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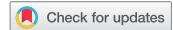
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Exploring the role of egocentrism and fear of missing out on online risk behaviours among adolescents in South Africa

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ABSTRACT

The study explored the potential for developmental and social factors to predict adolescent online risk behaviour. Employing a sample of 1184 adolescents aged 12–18 in South Africa, the study examined gender, age, egocentrism (Personal Fable and Imaginary Audience) and Fear of Missing Out (FoMO) on online risk taking. Results showed that all variables were significant predictors of online risk behaviour. Higher Imaginary Audience, higher FoMO and older age emerged as strongest predictors, and males engaged in more online risks. FoMO also correlated significantly with egocentrism constructs. The findings indicate that egocentrism is a relevant developmental construct for understanding adolescent online risk taking along with social factors like FoMO, which can inform more targeted online safety efforts at particular developmental stages.

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Egocentrism; imaginary audience; personal fable; fear of missing out; online risks; adolescents; South Africa

Introduction

While Information and Communication Technologies (ICTs) provide a vast range of opportunities for young people, they can also lead to experiencing and engaging in a range of risks. These risks are varied, and can include exposure to inappropriate or harmful content (Livingstone, Kirwil, Ponte, & Staksrud, 2014), contact with strangers leading to sexual solicitation (Liau, Khoo, & Hwaang, 2005; Van Den Heuvel, Van Den Eijnden, van Rooij, & Van de Mheen, 2012), cyberaggression and cyberbullying (Brochado, Soares, & Fraga, 2017; Selkie, Fales, & Moreno, 2016), and information security risks via the sharing of images and personal information (Kite, Gable, & Filippelli, 2010). A study exploring online risk experiences of 9–16 year olds in Europe found that 46% of them had experienced at least one online risk (Duerager & Livingstone, 2012). Much of the research focus on online risks to date has been on the experiences of children and adolescents in Europe, Australia and the United States, and relatively little is known about the experiences of young people in more developing contexts, including South Africa. Existing research in South Africa highlights online risk taking behaviour as being a growing problem among young people (Kritzinger, 2014; Motswi & Mashegoane, 2017; Payne & Belle, 2017; Phyfer, Burton, & Leoschut, 2016; Popovac & Leoschut, 2012), however, there is still a substantial gap in the research literature examining online risk taking behaviours in this context.

Given the proliferation of technology in recent years and the high use of technology globally among younger people (e.g. Lopez-Fernandez, Honrubia-Serrano, Freixa-Blanxart, & Gibson, 2013), it is crucial to gain a better understanding of risk taking in this domain and the potential factors that could underpin it. This is particularly important in samples where there is little current research

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exploring these issues and where efforts in relation to online safety are limited. The current study, therefore, set out to explore a broader range of online risk taking behaviours of adolescents aged 12–18 years in South Africa. In particular, the study examined the role of gender and age as well as two key factors that link to developmental and social aspects during adolescence that could play a role in online risk taking behaviour, namely, egocentrism and Fear of Missing out (FoMO). These variables have been shown to predict a range of adolescent behaviours in general, including offline-related risks and some online behaviours, and it is crucial to explore these further in relation to online risk taking specifically.

Adolescent development and risk

When exploring ICT use among young people, age often emerges as a factor that influences online risk taking, with studies suggesting that older adolescents engage in more online risk taking (Duerager & Livingstone, 2012) such as sexting (Klettke, Hallford, & Mellor, 2014) and interacting with online strangers and meeting them in person (Livingstone, Haddon, Görzig, & Ólafsson, 2011). Gender differences have also been noted, but these do vary in relation to the type of risk being studied. For example, females were found to be more likely to send sexting content (Mitchell, Finkelhor, Jones, & Wolak, 2012) and males were more likely to receive them (Hinduja & Patchin, 2010), whilst previous research found no gender differences (Lenhart, 2009). Studies have also examined potential risk and protective factors relating to online risks but largely in the context of online harassment and cyberbullying (e.g. Khurana, Bleakley, Jordan, & Romer, 2015; Menesini & Spiel, 2012) as well as exploring general predictors of online activities and internet addiction (e.g. Leung, 2004). Although there is interest in the impact of ICTs on the psychosocial development of adolescents (Valkenburg & Peter, 2011), relatively little is currently known in terms of the potential developmental and social factors that may predict a broad range of online risk taking behaviours during adolescence.

Egocentrism, a concept first proposed in Piaget's theory of cognitive development, refers to a child's inability to differentiate between certain aspects of subject-object interaction, which in turn manifests into thoughts and behaviours at different stages of development (Elkind, 1974; Piaget, 1964). Elkind (1967) was particularly interested in egocentrism during adolescence, and defined the term as the inability to differentiate between the self and others in relation to cognitive concerns. According to Elkind (1967), egocentrism encompasses two distinct but related constructs, namely, Imaginary Audience and Personal Fable. Imaginary Audience is the belief that others are constantly observing and evaluating one's appearance or actions, resulting in adolescents feeling that they need to constantly play up to this audience (Elkind, 1967; Vartanian, 2000), and is a construct that has been linked to self-consciousness (Elkind, 1967; Enright, Shukla, & Lapsley, 1980). Personal Fable refers to feelings of uniqueness, invulnerability and omnipotence and has been linked to an over-differentiation in one's own feelings and experiences compared to those of others (Elkind, 1967), and is a construct that has been linked to narcissism (Lapsley, FitzGerald, Rice, & Jackson, 1989). The constructs are related; believing that one is the focus of evaluation and attention of others (Imaginary Audience) may result in adolescents viewing their feelings as special and unique compared to others (Personal Fable) (Alberts, Elkind, & Ginsberg, 2007; Elkind, 1967). The constructs have been demonstrated to have considerable heuristic power for explaining various typical adolescent behaviours such as shyness, embarrassment and exhibitionism (Imaginary Audience) and a heightened sense of agency and invulnerability (Personal Fable) (Lapsley, Jackson, Rice, & Shadid, 1988; Lapsley & Murphy, 1985).

Developmental factors such as biologically-based changes in brain structure and hormones (Braams, van Duijvenvoorde, Peper, & Crone, 2015; Smith, Chein, & Steinberg, 2013) as well as social-developmental factors (Willoughby, Good, Adachi, Hamza, & Tavernier, 2013) have also previously been implicated in risk taking. Egocentrism is linked to these broader developmental changes, with changes in egocentrism across adolescence argued to occur due to decentration as

a result of biological maturation, the development of formal operational thought, and accumulating social experiences (Galanaki, 2012). Egocentrism is generally shown to emerge at early adolescence and decline in middle to late adolescence (Alberts et al., 2007; Elkind, 1967; Enright et al., 1980), and follows a similar trajectory to risk taking behaviour which shows a decline with age from early adolescence to early adulthood (Gardner & Steinberg, 2005). Indeed, studies have found egocentrism to be directly linked to risk taking (Alberts et al., 2007). More specifically, the sense of uniqueness and invulnerability associated with the Personal Fable construct has been linked to risk behaviour, with the belief that risks or consequences do not apply to oneself to the same extent as they do to others (Alberts et al., 2007; Arnett, 1995). Personal Fable has been linked to a range of risk taking behaviours such as unsafe driving, stealing and vandalism (Aalsma, Lapsley, & Flannery, 2006) and linked to optimistic bias in relation to cigarette smoking in adolescents (Frankenberger, 2004; Masiero, Lucchiari, & Pravettoni, 2015). This links to the broader research on risk perception during adolescence, reflecting individual information processing in terms of cost-benefit appraisals for those who engage in a risk taking behaviour (Benthin, Slovic, & Severson, 1993; Slovic, 2016). Adolescents may also engage in risk taking behaviours in order to seek the approval of an imaginary audience, especially when they believe that the behaviour will result in more positive peer evaluations. This suggests that, along with individual information processing in relation to risk such as cost-benefit appraisals, risk taking is also embedded in group perceptions and social norms (Kasperson et al., 1988). The work by Steinberg reflects this, with adolescents found to take more risks when in peer groups than when alone (e.g. Albert, Chein, & Steinberg, 2013; Gardner & Steinberg, 2005; Smith, Chein, & Steinberg, 2014). This social influence effect on risk perception was also supported in other studies (Peake, Dishion, Stormshak, Moore, & Pfeifer, 2013), including that younger adolescents were more influenced by peer perceptions compared to older adolescents and adults (Knoll, Magis-Weinberg, Speekenbrink, & Blakemore, 2015).

Egocentrism has recently also been linked to a range of online behaviours. For example, a recent study among Dutch and American adolescents found that Personal Fable ideation was linked to Facebook use in general as well as specific behaviours such as status updates and uploading of images (Cingel, Krcmar, & Olsen, 2015). Imaginary Audience ideation was also shown to be positively linked to Facebook use among 9–26 year olds (Cingel & Krcmar, 2014). A positive relationship was found between Imaginary Audience ideation and self-disclosure on Facebook, emerging as a stronger predictor than trait narcissism (Krcmar, van der Meer, & Cingel, 2015). It was also linked to impression management on Facebook (Ranzini & Hoek, 2017). A recent study also noted that higher self-objectification was linked to selfie-posting on social networking sites and that this effect was stronger for those who had higher Imaginary Audience ideation (Zheng, Ni, & Luo, 2018). To our knowledge, no recent studies have examined the role of egocentrism in relation to online risks specifically and, given its links to various risk behaviours offline and online behaviours more broadly, research examining the role of egocentrism in online risk taking is important.

Fear of missing out and risks

FoMO is defined as a “pervasive apprehension that others might be having rewarding experiences from which one is absent” (Przybylski, Murayama, DeHaan, & Gladwell, 2013, p. 1841). Individuals with higher FoMO scores tend to have more of a desire to stay continually connected with what others are doing, and a number of affective and behavioural correlates have been noted in relation to FoMO in the online context. For example, higher FoMO was linked to a tendency to use social media during university lectures and to compose and check text messages while driving (Przybylski et al., 2013). FoMO has recently been described as an envy-related anxiety about missed experiences and a fear of being left out of what others are doing (Reagle, 2015). FoMO has been characterised as a socially-driven concept, where individuals have a higher drive for more rewarding social experiences (Riordan, Flett, Hunter, Scarf, & Conner, 2015). Riordan et al. (2015) highlighted that such a relationship may lead those higher in FoMO to take more risks or be less risk

averse, noting that FoMO scores were linked directly to items measuring risk taking behaviour in the context of drinking alcohol in adolescents. Previous research has also hinted towards potential links between online self-promotion and online vulnerability (Dredge, Gleeson, & De la Piedad Garcia, 2014). In this instance, individuals who fear ostracism from online interaction or activities have a tendency to overcompensate by engaging in excessive self-promotion via editing and updating content in their online profiles (Trepte & Reinecke, 2013). Such activities could lead the individual into oversharing of personal information, in turn being linked to potential online victimisation (Davidson & Martellozzo, 2013; Debatin, Lovejoy, Horn, & Hughes, 2009; Kite et al., 2010). The desire to remain engaged in what others are doing can lead to more risk taking in order to not miss out on the experiences of peers. Given that FoMO tends to be higher among younger individuals (Dossey, 2014) and adolescence is a period where peer relationships become central and a need for belonging and acceptance within a peer group are of particular importance, FoMO may be a crucial social variable to consider in research in this area. A recent study showed that FoMO mediated the relationship between need to belong and authentic self-presentation online (Wang et al., 2018). FoMO was also linked to social network use and a higher number of different social networks used (Fuster, Chamarro, & Oberst, 2017). Studies have also linked FoMO to indicators of mobile phone addiction (Fuster et al., 2017) and problematic smartphone use as well as negative affectivity such as depression, anxiety and stress (Elhai et al., 2018). The research in this area has established a relatively strong link between FoMO and various online behaviours and risks. Further research is needed to explore the role of this variable in broader online risk taking among adolescents and to assess its relative contribution compared to developmental factors such as that of egocentrism.

Study rationale

Understanding the factors that could explain risk taking during adolescence could serve to inform more effective prevention, intervention and education strategies. Given that adolescents have been shown to be particularly vulnerable to a variety of risks compared to other age groups (Paulsen, Platt, Huettel, & Brannon, 2011), it is important to explore these issues further in the context of online risk behaviours and to examine the potential factors that contribute to risk taking in the online domain.

As discussed in the previous sections, egocentrism has been shown to play a crucial role in adolescent risk taking in general but has not been explored specifically in online risk behaviours. It has also been argued that much of the research focus in relation to egocentrism explores narrow age ranges, thereby failing to explore the full developmental stage of adolescence which would provide a greater insight into its role (Galanaki, 2012). FoMO has been shown to link to various online activities and risks, but its impact alongside potential developmental factors like egocentrism remains unknown. Finally, although risk behaviour during adolescence has had longstanding interest in the literature, some adolescent populations globally remain understudied particularly in relation to online risk behaviours. Studies among adolescents in South Africa have been conducted on a range of issues such as suicidal ideation and suicide attempts (Shilubane et al., 2013), risky sexual behaviour (Brook, Morojele, Zhang, & Brook, 2006; Thurston et al., 2014), substance abuse (Madu & Matla, 2003; Palen, Smith, Flisher, Caldwell, & Mpofu, 2006; Visser & Routledge, 2007) and violence and aggression (Liang, Flisher, & Lombard, 2007; Swart, Seedat, Stevens, & Ricardo, 2002), but further research is needed to understand online risk behaviours specifically.

Research question and aims

Taking into account these limitations, the current study aimed to (i) gain a better understanding of online risk taking among adolescents in South Africa across the full developmental stage of adolescence (12–18 years) and (ii) examine gender and age as well as the role of egocentrism and FoMO in online risk behaviours. The study thus explored the following research question: *Can*

gender and age as well as developmental and social variables linking to egocentrism and FoMO predict online risk taking among adolescents? Given the novel sample and sparse literature on online risk behaviours available in South Africa (and developing contexts more generally) as well as the exploratory combination of developmental and social variables linked to adolescence that were included in the study, we do not propose specific hypotheses at the outset.

Method

Research design and participants

The study was a quantitative cross-sectional survey design. Data was collected in two schools in Cape Town, South Africa. A total of 1184 adolescents (54% female) aged between 12–18 years ($M = 15.02$, $SD = 1.62$) took part in the study.

Sampling

A sampling framework of high schools within the Southern Suburbs and Central region of Cape Town was developed, comprising of both public and private schools. Contact was made with all schools from the sampling framework, with two schools being able to accommodate data collection across all grades. This included one private and one public school and both had English as the medium of instruction.

Procedure

Data was collected in class sessions by means of an anonymous online questionnaire collected through the Qualtrics data collection platform. The survey took approximately 30 minutes to complete. Participants first completed basic demographics, an online risk behaviour measure developed for the current study, as well as established measures of Imaginary Audience, Personal Fable and FoMO.

Measures

The new imaginary audience scale (Lapsley et al., 1989)

This 42-item scale assesses the extent to which the individual engages in interpersonal fantasies and 'visions of the self' (Lapsley et al., 1989, p. 491). Participants are asked how often they imagine themselves in a particular situation such as winning a lot of money, being a rockstar or becoming famous, and how they think individuals around them would view them. Responses are recorded on a frequency-based Likert scale (1 = Never to 4 = Often). Higher scores reflect a higher tendency to construct imaginary audiences. The scale has been previously validated for use in adolescents (Cingel et al., 2015; Lapsley et al., 1989) and has demonstrated good internal consistency ($\alpha = .92$) (Lapsley et al., 1989). The measure has been used in diverse samples in both English and non-English speaking contexts (Galanaki, 2012; Goossens, Beyers, Emmen, & Van Aken, 2002; Levpušček & Videc, 2008; Ranzini & Hoek, 2017). The Cronbach's alpha of the scale in the present study was .91.

The new personal fable scale (NPFS; Lapsley et al., 1989)

The 46-item Personal Fable scale was used in order to assess feelings related to personal uniqueness, omnipotence, and invulnerability associated with the Personal Fable construct. In the original conceptualisation presented by Lapsley et al. (1989) omnipotence was defined as 'having unlimited authority or influence' (p. 491), and includes items such as 'I believe that I can do anything I set my mind to', and 'I think I am a powerful person'. Invulnerability is viewed as the individual's imperviousness to experience harm or being injured, and is captured in items such as 'Nothing seems to bother

me', and 'I believe in taking risks'. Personal uniqueness assesses the extent to which the individual believes they are different to everyone else, and includes items such as 'No one has the same thoughts and feels that I have', and 'I'm somehow different from everyone else'. Participants responded on a 5-point Likert Scale (1 = Strongly Disagree to 5 = Strongly Agree). The scale has been widely tested, with the psychometric properties of the NPFS being described as adequate (personal uniqueness $\alpha = .69$; invulnerability $\alpha = .72$; and omnipotence $\alpha = .79$) and the scale demonstrating concurrent validity (Aalsma et al., 2006). In the current study, the Cronbach's alpha for the subscales were .74 for omnipotence, .69 for invulnerability and .61 for personal uniqueness. A Cronbach's alpha of above .6 is deemed satisfactory, indicating a moderate reliability of the subscales (Hair, Black, Babin, Anderson, & Tatham, 2010; Hinton, McMurray, & Brownlow, 2014).

FoMO scale (Przybylski et al., 2013)

FoMO was assessed using the 10-item FoMO scale (Przybylski et al., 2013). Participants respond to statements related to missing out on important information and fears relating to friends having more rewarding experiences than themselves on a 5-point Likert scale (1 = Not at all true of me - 5 = Extremely true of me). The original study reported good internal reliability for the scale ($\alpha = .90$), with the present study reporting an internal reliability of $\alpha = .84$. Higher scores on this measure indicate higher FoMO.

Child and adolescent online security (CHAOS) scale

The current study employed a self-report measure to assess how frequently participants engaged in potentially risky online activities. This scale was based on the behavioural subscale of the Human Aspects of Information Security Questionnaire (short version; S-HAIS-Q), previously used to explore the role of risk taking online and susceptibility to cybercrime (Hadlington & Chivers, 2018). Additional items that probed aspects of sexting, friending strangers online, and use of social media were added as these have been highlighted as being some of the primary concerns for online safety among young people (Dake, Price, Maziarz, & Ward, 2012; Livingstone et al., 2014). Participants indicated how likely they were to engage in a variety of risky online behaviours (e.g. sharing passwords, opening email attachments from strangers, friending a stranger online) using a 7-point Likert scale (1 = Strongly Disagree - 7 = Strongly Agree). The 14-item scale had a total score ranging from 14–98. Higher scores indicated more positive engagement with online safety and security (i.e. less risk taking). The Cronbach's Alpha was .81.

Statistical analysis

The CHAOS scale that was developed for the current study originally contained 20-items. The scale was subjected to item analysis and Principal Component Analysis (PCA) in order to reduce the number of items, assess reliability, and examine the factor structure of the items, in line with item-response theory. This resulted in the final 14-item scale used as the dependent variable in the current study.

Gender differences were assessed in relation to the key study variables utilising independent samples t-tests. Correlational analyses were conducted to determine the relationships between the study variables, followed by a hierarchical regression analysis to assess whether gender, age, egocentrism constructs (Personal Fable and Imagine Audience) and FoMO predicted online risk behaviours.

Ethics

The study received full approval from ethics committees at both institutions where the authors are affiliated. Parental consent was obtained and adolescents provided assent prior to engaging in data collection. A debrief was provided in writing on the final page of the survey to all participants, with links to further information and resources.

Results

CHAOS scale: validity and reliability

An item analysis was initially conducted on the 20-item scale to remove any items that decreased the reliability of the overall measure. This resulted in the removal of 3 items. A PCA using Orthogonal rotation (Varimax) was conducted on the remaining 17 items to determine the scale's factor structure. The Kaiser-Meyer-Olkin value obtained for the scale items was .840 and the Bartlett's Test of Sphericity was significant ($\chi^2(136) = 4633.74, p < .001$), suggesting that the scale was suitable for PCA.

The PCA indicated that the items loaded on to 5 factors, collectively explaining 55.86% of the variance. Each of the five factors explained roughly equal variance (between 10–12%), indicating the relevance of each of the factors in the scale. The rotated component matrix was examined and items with factor loadings below .4 as well as those that loaded above .4 on more than one factor were removed. This resulted in the removal of 3 additional items. The final scale contained 14 items reflecting Active Protection (Factor 1), Friending Online Strangers (Factor 2) Sexting (Factor 3), Conduct Risks (Factor 4), and Interpersonal Contact Risks (Factor 5) as shown in Table 1.

Engagement in online risks and gender differences

In examining some of the descriptive findings relating to online risk behaviours of adolescents, 26.9% of young people reported that they visit any website they want without thinking about how safe it is. A total of 31.5% of adolescents reported that they had accepted friend requests from strangers on social media based on a profile picture and 26% had accepted friend requests from strangers on social media to increase their number of followers. A similar proportion also reported that they had chatted to strangers online and developed relationships with them (24.8%). A total of 12.1% of adolescents sampled also stated that they often share their location on social media. In terms of sexting, 11.2% had sent nude images or videos of themselves to someone they know.

Gender differences were explored in relation to the key study variables using independent samples t-tests. Females engaged in significantly fewer risk behaviours ($M = 54.06, SD = 7.88$) than males ($M = 52.42, SD = 8.43$), $t(1185) = -3.46, p = .001, d = .20$, albeit with a small effect. In terms of Personal Fable subscales, males had significantly higher invulnerability scores ($M = 42.55, SD = 6.71$) compared to females ($M = 39.64, SD = 6.23$), $t(1185) = 7.75, p < .001$, which showed a medium effect ($d = .45$). Although effects were small, males also had significantly higher scores

Table 1. Principal component analysis of the CHAOS scale.

	Component				
	1	2	3	4	5
I use passwords with letters, numbers and symbols.	.625				
I don't open email attachments from strangers.	.597				
If something happened online that made me feel bad, I would tell someone (e.g. police, website provider).	.528				
If an email from a stranger looks interesting I would click on a link within it.	.510				
I accept friend requests from strangers on social media to increase my number of followers.		.799			
I have accepted friend requests on social media based on a profile picture.		.777			
I have sent nude images or videos of myself to strangers.			.792		
I have sent nude images or videos of myself to someone I know.			.739		
I share my passwords with friends.					.621
I use public Wi-Fi for sending personal details.					.618
When online, I visit any website that I want to without thinking about how safe it is.					.520
I often share my location on social media.					.485
I have chatted to strangers online and developed relationships with them.					.831
I have trusted strangers online and shared personal information with them.					.766
Variance Explained (%)	12.45	11.16	11.02	10.92	10.31

for personal uniqueness ($M = 45.73$, $SD = 5.95$) compared to females ($M = 44.59$, $SD = 5.72$), $t(1185) = 3.35$, $p < .001$, $d = .20$. This also applied to omnipotence (males $M = 55.75$, $SD = 9.04$; females $M = 53.30$, $SD = 8.90$), $t(1185) = 4.67$, $p < .001$, $d = .27$. In contrast, females reported higher Imaginary Audience ideation ($M = 110.92$, $SD = 18.56$) than males ($M = 108.46$, $SD = 19.99$), $t(1185) = -2.26$, $p = .024$, $d = .13$. Females also reported significantly higher FoMO ($M = 29.09$, $SD = 7.69$) compared to males ($M = 27.27$, $SD = 7.73$), $t(1185) = -4.05$, $p < .001$, $d = .24$.

Correlations and hierarchical regression

An initial exploration of correlations indicated that online safety was significantly negatively correlated with a number of study variables, including age ($r = -.26$), Imaginary Audience ($r = -.28$), FoMO ($r = -.27$) and the invulnerability subscale of Personal Fable ($r = -.16$). Omnipotence and personal uniqueness subscales of Personal Fable indicated weak but positive correlations with online safety.

Age also demonstrated significant negative correlations with the personal uniqueness ($r = -.13$) and omnipotence subscales ($r = -.05$), indicating that older adolescents displayed lower Personal Fable traits. There was a positive correlation with Imaginary Audience ($r = .07$), suggesting that older adolescents tended to have higher Imaginary Audience ideation, though these correlations are weak. FoMO did not appear to correlate with age, but showed a strong positive correlation with Imaginary Audience ($r = .49$) and a negative correlation with omnipotence ($r = -.25$) and invulnerability ($r = -.23$). The Personal Fable subscales were also positively correlated, particularly invulnerability and omnipotence ($r = .47$). These findings and the descriptive statistics for the different scales are shown in [Table 2](#).

To examine whether the key variables of interest predicted online risk behaviour of adolescents, a hierarchical regression analysis was conducted. Total scores on the CHAOS scale were entered as the dependent variable, with higher scores on this variable demonstrating safer online behaviours and lower scores being indicative of online risk taking. Demographic variables age and gender (0 = male, 1 = female) were entered at Step 1 of the analysis. Due to the findings in the literature suggesting a particular link between risk taking and the Personal Fable construct (e.g. Alberts et al., 2007; Arnett, 1995), the three subscales relating to Personal Fable (omnipotence, personal uniqueness and invulnerability) were entered into Step 2 of the analysis. Imaginary Audience was entered at Step 3 as a separate construct linked to egocentrism due to distinct findings in relation to the two egocentrism constructs. FoMO has a much larger support in the literature in terms of its impact on online activities and risks and was entered as a separate variable in Step 4.

Data was normally distributed and the Durbin-Watson statistic was 1.923 indicating independence of errors. The VIF and tolerance statistics indicated that multicollinearity was not a concern in the analysis. The results of the hierarchical regression are shown in [Table 3](#). At Step 1, age and

Table 2. Descriptive statistics and correlations of key study variables.

	1	2	3	4	5	6	7
CHAOS	-						
Age	-.264**	-					
Personal Fable (Omnipotence)	.068*	-.047	-				
Personal Fable (Personal Uniqueness)	.089*	-.132**	.143**	-			
Personal Fable (Invulnerability)	-.160**	-.009	.470**	.108*	-		
Imaginary Audience	-.283**	.069*	.015	.049	-.016	-	
Fear of Missing Out	-.272**	.051	-.252**	.008	-.232**	.486**	-
Score Range (min-max)	29–70	12–18	26–87	29–65	20–65	42–168	13–53
M	53.31	15.02	54.43	45.11	40.98	109.79	28.26
SD	8.18	1.62	9.04	5.86	6.61	18.79	7.76

* $p < .05$; ** $p < .001$

Table 3. Hierarchical regression analysis.

	Model 1				Model 2				Model 3				Model 4			
	B	SE B	β	t	B	SE B	β	t	B	SE B	β	t	B	SE B	β	t
(Constant)	68.77	2.20		31.24**	67.68	3.40		19.90**	77.75	3.38		23.03**	81.86	3.36		24.34**
Gender	1.52	.46	.09	3.30*	1.16	.46	.07	2.51*	1.51	.44	.09	3.42*	1.63	.43	.10	3.76**
Age	-1.19	.14	-.24	-8.67**	-1.12	.14	-.23	-8.31**	-1.02	.13	-.21	-7.78**	-.99	.13	-.20	-7.84**
Personal Fable (Omnipotency)					.15	.03	.17	5.32**	.16	.03	.17	5.85**	.12	.03	.13	4.40**
Personal Fable (Uniqueness)					.09	.04	.07	2.40*	.12	.04	.09	3.20*	.13	.04	.09	3.52**
Personal Fable (Invulnerability)					-.29	.04	-.23	-7.36**	-.29	.04	-.24	-7.90**	-.33	.04	-.26	-8.90**
Imaginary Audience									-.12	.01	-.29	-10.84**	-.08	.01	-.18	-6.08**
Fear of Missing Out													-.23	.03	-.21	-6.92**
R^2	.069				.118				.198				.229			
Adj R^2	.067				.114				.193				.224			
F	43.86**				31.50**				48.40**				49.98**			

* p < .05; ** p < .001

gender explained a very small proportion of the variance in online risk behaviour (6.7%). With the inclusion of the Personal Fable subscales at Step 2, the model explained 11.4% of the variance in online risk taking behaviour. The variance explained increased to 19.3% with the inclusion of Imaginary Audience in Step 3 and 22.4% with the inclusion of FoMO in the final model. The findings show that all of the variables are significant predictors of online risk taking in 12–18 year olds. Invulnerability associated with the Personal Fable construct was the largest predictor of online risk behaviour, followed by FoMO and age.

Discussion

The current study examined the role of gender and age as well as developmental and social variables linking to egocentrism and FoMO as potential predictors of online risk taking behaviours of 12–18 year olds in South Africa. The results from the study present a variety of critical issues that will be discussed in turn. The discussion of findings first examines the level of online risk taking reported by adolescents and the associated gender and age differences found, followed by a discussion of egocentrism and FoMO as predictors of online risk taking.

In the context of specific risks being taken online, some behaviours such as accepting friend requests from strangers on social media based on a profile picture (31.5%) and to increase the number of followers (26%) were particularly prominent. Contact risks were also high with 24.8% of adolescents reportedly chatting to strangers online and developing relationships with them and 11.2% admitted to sexting with someone they knew. Previous research from the U.S. showed that 11% of 10–17 year olds had developed close relationships with individuals online (Walsh, Wolak, & Mitchell, 2013) and 17% of 12–18 year olds had engaged in sexting (Dake et al., 2012). A comparative study of four countries also previously indicated that young people in South Africa engaged in and experienced higher online risks compared to their counterparts in Argentina, Serbia and the Philippines in relation to specific risks, including talking to strangers online, meeting online strangers in person, receiving sexual images and being asked for sexual information (Byrne, Kardefelt-Winther, Livingstone, & Stoilova, 2016). The current study findings show that online risks are a concern among adolescents in South Africa and rates are comparable with behaviours of adolescents globally, pointing to the need for further research in wider global samples.

In relation to gender differences and online risk taking, males were found to engage in significantly more online risks than females. Previous research in this area is mixed and findings vary in relation to particular types of risks such as sexting (e.g. Hinduja & Patchin, 2010; Lenhart, 2009; Mitchell et al., 2012). While these findings do not lead to firm conclusions around gender differences, they do add to the current body of literature as gender emerged as a significant predictor of online risk taking. Adolescents' age also emerged as a strong predictor indicating that online risk taking increased with age. This has been noted in previous studies exploring broader online risk taking (Duerager & Livingstone, 2012) as well as in studies looking at specific types of risks including sexting (Klettke et al., 2014) and contact related risks (Livingstone et al., 2011). This finding is also in line with a large body of literature on offline risk taking behaviours among adolescents, where findings have indicated an inverted U-shaped pattern of risk taking from late childhood to adulthood and a peak at mid- to late-adolescence (Steinberg, 2010; Steinberg et al., 2008, 2018). According to Steinberg (2010), this is due to age differences being associated with reward-seeking (which generally peaks at mid-adolescence) and impulsivity (which shows a linear decline from age 10 onwards). Thus, according to this Dual-Systems model, the peak of risk taking around mid-adolescence is attributed to higher reward-seeking combined with a lower capacity for self-control at this age (Steinberg, 2010; Steinberg et al., 2008).

These studies link age differences to particular developmental factors. The current study focused on egocentrism as a developmental construct during adolescence and sheds further light on potential explanations for the age differences noted in previous research. Indeed, a significant

negative correlation was found between age and personal uniqueness, suggesting that younger adolescents were more likely to have a sense of uniqueness compared to older adolescents. A significant positive correlation was also found between age and Imaginary Audience ideation. This highlights the differences in some aspects of egocentrism across adolescence and shows that age findings in relation to online risk taking may be a broader reflection of developmental changes. Apart from age being linked to egocentrism, gender differences were also noted. Males had significantly higher scores on all Personal Fable measures, thus tending to feel more omnipotent, unique and invulnerable, which was noted in previous research (Goossens et al., 2002). However, females had significantly higher Imaginary Audience scores compared to males, suggesting that they may be more self-conscious and more likely to play up to imagined audiences. This has been found in previous studies (Elkind & Bowen, 1979; Hauck, Martens, & Wetzel, 1986; Rycek, Stuhr, McDermott, Benker, & Swartz, 1998), though some studies have also reported higher scores among males (e.g. Greene, Rubin, Hale, & Walters, 1996) as well as no gender differences (Vartanian & Powlishta, 1996). These age and gender findings are important in their potential to inform more targeted approaches to prevention and intervention at particular developmental stages and in particular contexts.

While previous research has linked egocentrism to offline risk taking (e.g. Alberts et al., 2007; Arnett, 1995), the influence of this construct on online risk taking has not been explored previously. The current study showed that all egocentrism constructs significantly predicted risk taking online, particularly invulnerability (linked to Personal Fable), which emerged as the strongest predictor. A higher sense of invulnerability was shown to lead to higher risk taking, potentially due to the belief that one can influence and avoid risks more easily. Thus, adolescents may have an optimistic bias about their own level of risk compared to others their age, reflecting the research on risk perception in terms of cost-benefit appraisals of risk (Benthin et al., 1993; Slovic, 2016). Unlike invulnerability, the remaining Personal Fable constructs predicted higher online safety. This suggests that greater feelings of power, authority and influence (linked to omnipotence) and a higher sense of personal uniqueness led to lower online risk taking, which may be linked to self-confidence in being able to navigate online risks more effectively. Personal Fable has been described as an over-differentiation in one's own feelings and experiences compared to others (Elkind, 1967) and has been linked to narcissism (Lapsley et al., 1989), with studies linking narcissism to risks such as smartphone addiction (Pearson & Hussain, 2015) and lower vigilance on Facebook (Smith, Mendez, & White, 2014). It is interesting to note the varying ways in which the individual aspects of Personal Fable influence online risk taking in the current study. Further research to understand the mechanisms of influence of the individual aspects of Personal Fable may shed light on how they impact online risk taking specifically.

Imaginary Audience ideation was also a significant predictor of online risk taking amongst the egocentrism variables, with those who had higher scores on this variable engaging in more online risks. The belief that one is being observed and evaluated by others can thus extend online and impact on risk behaviours as individuals may feel that they need to play up to a constant audience (manage impressions) and potentially fit into perceived peer norms relative to online activities. This is not surprising given that online activities, such as those relating to social media in particular, inherently consist of an audience that provides feedback on one's posts and images through comments, shares and 'likes'. In the current study, a relatively large proportion of young people reported adding individuals on social media based on just a profile picture as well as to increase their number of followers on social media with the goal of adding to their audience. A larger online audience may serve to increase social status among peers but also likely contributes further to the Imaginary Audience ideation itself. At a developmental stage when social relationships are key and peer acceptance and belonging are deemed particularly important, online environments may add to both social opportunities and risk behaviours. Peer acceptance was shown to be crucial in adolescent risk taking more broadly (e.g. Albert et al., 2013; Gardner & Steinberg, 2005; Kasperson et al., 1988), and previous studies relating to online activities have found that Imaginary Audience was linked to self-disclosure (Krcmar et al., 2015) and impression management on Facebook

(Ranzini & Hoek, 2017). The current study findings demonstrate how an imagined audience can impact on online risk taking during adolescence and further research is needed to examine this construct in more detail, particularly in relation to its impact on online behaviours and links to impression management and how this might be related to risk behaviours.

Establishing the link between FoMO and online risk taking behaviours has some potential antecedents in past research. Although not specifically linked to risk taking in the online context across a broader range of risks, FoMO has been previously linked to the negative consequences of alcohol use in college students (Riordan et al., 2015). The authors of this study suggested that the drive to achieve more rewarding social experiences leads those individuals higher in FoMO to take more risks associated with alcohol use. It may be that the corollary in the present study is the drive to stay connected to the online social network, and to increase popularity by bolstering the number of social networking followers at the expense of online safety. FoMO was also significantly positively correlated with Imaginary Audience indicating that those with higher Imaginary Audience ideation appear to want to stay continually connected with the activities of others. Playing up to particular online audiences to obtain feedback and acceptance from peer groups and wanting to stay informed about the activities and experiences of others in order to not feel as though one is missing out can be powerful drivers of adolescent online behaviours. Previous research has shown that FoMO impacts on self-presentation online (Wang et al., 2018) and particular online activities and risks (Elhai et al., 2018; Fuster et al., 2017). The current study adds to this by demonstrating that FoMO is a significant predictor of broader online risk taking among adolescents (emerging as the second largest predictor variable) and that it also links to particular developmental constructs. Apart from being correlated with Imaginary Audience, it was also negatively correlated with the omnipotence and invulnerability subscales of Personal Fable. These are novel findings and further research in this area should examine the links between developmental constructs and FoMO further and, particularly, how they interact to influence risk taking online.

Conclusion

The current study presents a first step in exploring how both developmental and social factors could be used to predict adolescent risk taking online. Although egocentrism has been linked to risk taking offline, the current study demonstrates that this developmental factor is also relevant to online risk taking. The findings suggest that egocentrism constructs Personal Fable and Imaginary Audience are significant predictors of online risk taking, with differential effects on this behaviour. The study also demonstrates the role of FoMO in risk taking online as well as the strong links between FoMO and some of the aspects of egocentrism, particularly Imaginary Audience ideation. These links have not been previously established and extend the work on FoMO by demonstrating its role relative to developmental factors during adolescence. Understanding the potential factors that contribute to risk taking in the online domain at particular developmental stages is crucial, as this can inform prevention and intervention strategies aimed at young people that are better tailored to them and can thus be more effective in enhancing online safety practices and educational strategies. This is particularly crucial in contexts where there is little in the way of online safety efforts at present, as has been noted in the context of South Africa (Kortjan & von Solms, 2013; Kritzinger, 2014; Kritzinger & Padayachee, 2013). The study also utilised a large sample of adolescents in South Africa, where little current research in relation to online risk taking has been explored, thus adding to the body of literature in relation to understanding young people's online risk experiences in a more global context. It also reflects a broad age range allowing for an exploration into the full developmental stage of adolescence.

Limitations and future research

Although the study addresses a number of gaps in current research, it is not without its limitations that should be addressed in future research. Although developmental factors have been highlighted

as being relevant in relation to online risk taking in the current study, the study is cross-sectional and future work in this area should examine developmental changes in relation to online risks longitudinally. The study also focused on broader online risk taking as an exploratory study, but future research should examine specific types of online risks in more detail to add to an understanding of the relative contribution of factors such as egocentrism and FoMO on particular types of risky online behaviours. This would further inform targeted online safety efforts. Additional developmental factors apart from egocentrism could also be explored to determine which developmental factors are more strongly linked to online risk taking, which could also further inform targeted online safety interventions for young people. For example, measures of sensation-seeking and impulsivity associated with the Dual-Systems model (Steinberg, 2010) may be of interest to explore alongside egocentrism in future to add to the understanding of these factors in relation to risk taking online. Furthermore, additional psychosocial variables may contribute to egocentrism and FoMO and deeper insights into the role of peer relationships, susceptibility to peer influence, social support both offline and online, as well as variables linked to family- and school-level factors may also be important. Finally, in relation to measurement and design, a reliance on self-report data related to risk behaviour assumes that participants are aware of their risk taking behaviours, which means that these may not always be an accurate reflection of actual online activities. Thus, more objective data collection methods may also be considered in future research among this demographic. In addition, while the established scales used to measure egocentrism and FoMO have been utilised in a variety of samples and age groups and their psychometric properties assessed, there is a broader need to test out established measures of psychological constructs in more diverse populations. Despite these limitations, the study presents some important insights into this research area that can inform future study and practice.

Disclosure statement

No potential conflict of interest was reported by the authors.

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