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Daredevils on Social Media: A Comprehensive Approach towards Risky Selfie Behavior among Adolescents

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Abstract

Risky selfies are recent, but worrying phenomena in which adolescents take pictures of themselves during the act of risk behavior. By applying the principles of the prototype willingness model, the current cross-sectional study among adolescents ($N = 686$) aged 15 to 18 years old examined the relation between social media use and adolescents' risky selfie behavior. A structural equation model indicated that adolescents' general social media use was positively related to descriptive norm estimations of risky selfie takers and favorable prototype perceptions of risky selfie takers. Moreover, attitudes toward the taking of risky selfies and prototype perceptions of risky selfie takers were found to positively relate to adolescents' willingness to engage in risky selfie taking and their actual risky selfie behavior. Furthermore, no support was found for the moderating roles of gender, developmental status, narcissism, and sensation seeking in the reported relations with social media use.

Keywords

Social media, Adolescence, Risk behavior, Selfies, Prototype willingness model

Introduction

Social media platforms such as Facebook, Instagram, and Snapchat form a substantial part of adolescents' daily lives (Anderson and Jiang, 2018). They allow adolescents to strengthen their social ties and experiment with their identity (Subrahmanyam and Šmahel, 2011). However, scholars have warned that some social media practices may harm adolescent well-being (e.g., Nowland et al., 2018).

One of these worrying practices is the posting of risky selfies. Based on emerging literature (Lamba et al., 2016; Zuckerman, 2014), risky selfies can be defined as pictures displaying the social media user in a dangerous situation, such as the climbing on a cliff or the inattentive driving of a vehicle. Risky selfies target particularly intense, dangerous behaviors, and involve taking social and/or legal risks. Because of the user's focus on his/her smartphone camera or on posing for the camera, his/her attention to the dangerous situation will be lowered and the risks of being physically harmed will increase (Flaherty and Choi, 2016).

As social media are highly popular among adolescents (Anderson and Jiang, 2018) and adolescence is considered a key period for risk behavior (Arnett, 1992), it is most likely that some adolescents are willing to take risks for the glory of posting a risky selfie on social media. Given that research is lacking on this subject, the current cross-sectional study explores risky selfie behavior among 686 adolescents. Its goals are threefold. First, the study explores whether general social media use is linked to posting risky selfies. During their social media use, adolescents may encounter multiple examples of peers engaging in moderately to highly risky behavior. Such examples may support them to also post risky selfies (Lamba et al., 2016). Second, the study explores the potential value of the prototype willingness model to explain how (some of) the links between social media use and risky selfie behavior develop (Gerrard et al., 2008). This theoretical model was originally developed to explain offline risk behavior among adolescents (Gerrard et al., 2008), but recent studies suggest it may also be applicable to online risk behavior (e.g., van Oosten et al. 2017). Third, media effects theories (e.g., Valkenburg and Peter, 2013) suggest (social) media effects largely depend on differential susceptibility factors, though they are often neglected in media effect studies. The current study acknowledges this theoretical proposition and explores whether theoretically suggested socio-demographic factors (i.e., gender and developmental status) and personality variables (i.e.,

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narcissism and sensation seeking) moderate the links in the proposed model on risky selfie behavior.

Risky Selfies on Social Media

Public press has recently covered multiple stories with an unfortunate deadly ending of risky selfie behavior. One case was the death of an Australian student who died while taking a picture on the Trolltunga cliff. This cliff is a highly popular attraction among tourists, but at the same time also a dangerous place to visit (Romanos, 2015). In 2016, a USA data tracking company (Priceconomics) analyzed all selfie instances with fatal accidents ($N = 49$) that were reported in public press since 2014. Falling down of heights, drowning and train accidents were listed as the most prevalent causes in their results. In their study, one fifth of the examined cases involved adolescents (Priceconomics, 2016). Lamba and colleagues (2016) note that from March 2014 until November 2016 127 people died while taking a risky selfie and many have been injured. The authors provide no further information on socio-demographic factors and/or personal characteristics of those involved.

Although such knowledge is lacking, scholars have expressed concerns about risky selfie behavior. Tourism scholars in general appreciate the affordances of mobile media to enhance travelling experiences (e.g., Wang et al., 2012), but they have also warned that the taking of selfies distracts travelers from safeguarding their safety when visiting dangerous touristic places (Ayeh, 2018).

The reasons for why individuals would take risky selfies are likely closely intertwined with individuals' reasons for using social media and in particular the posting of selfies (Sung et al., 2016). Adolescents use social media mainly because of identity and popularity needs (Subrahmanyam and Šmahel, 2011). These drivers of social media use may in particular be gratified by the practice of posting risky selfies. More precisely, when creating an online identity, (adolescent) users especially value an authentic and original identity (Reinecke and Trepte, 2014). Risky selfies may contribute to establishing such an original online identity as they are likely to associate the individual with rather exceptional and adventurous activities. At the same time, adolescents may post dangerous selfies to enhance their social ties and more specifically their popularity status. Adolescents have been noted consistently to engage in risk behavior because of social rewards (Arnett, 1992). It is not unlikely that risky selfies receive many likes

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because of their rather exceptional nature. One study supports this reasoning by noticing that cues that hint at a wild personality are expected to impress peers (Peluchette and Karl, 2009).

Together, research suggests that risky selfies are taken and that individuals would engage in such behavior because of multiple reasons. However, literature is lacking to document and understand this selfie taking behavior that may have profound consequences for adolescents' health. Such insights may be important considering the popularity of social media among adolescents in Europe and the US (Anderson and Jiang, 2018; Apestaartjaren, 2018).

Prototype Willingness Model

In order to gain a deeper understanding of adolescents' risky selfie taking behavior, the present study relies on the prototype willingness model (PWM) (Gerrard et al., 2008; Gibbons and Gerrard, 1995). The framework describes a set of cognitive factors (i.e., attitudes, descriptive norms, subjective norms, and prototype perceptions) that mediate and thus explain the effects of an individual's social environment (e.g., social media use) on their risk behavior (e.g., risky selfie behavior) (Gerrard et al., 2008).

According to the PWM, adolescent risk behavior can be explained by a reasoned and social reaction path. The latter path is more intuitive and spontaneous, whereas the reasoned path is driven by rational thoughts. The reasoned path first assumes that an individual's performance of a behavior depends on the individual's *attitudes* towards the consequences of the behavior. If an individual has favorable attitudes towards the behavior he/she will (be more willing to) perform the behavior (Gerrard et al., 2008). Thus, the more favorable an individual feels about risky selfie taking, the more willing he/she is to take such selfies oneself.

Moreover, it is argued that an individual's norm beliefs, that is a) perceptions of the number of peers that conduct the behavior (i.e., *descriptive norms*) and b) perceptions of significant others' approval of the behavior (i.e., *subjective norms*) influence one's own willingness to engage in the behavior (Gerrard et al., 2008). Accordingly, if someone believes that significant others take risky selfies and that they approve this behavior, he/she will (have a higher willingness to) take risky selfies oneself.

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The social reaction path assumes behavior can be induced and facilitated by circumstances. The path proposes to focus on *prototypes* described as mental images of typical persons engaging in the particular risk behavior (Gibbons and Gerrard, 1995). If perceptions of the prototypes are positive, a greater willingness or openness to perform risk behavior is expected (Gibbons and Gerrard, 1995). In other words, if an adolescent has favorable perceptions of peers who perform risky selfie behavior, the more willing he/she would be to perform this behavior oneself.

The social environment sources that impact the cognitive factors central in the PWM (i.e., attitudes, subjective/descriptive norms, and prototypes) are not extensively described in the model, but have been addressed in the research following the PWM model. This literature indicates that the more frequent an individual is present in a social environment in which a risk behavior is performed, the higher the probability that he/she believes others approve and conduct the behavior, and that he/she will adopt a favorable attitude and prototype towards the behavior (Gerrard et al., 2008). One of these social environment sources is social media because of their popularity among adolescents and their influential role in adolescent development (Festl and Quandt, 2016).

Among adolescents, the PWM has successfully explained offline and online risk behavior, such as alcohol use and sexting (Gerrard et al., 2008; Walrave et al., 2015). A recent study among adolescents supported the relevance of social media use as a trigger of the cognitive factors described in the PWM (Festl and Quandt, 2016). In the study of Festl and Quandt (2016) positive associations between social media use and favorable attitudinal and normative beliefs on online risk behavior were found. However, not all studies that applied the PWM have found evidence for both a reasoned and social reaction path to explain adolescent risk behavior. For instance, in the study of van Oosten and colleagues (2017) no evidence was found for a social reaction path as prototype perceptions for casual sex did not predict adolescents' willingness to engage in casual sex.

Together, the literature suggests that the more adolescents use social media, the more they are confronted with risky selfies, but also with the importance of creating an original identity on social media (see reasoning above, Peluchette and Karl, 2009; Reinecke and Trepte, 2014). Accordingly, a high dose of daily social media use may result into cognitions that favor an adventurous personality and thus the taking of risky selfies. Such cognitions would, in turn, be expected to positively influence the willingness to take risky selfies and the actual risky selfie behavior. Accordingly, it is hypothesized that attitudes, descriptive norms, subjective norms, and prototype

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perceptions mediate the relations between social media use and one's willingness to take risky selfies. This reasoning is summarized in Figure 1.

[Figure 1.]

Individual Susceptibility to Risky Selfie Behavior

Social media effects are not uniform and largely depend on personal characteristics of social media users according to research (e.g., Nowland et al., 2018). This empirical conclusion coincides with media effect theories, such as the differential susceptibility to media effects model (Valkenburg and Peter, 2013) that summarizes different media effect theories in four theoretical assumptions. One assumption postulates that demographical and personality characteristics determine how susceptible an individual is to the impact of (social) media images. Social media imagery may appeal more to some users because of the congruence with their identity. This assumption is (partly) rooted within cognitive dissonance theory that argues that when new stimuli are congruent with one's identity, individuals are more likely to accept these stimuli and strengthen the identity ties that relate to the stimuli (Festinger, 1962). The new stimuli are regarded as a re-confirmation of existing identity structures (Festinger, 1962). With regard to risky selfies, especially developmental status, gender, sensation seeking, and narcissism may predict such congruencies and thus strengthen the links between social media, attitudinal, normative, and prototype beliefs about risky selfies, willingness to take risky selfies, and actual experiences.

First, developmental literature explains that adolescence is a key experimentation period for reckless behavior. Brain research has described that pubertal changes evoke an increased sensitivity for rewarding experiences, such as risky activities that are approved by peers (Steinberg, 2008). These changes cause a peak in adolescents' risk activities around middle adolescence (Steinberg, 2008). After this period, self-regulation skills will increase, which, in turn, cause a decline in risk taking activities in late adolescence (Steinberg, 2008). Applied to the current study, the peak in risk sensitivity in middle adolescence may imply that risky selfies are more attractive to middle adolescents than to late adolescents. That is because such risky selfies are congruent with existing heightened levels of interests in risky activities.

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Second, men and boys are more attracted to risk behavior than women and girls (Arnett, 1992; Harris and Jenkins, 2006). Women potentially engage less in risk behavior because they are expected to enjoy these activities less than men (Harris and Jenkins, 2006). Gender socialization theory further adds that risk behaviors help to establish a masculine identity (De Visser and McDonnell, 2012). Accordingly, risky selfies may especially attract male adolescents as they already have favorable attitudes to general risk behavior.

Third, sensation seekers are more easily drawn to sensational and risky behaviors (e.g., Jonah, 1997). Zuckerman (2014, p. 10) defined sensation seeking as “a trait defined by the need for varied, novel, and complex sensations and experiences, and the willingness to take physical and social risks to gain such experiences”. This trait especially increases during adolescence although inter-individual variations are still present (Arnett, 1992). Because sensation seekers are drawn to dangerous experiences (Arnett, 1992; Zuckerman, 2014), high levels of sensation seeking are likely to increase individuals’ attraction to risky selfie behavior.

Lastly, narcissism is a key characteristic to explain photo posting behavior on social media (Ong et al., 2011). This trait typically increases during adolescence when adolescents start to develop their own identity and become more independent from their parents (Cramer, 1995). Narcissism can be characterized by “a grandiose sense of self, feelings of entitlement, and a dominant and antagonistic interpersonal style” (Gentile et al., 2013). Narcissistic adolescents are likely to show their grandiose in their online profile and they also rate their personal profile pictures as more attractive and cool compared to less narcissistic adolescents (Ong et al., 2011). Accordingly, narcissistic adolescents may be more drawn towards risky selfies compared to non-narcissistic adolescents as these selfies can help establish an original self-presentation online.

Based on this literature, we propose that gender, developmental status, sensation seeking, and narcissism moderate the links with social media use in the hypothesized model (Figure 1).

Methods

Sample

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A team of researchers contacted schools throughout [deleted] by contacting their personal network and selecting ad random schools from the list of schools of the Department of Education. A total of 10 schools agreed to participate in the study. After the educational staff was fully informed about the study aims, parents received an active parental consent form. Adolescents with active parental consent participated in the study. Researchers visited the schools and asked participants to fill in the paper-and-pencil questionnaire. Confidentiality was guaranteed. The present study was approved by the Ethical Review Committee of [deleted]. The data that were used for the present study were collected in the context of a larger study¹.

The present study focused on middle and late adolescents given that these developmental groups are the most active social media users (Apestaartjaren, 2018) and adolescence is a fundamental period for risk behavior (Arnett, 1992). Of the 710 adolescents who filled in the survey, participants with missing values in more than 30% of the items ($N = 17$) or who indicated to have not filled in the survey honestly ($N = 6$), were deleted. One additional participant was excluded because its consecutive repeat response exceeded 30%. As such, the analytical sample consisted of 686 participants (55.9% girls). Their age ranged between 15 to 18 years and they were on average 16.41 years old ($SD = .98$). The majority of this sample (90.5%) was born in [deleted]. One in four participants had a father (25.3%) or a mother (26.3%) with a university degree. The percentage of missing values in the analytical sample was .81%. Missing values were handled automatically by Mplus (see Muthén and Muthén, 2017).

Measures

The current study included several new measurement instruments regarding risky selfies. To create these measures, an in-depth review of the literature guided the creation of a first set of items for each scale. Next, two additional researchers highly experienced in social media research among adolescents reviewed and adapted the items and further ensured the wording was age appropriate. Lastly, nine adolescents individually reviewed the items and confirmed the items were interpreted as intended. To examine the factor structures of the new cognitive and behavioral willingness measures, a conjunct CFA that

¹ The larger project examines new media use among middle and late adolescents. More information can be obtained from the corresponding author.

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simultaneously included risky selfie attitude, prototype perceptions, and willingness to take risky selfies was conducted.

Demographic variables. Gender (0 = boy, 1 = girl) and age (which was a continuous variable but recoded for multiple-group analysis: 0 = middle adolescents 15 to 16 years old, $N = 331$, 1 = late adolescents 17 to 18 years old, $N = 332$) were questioned.

Sensation seeking. The 8-item short form of the Sensation Seeking Scale (Hoyle et al., 2002) was used to assess sensation seeking levels. On a 7-point Likert scale ranging from completely disagree (1) to completely agree (7), the participants rated eight items, such as “I like to do frightening things”. As suggested by Hoyle et al. (2002), four estimates were produced by averaging the items in four sub-factors: boredom susceptibility ($r = .30$), disinhibition ($r = .49$), experience seeking ($r = .30$), and thrill and adventure seeking ($r = .46$). The four sub-factor estimates formed a latent variable that was used in the analyses.

Narcissism. The 13-item version of the Narcissism Personality Inventory (NPI-13; Gentile et al., 2013) was consulted. Items are rated on a forced-choice basis, such that one choice represents narcissism and the other does not (e.g., “I will usually show off if I get the chance versus I try not to be a show off”) ($\alpha = .69$). By summing the item scores, an estimate of adolescents’ narcissism was created.

Social media use. The participants completed eight questions about their time spent on the following social media platforms: Facebook, Instagram, Snapchat, and YouTube. On a 10-point Likert scale, they estimated how much time they spent on each platform on a regular weekday (Monday-Friday) and a weekend day (Saturday–Sunday). Answer options ranged from 0 hours (0) to the platform is opened throughout the day continuously (10). An exploratory factor analysis (EFA) showed that the factor loadings of the two YouTube items were lower than .4. These two items were omitted. A weighted score of the average daily time for each social media platform was computed as follows: $(\text{time weekday} \times 5 + \text{time weekend day} \times 2) / 7$. Additionally, social media use was computed by the average score of the three remaining platforms.

Descriptive norms. Following Ajzen (2006), participants estimated how many of their friends post risky selfies on a 5-point Likert scale ranging from nobody (1) to everybody (5). To prevent social desirability bias, the label “exciting selfies” was used instead of

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risky selfies. Exciting selfies were described as pictures that you take of yourself or that friends take of you (possibly pictures from you and your friends together) on exciting locations, such as on the roof of a high building, near a railway, on top of a remote cliff with a steep drop, or somewhere where it is not allowed to go, and during activities that require one's attention, such as driving a motorcycle or bicycle.

Subjective norms. Following Ajzen (2006), participants estimated how many of their friends approve posting exciting selfies on a 5-point Likert scale ranging from nobody (1) to everybody (5).

Attitudes. To measure participants' risky selfie attitudes, a 5-item scale was developed inspired by Ajzen (2006). We focused on one attitudinal component in line with prior literature, namely perceptions of *danger* (Gibbons et al., 1998). The items were formulated as follows: "I think it is dangerous to take a selfie ... a) on the roof of a high building, b) near a railway, c) on top of a remote cliff with a steep drop, d) somewhere where it is not allowed to go and e) during activities that require one's attention, such as the driving of a motorcycle or bicycle". Participants rated the items on a 7-point Likert scale ranging from I completely disagree (1) to I completely agree (7). The validity and reliability of this self-developed scale was measured with a two-step approach. First, we randomly divided the sample in two subsamples and conducted an EFA with one half of the sample ($N = 343$). Using principal axis factoring, a one-factor solution was obtained that accounted for 47.52% of the total variance with an eigenvalue of 2.38. The factor loadings of the five items were satisfactory, ranging between .50 and .80 ($\alpha = .81$). Second, a conjunct confirmatory factor analysis (CFA) with the other half of the sample ($N = 343$) confirmed the one factor model (see the description of the willingness variable for the results). Next, all items were reversed scored and a risky selfie attitude variable was created by averaging the item scores. A higher score on this variable indicates that taking risky selfies is believed to be less dangerous.

Prototype perceptions. Following the prototypes literature (Gibbons and Gerrard, 1995; van Oosten et al., 2017), traits were selected to be evaluated on a 7-point Likert scale (1 = completely disagree, 7 = completely agree) for how typical they were for someone who regularly posts exciting selfies. The characteristics were "cool", "popular", "interesting", and "attractive". The validity and reliability of this scale was again examined by the two-step approach. First, an EFA obtained a one-factor solution that accounted for 69.51% of the total variance with an eigenvalue of 2.78. The factor loadings for the four items

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ranged from .76 and .88 ($\alpha = .89$). Next, a conjunct CFA confirmed the one factor model of prototype perceptions (see the description of the willingness variable for the results). By averaging the item scores, a prototype variable was created. A higher score indicates a more positive prototype perception.

Willingness. Following prototypes literature (Gibbons and Gerrard, 1995), participants evaluated their willingness to engage in risky selfie behavior in three situations: (1) “You are near a remote railway and your friends dare you to take a selfie when you are on the railway”, (2) “You are on a holiday and you could take a selfie while jumping off a cliff into a lake. A “no jumping” sign is present, though, you believe that the lake will be deep enough to safely jump. You climb the cliff and jump into the lake to take the selfie” and (3) “You are riding your bicycle with your friends and you would like to take a selfie while you are riding the bicycle. You think you can manage such a behavior, so you take the selfie”.

Participants used a 5-point Likert scale ranging from not likely at all (1) to highly likely (5). The validity and reliability of this scale was again examined by the two-step approach. A one-factor solution was obtained from the EFA that accounted for 37.60% of the total variance with an eigenvalue of 1.13. The factor loadings for the three items that assessed willingness ($\alpha = .66$) were ranging between .54 and .67. Next, a conjunct CFA validated the one factor structure of willingness. This conjunct CFA examined the factors of attitudes, prototype perceptions, and willingness and had an admissible fit ($\chi^2 = 153.74$, $df = 51$, $p < .001$; CFI = .937; RMSEA = .077; $\chi^2/df = 3.01$). By averaging the item scores, a willingness variable was created. A higher score on this variable indicates a greater willingness to take a risky selfie.

Risky selfie behavior. Participants’ own experience with taking risky selfies was measured with one item “To what extent do you have experience with taking exciting selfies?” on a 4-point Likert-scale (1 = no experience, 4 = much experience).

Analyses

Descriptive statistics were examined. The hypothesized relations were tested with structural equation modeling (Mplus) (figure 1). Age, gender, sensation seeking, and narcissism were included as covariates. Error terms of covariates were correlated. Similarly, social media use was correlated with the included covariates. To test for

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mediation effects, 5000 bootstrapped samples were estimated to obtain the 95% bias-corrected (BC) confidence intervals (CIs). Values higher than .95 for the CFI and values lower than .06 for the RMSEA are considered a good fit of the model (Hu and Bentler, 1999).

Gender (boys vs girls) and developmental status (middle vs late adolescents) differences were evaluated using Mplus multiple-group analysis. First, measurement invariance tests for risky selfie attitudes, prototype perceptions, and willingness were conducted to test whether the factor loadings of the measurements are the same for the groups (middle vs late adolescents and boys vs girls) (Meredith, 1993). The configural model, in which we imposed no equality constraints on the factor loadings of the variables in each group, served as our baseline model. This model was compared with a model in which all factor loadings were constrained to be equal across developmental status (age) or gender. The CFI difference test (Δ CFI) was used as an indicator of measurement invariance in the multiple-group comparisons. A Δ CFI higher than .01 indicates a meaningful change in model fit and thus differences between groups with regard to the factor loadings of the variables (Cheung and Rensvold, 2002). Second, path invariance was tested. Configural SEM models, in which all path coefficients were set free across the targeted groups were compared to SEM models in which the hypothesized links with social media use were set invariant across groups. The variance-adjusted chi-square test statistics of both models, obtained by using MLMV as estimator, were compared (Muthén and Muthén, 2017). A $\Delta\chi^2_{\text{MLMV}}$ with a p-value lower than .05 indicates differences between compared groups with regard to the hypothesized paths with social media use.

To test the other hypothesized moderation effects, interaction terms for sensation seeking and narcissism were created. Different procedures were used to create these terms as sensation seeking is treated in the present study as a latent variable and narcissism is modeled as a manifest variable given the dichotomous nature of its scale items. Regarding sensation seeking, a latent interaction term was produced by multiplying the latent variable of sensation seeking and the manifest social media use variable. This interaction term was included in the model simultaneously with the latent sensation seeking variable and the manifest social media use variable. This Mplus procedure is valid even when multicollinearity would be a problem. Regarding narcissism, a manifest interaction term was generated by multiplying the manifest narcissism variable (the standardized Z scores: Z) with the manifest social media use variable (Z). Also, this

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interaction term was included in the model together with narcissism (Z) and social media use (Z). Multicollinearity was no problem as VIF-values were below 5.

Results

Descriptive Statistics

The results showed that adolescents spent on average 1.5 hours daily on social media. Adolescents further reported that less than half of their friends had posted risky selfies (descriptive norms), and that about half of their friends approved such pictures (subjective norms) (see Table 1 for M 's and SD 's). The mean level of attitudes indicated that adolescents did not particularly consider risky selfie taking as "risky". Adolescents' prototype perceptions were rather negative. Adolescents further reported to be somewhat unwilling to take such selfies. Furthermore, on average, adolescents had limited risky selfies taking experience. A percentile distribution further informed that 9.2% of the participants had much experience, that 23.7% had some experience, and that 32.5% and 34.6% had not much to no experience. Zero-order inter-correlations among the key variables are also presented in Table 1. Almost all correlations were significant ($p < .05$).

[Table 1.]

Hypothesized Model

The tested model showed an acceptable fit ($\chi^2 = 649.51$, $df = 182$, $p < .001$; RMSEA = .061; CFI = .906; $\chi^2/df = 3.57$). First, the results showed that social media use positively predicted descriptive norms and prototype perceptions. No support emerged for significant relations between social media use and subjective norms or attitudes ($p > .05$) (see Figure 2 for parameter values).

Second, the results demonstrated that attitudes and prototype perceptions were positively related to willingness. No significant relations emerged between (descriptive/subjective) norms and willingness. Furthermore, willingness positively predicted risky selfie behavior. Together, all predictors in the model explained 33% of the variance in risky selfie behavior ($R^2 = .33$).

[Figure 2.]²

Significant indirect paths were found between social media use and risky selfie taking through prototype perceptions and willingness ($\beta = .012$, $B = .006$, $SE = .003$, $p = .063$, 95% CI: .001/.014). No other significant indirect paths emerged. A significant direct path emerged between social media use and risky selfie behavior.

Moderation Tests of Gender and Age

Measurement Invariance. To test the equivalence of the measurement models of attitudes, prototype perceptions, and willingness across gender and age groups, the configural model, in which we imposed no equality constraints between groups, served as our baseline model. This model was compared with a model in which all factor loadings were constrained to be equal across gender or age. The results showed no differences between the constrained model (model fit gender: $\chi^2 = 395.92$, $df = 111$, $p < .001$; RMSEA = .088; CFI = .913; $\chi^2/df = 3.57$; model fit age: $\chi^2 = 383.95$, $df = 111$, $p < .001$; RMSEA = .087; CFI = .915; $\chi^2/df = 3.46$) and the configural model (model fit gender: $\chi^2 = 371.05$, $df = 102$, $p < .001$; RMSEA = .090; CFI = .918; $\chi^2/df = 3.64$; model fit age: $\chi^2 = 374.23$, $df = 102$, $p < .001$; RMSEA = .091; CFI = .915; $\chi^2/df = 3.67$) for both gender ($\Delta\chi^2 = 24.87$, $\Delta df = 9$, $p < .01$; $\Delta CFI = -.005$, the value was lower than .01) and age ($\Delta\chi^2 = 9.72$, $\Delta df = 9$, $p > .05$; $\Delta CFI = .000$) groups, which indicated that the factor loadings were the same for boys versus girls and middle versus late adolescents.

Path invariance. The conducted moderation tests between the restricted model (model fit gender: $\chi^2 = 624.97$, $df = 370$, $p < .001$; RMSEA = .047; CFI = .904; $\chi^2/df = 1.69$; model fit age: $\chi^2 = 638.71$, $df = 370$, $p < .001$; RMSEA = .048; CFI = .901; $\chi^2/df = 1.73$) and the configural SEM model (model fit gender: $\chi^2 = 620.00$, $df = 364$, $p < .001$; RMSEA = .047; CFI = .904; $\chi^2/df = 1.70$; model fit age: $\chi^2 = 633.84$, $df = 364$, $p < .001$; RMSEA = .049; CFI = .901; $\chi^2/df = 1.74$) showed that the hypothesized pathways with social media remained invariant across gender ($\Delta\chi^2_{MLMV} = 5.25$, $\Delta df = 6$, $p > .05$) and age

² Note: β = standardized path coefficient; B = unstandardized path coefficient; p = p values as obtained from the model; bc 95% bt CI = 95% bias-corrected bootstrap confidence interval for unstandardized path coefficients. All displayed paths were significant in the tested model (at $p < .05$). For clarity, error terms, covariances and measurements are not shown.

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($\Delta\chi^2_{MLMV} = 5.24$, $\Delta df = 6$, $p > .05$). That is, gender and age did not significantly moderate the hypothesized paths with social media.

Moderation Tests of Sensation Seeking and Narcissism

There were no significant interaction effects (all $p > .05$) between sensation seeking and social media use on descriptive norms ($B = .06$, $SE = .05$); subjective norms ($B = .04$, $SE = .05$, $p > .05$); attitudes ($B = -.01$, $SE = .05$); prototype perceptions ($B = -.03$, $SE = .05$); willingness ($B = -.02$, $SE = .04$); and behavior ($B = -.03$, $SE = .04$).

Likewise, there were no significant interaction effects (all $p > .05$) between narcissism and social media use on descriptive norms ($B = .06$, $SE = .03$); subjective norms ($B = .06$, $SE = .04$); attitudes ($B = .03$, $SE = .04$); prototype perceptions ($B = -.03$, $SE = .05$); willingness ($B = .001$, $SE = .03$); and behavior ($B = -.01$, $SE = .03$).

Discussion

The current study is the first empirical study on adolescents' risky selfie behavior and explained this behavior from a prototype willingness model perspective. Our results showed that social media use related to adolescents' descriptive norms, prototype perceptions, and risky selfie behavior. Attitudes and prototype perceptions were further found to relate to adolescents' willingness to take risky selfies and their actual risky selfie behavior. These results have several implications.

Concerns on Risky Selfie Behavior

The current study responded to concerns that have arisen in the public and scholarly discourse concerning risky selfies (Ayeh, 2018; Lamba et al., 2016). The study data were the first to examine this behavior among social media users and underline the validity of these concerns to some extent among adolescents. Approximately 65% has at least once taken a risky selfie and one in three adolescents indicated to have some to substantial experience with this risk behavior. Our correlational data further showed that the personality characteristics narcissism and sensation seeking positively correlated with the taking of risky selfies. Future research may further examine the links between identity

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markers and risky selfie behavior, and explore other relevant factors, such as self-esteem (Veselska et al., 2009) or family bounds (Tyler, 2008).

The Value of the Prototype Willingness Model to Explain Risky Selfie Behavior

The results coincide with past research showing social media use is positively related to adolescent online risk behavior (e.g., Festl and Quandt, 2016). Explanatory processes theorized in the PWM further proved to be partly valid to explain this relation, though, some inconsistent findings also occurred. Therefore, our data underline the partly mixed conclusion of recent studies on the validity of the PWM model to explain online risk behavior next to offline risk behavior (Walrave et al., 2015).

Within the inconsistent findings, the results firstly did not support a significant link between social media use and subjective norms. Social media appear to be a venue for adolescents to learn about their peers' risk behavior (i.e., descriptive norms), but not to learn about the approval of (close) peers of those behaviors. This finding is surprising as a major aspect of social media interactions is approving each other's content in the form of likes and comments (Zell and Moeller, 2018). However, adolescents are known to like almost all social media content of their (close) friends; they even explicitly ask each other to like a post when they have not done this yet (Yau and Reich, 2018). As a result, all sorts of social media content gets likes. Likes are even perceived by adolescents as something that is "commonplace" (Yau and Reich, 2018). Moreover, positive comments seem more accepted, and therefore more prevalent, on social media than negative ones (Ziegele and Reinecke, 2017). Similar to other social media content, risky selfies may receive likes and positive comments, but it might remain unclear for an adolescent whether his/her peers truly approve of this specific behavior and whether they thus positively respond "out of habit". Therefore, subjective norms are potentially not developed in social media interactions, but rather during interpersonal interactions, as peers may here be more straightforward in their (dis)approval of such behaviors. Future research is needed to further examine this explanation.

Additionally, the findings showed full support for the social reaction path (i.e., prototype perceptions predicted willingness/behavior), but only moderate support was found for the reasoned path of the PWM. Neither descriptive norms nor subjective norms

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predicted willingness. Similar results have been found in the study of Van Gool and colleagues (2015) in which no significant association between social norms and willingness to disclose personal information on Facebook emerged (Van Gool et al., 2015). As suggested by Kallgren et al. (2000), social norms may not constantly drive individuals' behavior. Potentially, the taking of risky selfies is one of these behaviors and future research seems warranted to fully exclude the normative influence on this particular selfie behavior.

Among the reasoned path, attitudes did occur as an important determinant of adolescents' risky selfie behavior. The less dangerous adolescents think it was to take risky selfies, the more willing they were to take such selfies themselves. Yet, their attitudes were not affected by social media use. As the descriptive data indicated that adolescents did not particularly consider the taking of risky selfies as "risky", interventions may find this a useful variable as there seems to be room in heightening adolescents' awareness on the risks of such selfies. However, it is possible that adolescents who perceive risky selfie taking to be dangerous, not necessarily evaluate this behavior as negative. As adolescents are well-known risk seekers, they may even favor risky and thus dangerous activities. Future research should take this notion into account and explore which other attitudinal components, apart from perceptions of danger, negatively predict risky selfie taking behavior. The knowledge that will follow from such research lines will help shaping the messages of future intervention studies.

Next to attitudes, prototype perceptions appeared as a valid mechanism to explain risky selfie behavior. This finding coincides with studies reporting similar conclusions (e.g., Walrave et al., 2015). However, it should be noted that the prototype perceptions were rather negative in the current sample of adolescents. It would be interesting to further examine whether prototype perceptions of risky selfie takers are also affected by other factors than social media use. For instance, during (offline) family conversations, parents may comment negatively on risky selfie takers and, as such, adolescents may develop more negative prototype perceptions (Collier et al., 2016). Moreover, we only included four indicators of prototype perceptions. Future research may include other indicators of prototype perceptions (e.g., smart) that potentially are more relevant for a favorable view towards the typical risky selfie taker.

Lastly, a direct relation emerged between social media use and risky selfie taking suggesting other mediators except those suggested in PWM are relevant. Future research may consider other theories, such as wishful identification theory (Hoffner, 1996), to

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introduce additional mediators that help explain why adolescents engage in risky selfie behavior.

Individual Susceptibility Variables

The current study showed that neither gender, age, sensation seeking, nor narcissism moderated the studied relations with social media use. As noted above, our descriptive data did indicate the relevance of several of the targeted individual susceptibility variables to determine how adolescents think about risky selfies (cognitive factors) and engage themselves into taking risky selfies (willingness and behavior). However, we could not find that social media use affects such cognitions or behaviors differently depending on gender, age, sensation seeking, or narcissism, even though current media effect theories point at the conditional relevance of such dispositional factors (e.g., Valkenburg and Peter, 2013).

One possible explanation might relate to our measure of social media use. These media effect theories specifically argue that the congruence between specific content types (e.g., risky selfies on social media) and dispositional factors (e.g., being a sensation seeker) may enhance the effects of this content (e.g., Valkenburg and Peter, 2013). It is therefore possible that such congruence effects were not captured as social media use in general was measured and not specific exposure to risky selfies on social media.

Another explanation may be that we did not take into account additional complexities that surround each of the included dispositional factors. For instance, most of the selfies that social media users take are not uploaded on social media (Katz and Crocker, 2015). Narcissists are likely to care less about their personal pictures and more about the pictures that are posted of themselves online (Etgar and Amichai-Hamburger, 2017). Accordingly, research particularly focusing on the posting of risky selfies online and not on the general act of taking risky selfies as we did in the current study might find different results.

Finally, other variables could prove relevant to consider as moderators for the links with social media use. For example, in prior studies, social comparison tendencies (Gibbons and Gerrard, 1995) and need for popularity (Walrave et al., 2015) were suggested as moderators for links in the PWM.

Limitations

The current study has shortcomings, which could open avenues for future research. First, the study was limited because of its cross-sectional design. Future longitudinal studies should further explore the proposed causal order in our model on risky selfies. Second, our study was the first study to develop several measures on risky selfies. Future research may further examine the reliability and validity of the newly developed measurement instruments, especially the three-item willingness scale as the Cronbach's alpha was below .7 ($\alpha = .66$). This measure might have influenced the fit of the model, which could be perceived as sub-optimal as the values of the fit indices were somewhat higher (RMSEA) or lower (CFI) than the cutoff values that are described in the literature (Hu and Bentler, 1999). Although somewhat higher or lower values are not uncommon and are accepted in (media effect) research that explains adolescent risk behavior (e.g., Pabian et al., 2015), future research should take into account the weaknesses regarding some of the measures of the present study in order to improve model fit.

Related to this, the current study was conducted in the context of a Western European country. The generalizability of the study findings to other cultural contexts is therefore limited as research has suggested to consider culture when exploring social media interactions (Livingstone, 2014) and adolescents' risk taking behaviors in general (Kloep et al., 2009). Therefore, follow-up studies across different cultures seem highly valuable and necessary.

Next, the intention to perform the risk behavior, which is part of the reasoned pathway of the PWM and which is expected to be explained by attitudes and norms, was not included. In this way, the PWM was only partially tested. Intention was omitted following other recent studies that rely on the PWM (e.g., van Oosten, et al., 2017). In accordance to these studies, attitudes and norms were expected to predict willingness. Also the original PWM model describes that the reasoned and the social reaction pathway are connected and that the reasoned constructs not only affect the intention to perform the behavior, but also behavioral willingness (Gerrard et al., 2008). Future research may test the full PWM model by including the intention to take risky selfies to investigate whether the relations between the constructs are the same when intention is taken into account.

Finally, we used a general measure of social media use and did not address exposure to risky selfies in particular. Findings from prior studies (e.g., Sargent et al.,

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2007) underline that such detailed measurement instruments may be necessary to fully capture the examined media effects. As our results were the first to show that a considerable number of adolescents has some experience with taking risky selfies, it is probable that such selfies appear every so often on one's social media feed. Though, important variations in exposure may exist across adolescents as each social media feed depends on "a complex interaction between friending choices, the content those "friends" post, and opaque algorithms that display some content over others" (Vraga et al., 2016, p. 150). We thus strongly advice follow-up studies on this topic to include detailed measures of risky selfies exposure or to use other research designs, such as experiments.

Conclusion

The current study was the first to examine the links between social media use and adolescents' risky selfie behavior and showed the partial validity of the prototype willingness model to explain such relations. More precisely, prototype perceptions emerged as a relevant mediator which needs to be considered in future research. No support was found for the moderating roles of gender, developmental status, narcissism, and sensation seeking in relation with social media use. Given the prevalence of risky selfie behavior among adolescents, more research seems needed on why adolescents become online daredevils.

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Declaration of conflicting interests

The authors declare that there is no conflict of interest.

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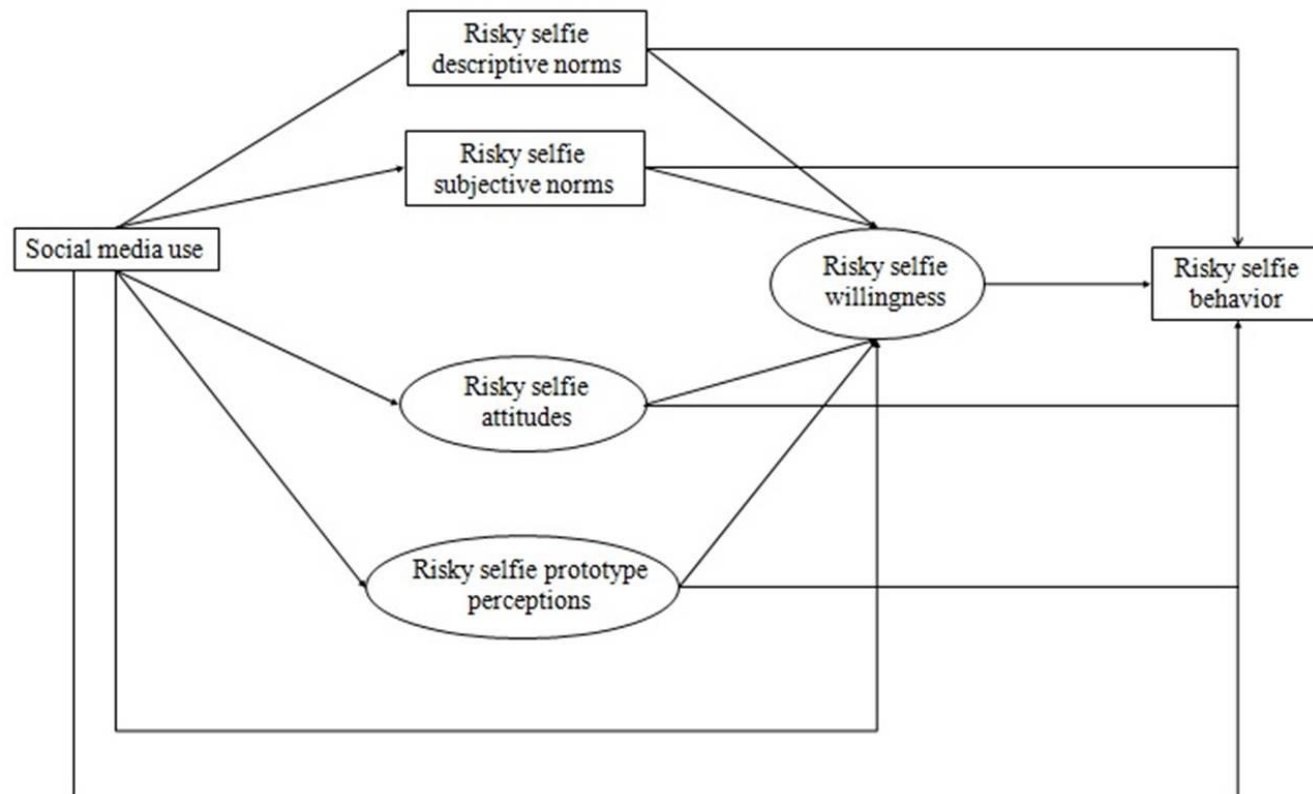
Table 1. Zero-Order Inter-Correlations, Means, SDs and Ranges.

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | <i>M</i> | <i>SD</i> | Range |
|---------------------------------------|---------|---------|--------|--------|--------|--------|--------|--------|--------|--------|----|----------|-----------|--------|
| 1. Gender | 1 | | | | | | | | | | | — | — | — |
| 2. Age | -.08* | 1 | | | | | | | | | | 16.41 | .98 | 15-18 |
| 3. Narcissism | -.20*** | .09* | 1 | | | | | | | | | 3.36 | 2.56 | 0-12 |
| 4. Sensation seeking | -.03 | .04 | .22*** | 1 | | | | | | | | 4.58 | .99 | 1.38-7 |
| 5. Social media use | .23*** | -.12** | .12** | .16*** | 1 | | | | | | | 3.96 | 2.05 | 1-10 |
| 6. Risky selfie descriptive norms | -.02 | -.15*** | .05 | .10* | .19*** | 1 | | | | | | 2.31 | .90 | 1-5 |
| 7. Risky selfie subjective norms | .02 | -.08* | .04 | .09* | .06 | .50*** | 1 | | | | | 2.68 | .98 | 1-5 |
| 8. Risky selfie attitudes | -.18*** | -.01 | .15*** | .31*** | .13*** | .16*** | .15*** | 1 | | | | 3.61 | 1.15 | 1-7 |
| 9. Risky selfie prototype perceptions | .01 | -.04 | .15*** | .16*** | .21*** | .13** | .22*** | .09* | 1 | | | 2.94 | 1.27 | 1-6 |
| 10. Risky selfie willingness | -.03 | -.07 | .16*** | .44*** | .24*** | .14*** | .15*** | .40*** | .34*** | 1 | | 2.51 | .94 | 1-5 |
| 11. Risky selfie behavior | -.06 | -.03 | .23*** | .38*** | .26*** | .20*** | .19*** | .31*** | .27*** | .42*** | 1 | 2.08 | .97 | 1-4 |

Note. * $p < .05$, ** $p < .01$, *** $p < .001$.

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Figure 1. Hypothesized relations between social media use, cognitive factors, risky selfie willingness and behavior.



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Figure 2. Model examining the relations between social media use, cognitive factors, risky selfie willingness and behavior.

