled since 2010, reaching to 35% (Perrin, 2015).

Research based on life cycle theory (Erikson, 1968) has shown that individuals' expectations from and preference about interpersonal relationships vary depending on the life stage they are at. Major life events (e.g., school, employment, marriage, retirement) play a critical role in individuals' motivations and behavioral patterns regarding social relations (Holmes & Rahe, 1967). Recent meta-analytic work indicates that life stages influence both the structure and the size of individuals' social networks. Namely, individuals' network size reaches a peak by early young adulthood, after which the size plateaus until late young adulthood and then starts continuous decrease thereafter (Wrzus, Hanel, Wagner, & Neyer, 2013). Socio-emotional selective theory is proposed as a framework to interpret this change in social network size. Accordingly, while informational goals are related to expansion of one's networks in younger adulthood, as individuals age, they tend to focus on close relationships to satisfy their emotional needs, resulting in elimination of peripheral relations (Wrzus et al, 2013).

In line with the life cycle theory, recent research demonstrates key differences across adult age groups in the types of uses of SNSs. Older users primarily use SNSs to maintain their relationship with close contacts (i.e., friends and family) and overall spend less time on the site (e.g., Brandtzæg, Lüders, & Skjetne, 2010; Christofides, Muise, & Desmarais, 2012; McAndrew & Jeong, 2012), whereas younger adults seek larger and more heterogeneous social networks and use SNSs for a wider range of purposes (Arjan, Pfeil, & Zaphiris, 2008; Chang et al., 2015). Being at a developmental stage characterized by "exploration and instability" (Arnett, 2004), young adults are more likely to be motivated to experiment with social boundaries and engage in self-disclosure on SNSs as a means of satisfying this motivation than older adults do (for a summary, see Van den Broeck et al., 2015). Relatedly, young adults are more likely to use SNSs for self-presentation, which, in turn, may be related to their tendency to use SNSs more actively, which entails higher self-disclosure (Arjan et al., 2008; Chang et al., 2015; Christofides et al., 2012; Peter & Valkenburg, 2011; Steijn, 2014; Walrave et al., 2012). Given these findings, this study will test the following two hypotheses:

H1. Younger adults a) will have larger network of friends on Facebook and b) will be more likely to engage in uses of Facebook that are oriented towards social interactions with others.

H2. Younger adults will be more likely to engage in self-disclosure on Facebook.

With respect to age differences regarding privacy protective behavior, extant research points to a similar trend. Across different SNS platforms like Facebook and Google+, age of adult users has been found to be inversely related to the frequency with which users checked and/or changed their privacy settings (Blank et al. 2014; Van den Broeck et al. 2015) and their tendency to take measures to limit the circulation of information about themselves such as untagging photos and limiting updates to certain people (Litt, 2013).

H3. Younger adults will be more likely to adopt privacy protective behavior on Facebook.

Research also suggests that privacy literacy may be an important factor that explains the observed age differences regarding the adoption of privacy protection measures in SNS settings. Accordingly, because they are more tech savvy in general and because they tend to use SNSs more frequently, younger adults may not only have higher awareness of privacy risks posed by SNSs but may also be more apt in adjusting privacy settings to protect themselves from these risks (Bolton et al., 2013; boyd & Hargittai, 2010; Brandtzæg et al., 2010; Debatin

et al., 2009; Litt, 2013; Tufekçi, 2012). In line with these findings, Van den Broeck et al. (2015) report significant age differences in knowledge of options for changing Facebook privacy settings.

Yet, evidence also suggests that age differences in privacy literacy may not be as pronounced as assumed (Hoofnagle, King, Li, & Turow, 2010). Indeed, according to a recent study by Blank et al. (2014), there were no significant differences between age and skills associated with changing privacy settings. As such, it is possible that the any age difference with respect to knowledge of Facebook privacy settings may be a function of perceived need for changing privacy settings rather than a gap in literacy. Namely, to the extent that older adults—as illustrated in previous research summarized above—are less frequent users of SNSs and are less likely to engage in disclosure of information on such platforms, they may not perceive a need for changing their privacy settings. This could, in turn, decrease their knowledge of options (Maaß, 2011; Urista, Dong, & Day, 2009; Van den Broeck et al., 2015) simply because they did not perceive the need to try the options.

In the light of this discussion regarding potential age differences in engaging in privacy protective behavior and the respective roles that self-disclosure (as a factor that influences need for privacy protection) and literacy may play, and due to the inconsistencies in findings from extant research, we pursue the following research question:

RQ1. What is the respective role that disclosure and privacy literacy play as factors that mediate the relationship between user age group and privacy protective behavior?

Regarding the relationship between privacy attitudes and privacy management in general, an area of inquiry that has received significant amount of attention concerns differences between adults and adolescents. These studies have reported key differences between adults and adolescents as to what is considered as (disclosure of) “private” information and what constitutes a breach of privacy (e.g., Livingstone, 2008; Livingstone, Ólafsson, & Staksrud, 2011; Peter & Valkenburg, 2011). In terms of age differences in privacy attitudes among adults, current research provides some conflicting evidence. On the one hand, several studies indicate that privacy concerns are present across different age groups (e.g., Jensen & Sørensen, 2013; Taddicken, 2014). On the other hand, a number of recent studies report that older adults are more likely to be concerned about privacy, which, accordingly, can be attributed to the fact that younger adults are more comfortable about managing their privacy and hence do not feel as concerned (Maaß, 2011; Tufekçi, 2012; Van Broeck et al. 2015).

It should also be noted that the studies discussed in the previous paragraph primarily focus on age differences about privacy concerns without differentiating concerns from attitudes. Yet, despite the aforementioned importance of understanding the behavioral implications of the multidimensionality of privacy attitudes, there is a considerable dearth of research on age differences pertaining privacy attitudes in general and how privacy attitudes may interact with age in predicting SNS users’ tendency to engage in privacy protective behavior.

The CPM provides a useful point of entry for understanding the nature of this potential interaction between privacy attitudes and age. According to CPM, in addition to factors such as risk-benefit ratio and motivational criteria, one important factor that influences privacy rule development concerns cultural differences that may govern individuals’ expectations and values (Petronio, 2002). Consider, for example, discussions in privacy literature tracing how, particularly over the last two decades, privacy is being transformed from being a right into a commodity (e.g., Davies, 1997; Papacharissi, 2010). Accordingly, along with this recent transformation of privacy into being a commodity, neoliberal approaches to privacy protection place the onus on individuals to understand risks and act (Solove, 2013). To our knowledge, there is no empirical research on how these changes are implicated in age differences in understanding of privacy mirroring these cultural differences in values and expectations. Yet, it is possible that for young adults, who have grown within this cultural context, concern about individual privacy will be more important in predicting behavior than other considerations related to the value of privacy as a right or respect for the privacy of other individuals. Given these considerations, we investigate the following questions regarding age differences in privacy attitudes and how age may interact with different dimensions of privacy attitudes in predicting the extent to which an individual engages in privacy protective behavior:

RQ2. What are the differences between age groups in terms of different dimensions of privacy attitudes?

RQ3. How does age interact with different dimensions of privacy attitudes in predicting privacy protective behavior on Facebook?

## Method

### Participants

The sample comprised a convenience sample of adult online panel members provided by Qualtrics Panel from ClearVoice Research®. The ClearVoice research participation is voluntary. Panel members are recruited and regularly verified via SMS or phone. Out of the 1540 panel members who received the invitation for the survey, 600 completed it (completion rate 39%). Out of the 600 respondents, 518 reported using Facebook. The study will mainly focus on these respondents. The respondents were between the ages of 18 and 85 (53.3% female,  $M_{age} = 49.36$ ,  $SD_{age} = 13.83$ ). Participants received cash or gift cards from Qualtrics.

For the comparative analyses, we divided the participants into three age groups based on lifespan stages (Kail & Cavanaugh, 2010): young adulthood (18-40 years old,  $n = 138$ , 41.3% female), middle adulthood (41-65 years old,  $n = 330$ , 57.9% female), and late adulthood (65+ years old,  $n = 50$ , 56% female). Age groups were comparable in terms of their educational level (23-31% were high school graduates or less, and 67% in each group had some college education or were college graduates). A significantly larger proportion of young adults (97%) reported using Facebook than middle adulthood (84%) and late adulthood groups (81%).

### Measures

**Facebook uses and gratifications.** To compare groups in terms of their motivations for using Facebook, we collected data about four types of uses of Facebook based on prior research, all measured with three items using 5-point Likert scale ranging from 0 to 4 (Chen, 2011; Whiting, & Williams, 2013): (1) using Facebook to satisfy social curiosity (e.g., "to learn about daily lives of other people",  $\alpha = .85$ ,  $M = 1.44$ ,  $SD = 0.97$ ), (2) using Facebook for getting information (e.g., "to be up to date about current events",  $\alpha = .90$ ,  $M = 2.11$ ,  $SD = 1.04$ ), (3) using Facebook for social interaction (e.g., "to expand my circle",  $\alpha = .87$ ,  $M = 1.65$ ,  $SD = 1.05$ ), and (4) using Facebook for entertainment (e.g., "to have fun",  $\alpha = .89$ ,  $M = 2.63$ ,  $SD = 0.92$ ). Items were averaged to create an index score for each subscale, respectively.

**Information disclosure behavior on Facebook.** Information disclosure behavior on Facebook was measured using eight items ranging from *never* (0) to *more than once a day* (5) ( $M = .79$ ,  $SD = 0.84$ ). A general score for information disclosure on Facebook was calculated by averaging the items. See Appendix A for wording of the items.

**Online privacy literacy.** Eight true-false items were used to assess respondents' general knowledge about online privacy. See Appendix B for wording of the items. A literacy score was calculated by summing the number of correct answers ( $M = 5.66$ ,  $SD = 1.45$ , range: 1-8).

**Multidimensional privacy orientation scale.** Participants filled out the 18-item Multidimensional Privacy Orientation Scale (Baruh & Cemalcilar, 2014), using a five-point scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). The dimensions of the scale were as follows: 1) *Privacy as a right*; 2) *Concern about own informational privacy*, (3) *Other-contingent privacy*, 4) *Concern about privacy of others*. Table 1 provides the wording and the factor loading of items in each dimension, and the reliability and descriptive summaries of ensuing dimensions of privacy attitudes.

**Privacy protective measures on Facebook.** Use of privacy protective measures on Facebook was assessed by summing 11 items based on Baruh and Cemalcilar (2014) and Litt (2013), measuring whether the participant ever engaged in specific types of privacy protective actions on Facebook ( $M = 4.42$ ,  $SD = 3.08$ , range: 0-11). See Appendix C for wording of the items. Also, Appendix D demonstrates correlations among and descriptive summaries of the variables.

Table 1. *Components of the Privacy Orientation Scale.*

	<b>Factors</b>			
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
<b>Factor 1: Privacy as a right</b>				
Privacy laws should be strengthened to protect personal privacy	<b>.78</b>	.21	.14	.24
People need legal protection against misuse of personal data	<b>.85</b>	.13	.11	.28
If I were to write a constitution today, I would probably add privacy as a fundamental right	<b>.85</b>	.13	.11	.28
<b>Factor 2: Concern about own informational privacy</b>				
When I share the details of my personal life with somebody, I often worry that he/she will tell those details to other people	.10	<b>.80</b>	.18	.04
I am concerned that people around me know too much about me	.08	<b>.84</b>	.10	-.05
I am concerned with the consequences of sharing identity information	.25	<b>.67</b>	.28	.24
I worry about sharing information with more people than I intend to	.16	<b>.77</b>	.25	.18
<b>Factor 3: Other-contingent privacy</b>				
If somebody is not careful about protecting their own privacy, I cannot trust them about respecting mine	.09	.15	<b>.79</b>	.23
If I am to enjoy some privacy in my life, I need my friends to be careful about protecting their privacy as well	.14	.21	<b>.78</b>	.25
I could never trust someone as my confidant if they go around sharing details about their own private lives	.06	.16	<b>.81</b>	.12
The level of privacy that I can enjoy depends on the extent to which people around me protect their own privacy	.13	.25	<b>.79</b>	.08
<b>Factor 4: Concern about privacy of others</b>				
It is important for me to respect the privacy of individuals, even if they are not careful about protecting their own privacy	.24	.08	.22	<b>.73</b>
I value other people's privacy as much as I value mine	.15	.09	.15	<b>.80</b>
Even when somebody is not careful about his/her privacy, I do my best to respect that person's privacy	.20	.08	.10	<b>.84</b>
I always do my best not to intrude into other people's private lives	.16	.03	.13	<b>.75</b>
Respect for others' privacy should be an important priority in social relations	.27	.10	.16	<b>.81</b>
<b>Cronbach's <math>\alpha</math></b>	.83	.83	.86	.88
<b>Mean</b>	4.14	3.47	3.46	4.15
<b>Standard Deviation</b>	.73	.89	.84	.63

**Note:** For each subscale, the Cronbach's  $\alpha$  values are calculated using the items with factor loadings indicated in bold.

In addition to these key measures related to our main hypotheses and research questions, to further assess age differences in SNS use, we collected data regarding Internet and Social Media use. Respondents reported the number of years they had been using the Internet, their daily Internet use separately for work days and weekends. In terms of SNS use and SNS network, respondents reported the frequency of their use of various social media platforms (Facebook, Twitter, video sharing platforms like YouTube, and photo sharing platforms like Instagram) using a scale ranging from *never* (0) to *more than once a day* (5) and the number of friends on their Facebook account and percentage of Facebook friends with whom they never met in person.

## Results

Table 2 provides a comparison of the age groups in terms of level of Internet use, use of social media, and characteristics of respondents' Facebook friends network and uses and gratifications of Facebook. Overall, there was no significant difference between age groups in terms years of internet use,  $F(2, 510) = 0.348, p > .05$  and hours per day of internet use during weekdays Welch's  $F(2, 135.80) = 2.576, p > .05$ ; however, mature adults reported using the Internet less frequently during the weekends than younger age groups Welch's  $F(2, 130.14) = 9.659, p < .001$ .

Table 2. Comparison of Age Groups in Terms of Internet and SNS Use.

	Young Adulthood	Middle Adulthood	Mature Adulthood	<i>F</i>	$\eta^2$ ( $\omega^2$ )
<b>Internet Use</b>					
Years of Internet use	8.26 (2.46)	8.44 (2.47)	8.23 (2.36)	.348 <sup>NS</sup>	.001
Internet hours per work day <sup>3</sup>	4.49 (2.93)	4.57 (2.87)	3.75 (2.31)	2.576 <sup>NS</sup>	.006
Internet hours per weekend day <sup>3</sup>	5.18 (2.91) <sup>a</sup>	5.42 (2.77) <sup>a</sup>	3.77 (2.40) <sup>b</sup>	9.659	.033
<b>Social Media (Frequency)</b>					
Facebook <sup>3</sup>	4.29 (1.13) <sup>a</sup>	4.05 (1.28) <sup>b</sup>	3.56 (1.47) <sup>b</sup>	5.543	.017
Twitter <sup>3</sup>	1.46 (1.95) <sup>a</sup>	.74 (1.35) <sup>b</sup>	.29 (.74) <sup>c</sup>	1.449	.063
Photo Share <sup>3</sup>	1.42 (1.54) <sup>a</sup>	.58 (.93) <sup>b</sup>	.35 (.97) <sup>b</sup>	20.300	.069
Video Share <sup>3</sup>	2.61 (1.68) <sup>a</sup>	1.67 (1.33) <sup>b</sup>	1.10 (1.30) <sup>c</sup>	24.523	.083
<b>Facebook Network</b>					
Number of Friends <sup>1,3</sup>	250.63 (229.69) <sup>a</sup>	205.82 (218.72) <sup>a</sup>	117.08 (159.91) <sup>b</sup>	9.697	.034
Percent of Facebook friends not met in person (mean percent) <sup>2,3</sup>	29.85 (30.70)	36.05 (34.08)	35.31 (33.39)	1.850 <sup>NS</sup>	.003
<b>FB Uses and Gratifications</b>					
Entertainment	2.64 (.92)	2.67 (.90)	2.36 (1.07)	2.411 <sup>NS</sup>	.009
Social interaction	1.84 (1.08) <sup>a</sup>	1.62 (1.02) <sup>a,b</sup>	1.27 (1.01) <sup>b</sup>	5.793	.022
Social curiosity	1.77 (1.04) <sup>a</sup>	1.34 (.91) <sup>b</sup>	1.21 (.92) <sup>b</sup>	11.527	.043
Information seeking	2.22 (1.09)	2.23 (1.00)	2.03 (1.16)	.823 <sup>NS</sup>	.003

**Note:** Sample *n*'s for the age groups vary as follows depending on missing values in specific variables: Young Adulthood:  $n = 131$  to  $138$ ; Middle Adulthood:  $n = 319$  to  $330$ ; Mature Adulthood:  $n = 48$  to  $50$ . All *F* values other than with a superscript of NS are significant at  $p < .05$  level. Different superscripts in a row denote columns that are significantly different. Unless otherwise stated (see below at Note 3), Bonferroni post-hoc analysis was used for group comparisons.

1 Capped to 700, 90th percentile.

2 Capped to 90%, 90th percentile.

3 ANOVA's for variables violating the homogeneity of variances assumption were conducted using Welch's *F* was used. For these variables adjusted Omega-squared ( $\omega^2$ ) was used for effect size. Also, for these variables post-hoc analysis for group comparisons were conducted using the Games-Howell procedure instead of the Bonferroni procedure.

### Age Group Differences in Facebook Use, Disclosure and Privacy Protection on Facebook

As predicted by Hypothesis 1, age groups differed on the extent of Facebook network size, with number of friends decreasing by age groups Welch's  $F(2, 134.78) = 9.687, p < .001$ . Yet, there was no difference in terms of percentage of friends that respondents characterized as not having met in person (on average one in three, for all groups) Welch's  $F(2, 126.41) = 1.850, p > .05$ . Also in line with Hypothesis 1, young adults were more likely than older age groups to utilize Facebook for social interaction purposes  $F(2, 518) = 5.793, p < .01$  and satisfying social curiosity  $F(2, 518) = 11.527, p < .01$ . On the other hand, age groups did not significantly differ from each other in



terms of use of Facebook to get information about current events and for using Facebook because it is entertaining (Table 2).

Table 3 compares age groups in terms of disclosure on Facebook, number of privacy protective measures taken on Facebook, online privacy literacy, and privacy attitudes. One-way analysis of variance results showed that, age groups were significantly different from each other in terms of both disclosure on Facebook Welch's  $F(2, 132.81) = 19.729, p < .001$  and use of privacy protection measures on Facebook,  $F(2, 515) = 15.222, p < .001$ , confirming H2 and H3, respectively. Post-hoc analyses indicated that young adults were significantly more likely than older age groups to disclose information and engage in privacy protective behavior on Facebook.

Table 3. Mean Comparisons by Age Groups: Information Sharing and Privacy Protective Behavior on Facebook, Privacy Literacy and Privacy Attitudes.

	Young Adulthood	Middle Adulthood	Mature Adulthood	F	$\eta^2(\omega^2)$
Information disclosure on FB <sup>1</sup>	1.18 (1.10) <sup>a</sup>	.68 (.69) <sup>b</sup>	.42 (.55) <sup>c</sup>	19.729	.067
Privacy protect. measures on FB	5.55 (3.16) <sup>a</sup>	4.12 (2.90) <sup>b</sup>	3.26 (3.22) <sup>b</sup>	15.222	.056
Online privacy literacy	5.45 (1.36)	5.69 (1.45)	5.76 (1.59)	1.601 <sup>NS</sup>	.006
<b>Privacy Attitudes</b>					
Privacy as a right	4.10 (.77)	4.16 (.72)	4.03 (.65)	.966 <sup>NS</sup>	.004
Concern about own privacy	3.36 (.97)	3.41 (.86)	3.55 (.77)	.816 <sup>NS</sup>	.003
Other-contingent privacy <sup>1</sup>	3.17 (.90) <sup>a</sup>	3.44 (.81) <sup>b</sup>	3.80 (.67) <sup>c</sup>	13.125	.045
Concern about privacy of others	3.99 (.71) <sup>a</sup>	4.21 (.61) <sup>b</sup>	4.14 (.50) <sup>a,b</sup>	6.115	.023

**Note:** Sample n's for the age groups vary as follows depending on missing values in specific variables: Young Adulthood:  $n = 137$  to  $138$ ; Middle Adulthood:  $n = 329$  to  $330$ ; Mature Adulthood:  $n = 50$ . All  $F$  values other than with a superscript of NS are significant at  $p < .05$  level. Different superscripts in a row denote columns that are significantly different. Unless otherwise stated (see below at Note 1), Bonferroni post-hoc analysis was used for group comparisons.

1 ANOVA's for variables violating the homogeneity of variances assumption were conducted using Welch's  $F$  was used. For these variables adjusted Omega-squared ( $\omega^2$ ) was used for effect size. Also, for these variables post-hoc analysis for group comparisons were conducted using the Games-Howell procedure instead of the Bonferroni procedure.

## Privacy Literacy and Disclosure as Predictors of Privacy Protection on Facebook

The RQ1 inquired about the respective roles that online privacy literacy and disclosure may play as factors that mediate the relationship between age groups and utilization of privacy protective measures on Facebook. Since differences among age groups in terms of online privacy literacy was not significant,  $F(2, 516) = 1.601, p > .05$  (Table 3), the mediation analysis will focus only on whether disclosure on Facebook mediates the relationship between age groups and number of privacy protective measures taken on Facebook. To test this mediation model, we used the PROCESS macro in SPSS (Model 4, with a bootstrap approach of 5000 drawings). This model allows for a sequential comparison of the effects of a multicategorical independent variable (in this analysis, three age groups) on mediating and dependent variables (Hayes & Preacher, 2014). Specifically, in this sequential analysis, initially the first group (young adulthood) is compared with all the remaining groups combined (middle adulthood and mature adulthood), then the first two groups (young adulthood and middle adulthood) are compared with the mature adults.

Figure 1 provides the summary of the mediation analysis. Accordingly, information disclosure partially mediated the relationship between age groups and privacy management. Specifically, young adults were more likely than both of the older age groups ( $B = -0.50, p < .001$ ) and mature adults were less likely than both of the younger age groups ( $B = -0.25, p < .05$ ) to engage in information disclosure on Facebook. In turn, those who disclosed more were more likely to take privacy protective measures on Facebook ( $B = .56, p < .01$ ). In addition, after controlling

for disclosure, young adults were more likely than other age groups to utilize privacy protection measures ( $B = -1.15, p < .01$ ). The model explained 16% of the variance in privacy protection measures ( $p < .001$ ).

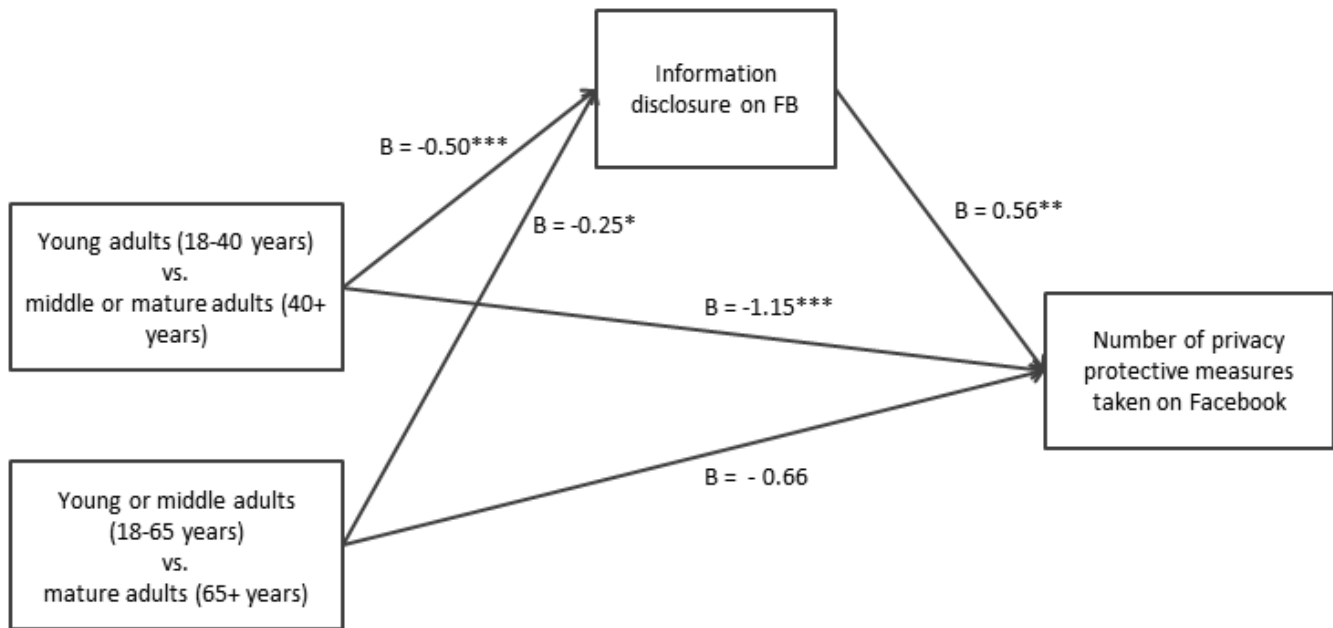


Figure 1. Multicategorical (sequential) mediation model for the direct and indirect effect of age on privacy management on Facebook. \*  $p < 0.05$ , \*\*  $p < 0.01$ .

## Age Differences in Privacy Attitudes and Their Impact on Privacy Protection on Facebook

RQ2 inquired about whether there would be differences between age groups in terms of different dimensions of privacy attitudes and the respective impact of the attitudes on privacy protective behavior. Table 3 provides the comparison of age groups with respect to the four dimensions of privacy attitudes. Accordingly, there were no significant differences among age groups for the belief that privacy is a right,  $F(2, 518) = 0.966, p > .05$  and concern about one's own privacy,  $F(2, 518) = 0.816, p > .05$ . On the other hand, age groups significantly differed from each other in terms the belief that their own privacy is contingent on the extent to which other people around them are careful about protecting their own privacy (other-contingent privacy), Welch's  $F(2, 134.54) = 13.125, p < .001$  and in terms of valuing the privacy of others,  $F(2, 517) = 6.115, p < .01$ . Specifically, older adult groups were most likely to think that their own privacy depended on whether other people around them would safeguard their privacy. They were followed by middle age adults and then young adults. Also, young adults were less likely than both other age groups to report valuing privacy of others.

RQ3 focused on whether different dimensions of privacy attitudes would interact with age in terms of predicting the extent to which respondents used privacy protection measures on Facebook. To test the interactions, we performed analysis of covariance (ANCOVA) tests with privacy attitude dimensions as covariates. Accordingly, age interacted significantly with all four dimensions of privacy attitudes: 1) belief in privacy as a right,  $F(3, 515) = 8.993, p < .001$ , partial  $\eta^2 = 0.05$ ; 2) concern about one's own informational privacy,  $F(3, 515) = 16.893, p < .001$ , partial  $\eta^2 = 0.09$ ; 3) other contingent privacy,  $F(3,515) = 11.489, p < .001$ , partial  $\eta^2 = 0.06$ ; and 4) concern about privacy of others,  $F(3,515) = 7.338, p < .001$ , partial  $\eta^2 = 0.04$ .

As shown in Figure 2, a similar trend is observed for all four of the privacy attitude dimensions. Namely, among members of the mature adulthood groups, the impact of privacy attitudes on use of measures to protect privacy on Facebook is generally stronger than other age groups. The only attitude dimension for which young adults and mature adults were comparable to each other in terms of the impact of the attitude on number of privacy

protective measures taken on Facebook was “concern about one’s own informational privacy” (Figure 2B). Indeed, among young adults, belief in privacy as right ( $B = .506, p = .119$ , Figure 2A) and concern about privacy of others ( $B = .068, p = .848$ , Figure 2D) had no impact on number of measures taken to protect privacy on FB.

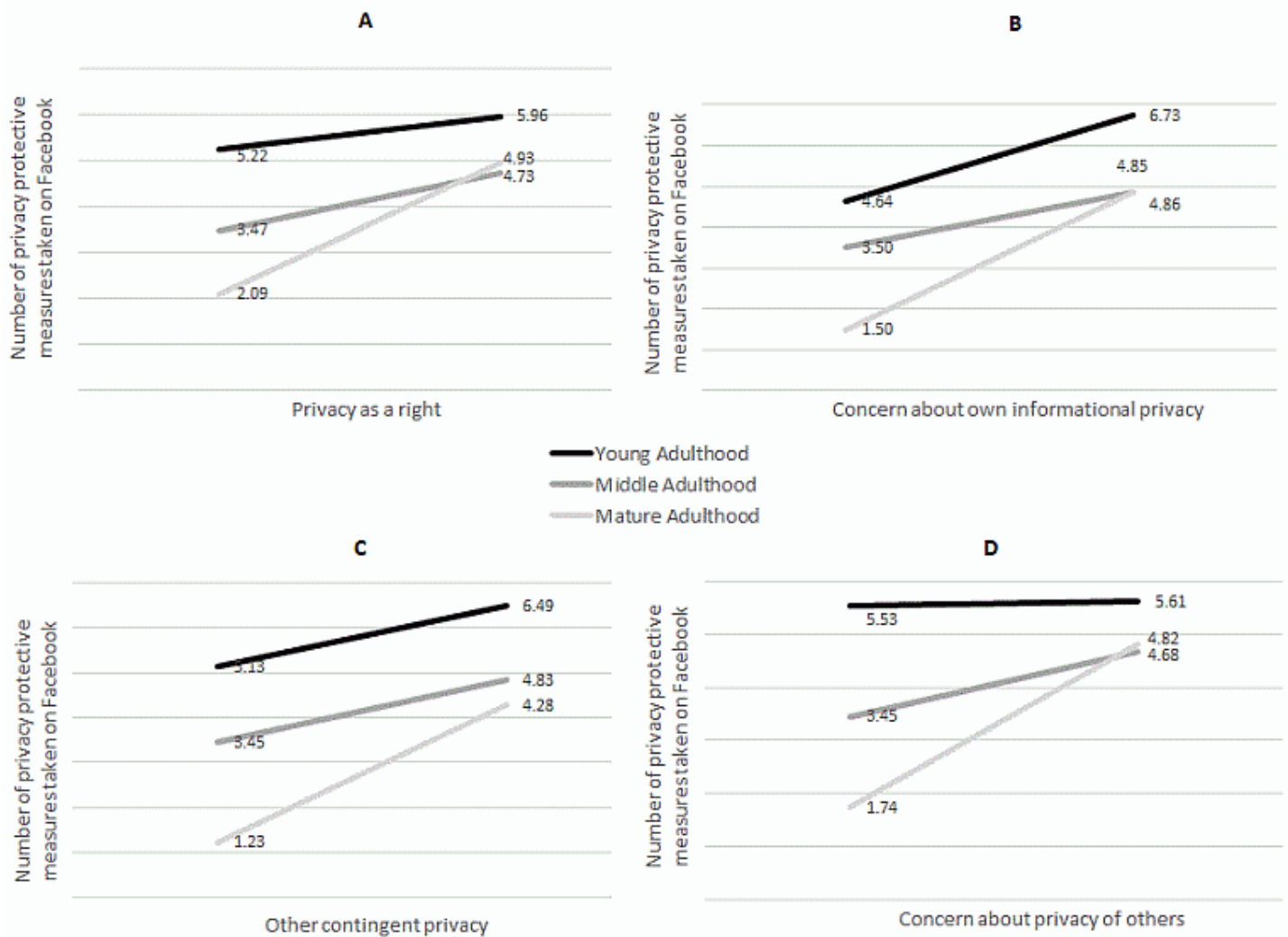


Figure 2. A) Interaction between age groups and valuing privacy “as a right”; B) Interaction between age groups and concern about one’s own informational privacy; C) Interaction between age groups and other contingent privacy; D) Interaction between age groups and concern about privacy of others.

## Discussion

In recent years, informational privacy has become a hot button issue in literature on SNSs (Wilson, Gosling, & Graham, 2012). Previous studies have mainly focused on two dimensions of privacy management behavior: self-disclosure and taking privacy protecting measures. Considering that SNSs are increasingly being used by adults of all ages (Perrin, 2015) and given the recent evidence suggesting that older adults differ from younger adults and adolescents in terms of how they use SNSs (e.g., Brandtzæg et al., 2010; Chang et al., 2015; McAndrew & Jeong, 2012), understanding age differences in relation to privacy related behavior is an important subject of inquiry. Yet, until recently, there has been very limited research in this area (for recent exceptions see, Steijn, 2014; Van den Broeck et al., 2015).

Accordingly, in this study we investigated how adult age groups—divided based on three lifespan stages (young adulthood, 18 to 40 years old; middle adulthood, 41 to 65 years old; and mature adulthood, 65+ years old)—differ from each other in terms of online literacy, privacy concerns and attitudes, self-disclosure and privacy protective behavior on Facebook. Also, we investigated how disclosure mediates the relationship between age

and use of privacy protection measures on Facebook. Finally, we report findings regarding the interaction between age group membership and privacy attitude dimensions as predictors of privacy protection on Facebook.

Consistent with previous research (e.g., Chang et al., 2015; Steijn, 2014; Van den Broeck et al., 2015), our findings indicate that older adults are less likely to disclose information and that they are less likely to employ privacy protection on Facebook. This may be attributed to age differences in frequency of and motivations in use of Facebook. Namely, studies indicate that older adults not only spend less time on Facebook but also are less motivated to use SNSs for purposes—such as expanding one's network or engaging in self-presentation—that may be associated with self-disclosure (e.g., Chang et al., 2015; Peter & Valkenburg, 2011; Steijn, 2014; Walrave et al., 2012). Our analyses of Facebook usage amount and motivations are in line with previous research. Not only did frequency of use of Facebook (and indeed other social media platforms like Twitter) decline with age, but also, older age groups had smaller networks and were less likely to use Facebook for socialization purposes (i.e., satisfying social curiosity and engaging in social interactions).

Previous literature offers two alternative explanations for the observed differences between age groups in terms of utilization of privacy protection measures on Facebook. On the one hand, one interpretation that is frequently offered is that users from younger generations are more likely to employ privacy protection measures because they are both more aware of the privacy risks and more technically apt in changing privacy settings (e.g., Bolton et al., 2013; Debatin et al., 2009; Tufekçi, 2012). On the other hand, it is also possible that older adults do not perceive as strong a need for utilizing these measures as younger adults do. The results summarized in this study are in line with this second interpretation of age group differences. First, we did not find any significant differences between age groups in terms of general online privacy literacy. When combined with the finding that across all age groups online privacy literacy is not related to use of privacy protection on Facebook this finding may imply that increasing literacy will not be sufficient in terms of boosting protective behavior. Second, among potential predictors, information disclosure had the highest correlation with privacy protection on Facebook. Third, the mediation model we tested indicates that information disclosure mediates the relationship between age and privacy protection.

To our knowledge, this study constitutes one of the first attempts at understanding age group differences in privacy attitudes as a multidimensional construct and how they may influence privacy protective behavior. Specifically, we focused on four potential dimensions of privacy attitudes proposed by Baruh and Cemalcilar (2014): 1) concern about one's own privacy; 2) belief that privacy constitutes a value that should be legally safeguarded; 3) codependency of privacy (i.e., belief that one's privacy depends on how careful others are about their own privacy); 4) concern about privacy of others (i.e., respecting others' privacy).

Our analyses of these four dimensions of privacy attitudes reveal several important insights. First, while all dimensions of privacy attitudes are positively related to adoption of privacy protection measures on Facebook, none of them were significantly related to disclosure behavior. Second, there were no significant differences between age groups in terms of considering privacy as a right or being concerned about own privacy. However, we observed that older adults were more likely to be conscious about the co-dependency of privacy and to value privacy of others. This finding becomes particularly important in the light of results concerning how privacy attitudes and age interact with each other in predicting use of privacy protective measures on Facebook. Specifically, our findings indicate that for all of the dimensions of privacy attitudes, the impact of the attitudes on use of privacy protective measures is strongest for mature adults. Perhaps more importantly, our analysis indicates that among younger adults, consideration of the value of privacy as a fundamental right and respect for the privacy of others do not significantly predict use of privacy protective measures on Facebook. We believe that these results can be interpreted through the premise of the CPM that cultural values play an important role in privacy rulemaking (Petronio, 2002). Hence, the 'neoliberal' reconceptualization of privacy as a personal responsibility may explain the age differences we are observing.

Another potential explanation to be considered is that Facebook usage patterns may make privacy attitude dimensions less relevant for younger users. That is, given the findings that younger adults are more likely to seek wider networks and utilize Facebook for socialization purposes, which include sharing information and perusing information from others, it is likely that concern about privacy of others will not factor into their privacy

rulemaking decisions. On the other hand, as life cycle theory suggests, since the network of older adults are more likely to contain close rather than peripheral relations, they are more likely to value the privacy of the members of their network.

## **Limitations and Future Research**

While interpreting these findings, it should be noted that the data for this study came from a convenience sample of online panel of respondents who opted in for receiving survey invites and responding. As such, particularly in terms of privacy concerns, this group of respondents may not be representative of Facebook users in general. Relatedly, as reported above, while majority of respondents across all age groups reported using Facebook, mature adults were slightly less likely to be Facebook users than younger age groups, a factor that may potentially bias results about the relationship between privacy attitudes and privacy protection behavior. Also, the fact that we used a convenience sample of online respondents means that we did not have much control over the size of the age groups that were compared, resulting in disproportionate sizes for age groups.

Another key factor to consider concerns the level of specificity of some of the measures utilized in the study. First, rather than measuring attitudes about privacy within the context of Facebook, the multidimensional privacy scale administered in this study is a general measure of privacy attitudes. Studies on attitude-behavior relationship indicate that low correlations between attitudes and behavior may often be the result of such mismatch between level of specificity of attitudes and behavior (Ajzen, 2001; Glasman & Albarracin, 2006). As such, this may explain the statistically significant yet small correlations (ranging between  $r = .12$  and  $r = .27$ ) between the dimensions of privacy attitudes and privacy protective measures taken on Facebook. However, it should also be noted that despite this potential specificity problem, all dimensions of privacy attitudes were strongly related to adoption of privacy protective behavior on Facebook among mature adults. Nevertheless, future research shall consider applications of the different dimensions of the privacy scale to the context of specific SNS platforms or other online consumption behaviors.

In a similar vein, the privacy literacy items utilized for this study focused on declarative (i.e., "knowing that") knowledge regarding general online privacy rather than procedural knowledge (i.e., "knowing how") of Facebook privacy protective behavior. This may explain why literacy was not related to privacy protective behavior and had a very low correlation with disclosure. An important reason why we focused on declarative knowledge as a predictor of privacy protective behavior concerns the potential circularity of the relationship between them. Indeed, recent research (Bartsch & Dienlin, 2016) provides reasons to call into question the direction of causality between previous experience in privacy protective behavior and procedural knowledge of how to do so. Still, analysis of the respective influence of declarative and procedural knowledge on privacy protective behavior would be valuable in future research, particularly if studied longitudinally or in controlled experiments that may help test this causal mechanism.

Relatedly, a more nuanced measurement of privacy management techniques that distinguishes between methods that may protect users' information from other members of their network and methods that users may utilize to protect their data from use by the SNS platform would be useful in terms of understanding age differences.

While we focused on Facebook because it is among the most commonly used SNS platforms, recent studies indicate that SNS platforms vary significantly in terms of the affordances they create for selective management of information sharing activities (Bazarova & Choi, 2014). Further research may investigate how differences in these affordances may influence the relationship between age, disclosure and use of privacy protective measures.

## **Implications**

Despite these limitations, the findings presented in this study have important implications both on a conceptual level and in terms of enhancing privacy risk awareness in ways that can boost protective behavior. On a conceptual level, the findings regarding the relationship between different dimensions of privacy attitudes and

use of privacy protective measures on Facebook confirm the arguments that in a networked age, understanding the relationship between privacy attitudes and behavior requires that the multidimensionality of the attitudes is accounted for (Dienlin & Trepte, 2015; Marwick & boyd, 2014). At the same time, results regarding the age differences in the impact of privacy attitudes on protective behavior point to an alternative approach to raising privacy awareness. That is, within the context of SNSs, as CPM suggests and our findings confirm, emphasis on the need to engage in privacy management collectively by the users could be a useful strategy in raising risk awareness. This could be particularly appealing to mature adults who are reportedly more cognizant of the co-dependency of privacy entitlements.

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**Correspondence to:**

Murat Kezer  
Koç Üniversitesi  
Rumelifeneri Yolu  
Sarıyer 34450  
Istanbul  
TURKEY

Email: [mkezer15@ku.edu.tr](mailto:mkezer15@ku.edu.tr)

## Appendices

### Appendix A – Information Disclosure on Facebook

When you use Facebook how often do you...

- 0 = Never
- 1 = Less than once a week
- 2 = Once a week
- 3 = Several times a week
- 4 = Once a day
- 5 = More than once a day

- 1. \_\_\_ Write or post photos/videos about what you did in your spare time?
- 2. \_\_\_ Write or post photos/videos about your family and friends?
- 3. \_\_\_ Write or post photos/videos about your work or education?
- 4. \_\_\_ Write or share articles/pictures/videos about your political views?
- 5. \_\_\_ Write or share articles/pictures/videos about your religious beliefs?
- 6. \_\_\_ Post photos/videos of yourself or your friends in party, drinking with friends?
- 7. \_\_\_ Share information about your location?
- 8. \_\_\_ Write about your feelings or emotions?

### Appendix B – Online Privacy Literacy

Below there are a few statements about Internet and online privacy. For each statement, please indicate whether you think it is true or false

- 1 = Yes
- 2 = No

Table B1. *Online Privacy Literacy: The Distribution of Answers.*

Item	Correct Answer (%)	False Answer (%)
Companies today have the ability to place an online advertisement that targets you based on information collected on your web-browsing behavior	95.2	4.8
A company can tell that you have opened an email even if you do not respond	22.8	77.2
When you go to a website, it can collect information about you even if you do not register	15.1	84.9
Popular search engine sites, such as Google, track the sites you come from and go to	5.8	94.2
When a website has a privacy policy, it means the site will not share your information with other websites or companies	50.8	49.2
Government policy restricts how long websites can keep the information they gather about you	26.8	73.2
It is legal for an online store to charge different people different prices at the same time of day	50.9	49.1
When I give personal information to an online banking site, privacy laws say the site has no right to share that information, even with companies it owns	59.2	40.8

### Appendix C – Privacy Protective Measures Taken on Facebook

Have you ever done the following **because you are concerned about your privacy on Facebook?**

1= Yes

2= No

1. \_\_\_ Untagged photos/videos on Facebook because you were concerned about privacy
2. \_\_\_ Delete information from your Facebook profile or timeline because you were concerned about privacy
3. \_\_\_ Unfriend people on Facebook you were concerned about privacy
4. \_\_\_ Deactivate your Facebook profile
5. \_\_\_ Restrict access to parts of your Facebook profile so that only your friends can see them
6. \_\_\_ Make your status updates private and allow only your friends to see them
7. \_\_\_ Turn off automatic face recognition on Facebook
8. \_\_\_ Remove an app from your Facebook account because of the information it collects about you.
9. \_\_\_ Restrict the types of information that you share with apps on Facebook
10. \_\_\_ Turn of all apps on Facebook
11. \_\_\_ Install an additional application to prevent third parties on Facebook from tracking you and displaying targeted advertisements.

## Appendix D – Correlations among and Descriptive Summaries of Variables

Table D1. *Correlations and Descriptive Summaries.*

	1	2	3	4	5	6	7	8	9	10	11
<b>1. Privacy as a right</b>	-										
<b>2. Concern about own privacy</b>	.42**	-									
<b>3. Other-contingent privacy</b>	.35**	.51**	-								
<b>4. Concern about privacy of others</b>	.57**	.33*	.41*	-							
<b>5. Online privacy literacy</b>	.13**	.07	.11**	.14**	-						
<b>6. FB U&amp;G-Entertainment</b>	.10*	.01	-.04	.12**	-.13**	-					
<b>7. FB U&amp;G-Social interaction</b>	.01	.03	-.05	-.06	-.20**	.48**	-				
<b>8. FB U&amp;G-Social curiosity</b>	-.07	.11**	-.002	-.15**	-.10*	.39**	.48**	-			
<b>9. FB U&amp;G-Information seeking</b>	.09	.07	-.01	.05	-.09*	.59**	.46**	.38**	-		
<b>10. Information disclosure on FB</b>	-.02	-.04	-.07	-.09	-.09*	.37**	.33**	.42**	.35**	-	
<b>11. Privacy protect. behavior on FB</b>	.20**	.27**	.18**	.12**	.06	.16**	.06	.09*	.12**	.21**	-
<b>Mean</b>	4.14	3.47	3.46	4.15	5.66	2.63	1.65	1.44	2.11	.79	4.42
<b>Standard Deviation</b>	.73	.89	.84	.63	1.45	.92	1.05	.97	1.04	.84	3.08

Note: \*  $p < 0.05$ , \*\*  $p < 0.01$

### About authors

**Murat Kezer** (B.A. Boğaziçi University, 2015) is currently a graduate student at the Department of Psychology, at Koç University in Turkey. His current research interests are dynamics of social media, interpersonal perception, and particularly first impressions.

**Barış Sevi** (B.A. Bilkent University, 2015) is currently a graduate student at the Department of Psychology, at Koç University in Turkey. His current research focuses on interpersonal relations and attitudes in social media.

**Zeynep Cemalcılar** (Ph.D. University of Texas, 2003) is Associate Professor at the Department of Psychology, at Koç University in Turkey. She is interested in studying social psychological theories and issues as processes applied to real world situations. Her recent research also focuses on understanding the dynamics of social media and use of technology in the social life.

**Lemi Baruh** (Ph.D. University of Pennsylvania, Annenberg School for Communication, 2007) is Associate Professor at the Department of Media and Visual Arts, at Koç University in Turkey. His research interests include new media technologies, surveillance, privacy—especially related to attitudes about privacy—and culture of voyeurism.