



Research article

Self-esteem, self-efficacy, self-concept and intimate image diffusion among deaf adolescents: A structural equation model analysis



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ABSTRACT

This study aimed to assess the role of self-esteem, self-efficacy and self-concept on intimate image diffusion among in-school deaf adolescents in Lagos, Nigeria. The theory of planned behaviour served as a framework for the study. Data was collected through structured questionnaire from 276 (male = 39.5%; female = 60.5%) in-school deaf adolescents from five senior secondary (3 integrated and 2 inclusive). Data generated were analysed with IBM SPSS 22 and IBM AMOS 26.0 packages. Mean age of participants was ± 16.5 , all participants use WhatsApp while 71.7% had Facebook profile. It was observed that all the fit measures of the SEM fell within the acceptable range ($\chi^2 = 104.34$, $df = 39$, $\chi^2/df = 2.67$, $GFI = 0.92$, $CFI = 0.91$, $NFI = 0.93$, $IFI = 0.91$ and $RMSEA = 0.54$). According to the findings, self-esteem and self-efficacy had a positive and direct relationship with intimate image diffusion while a negative but direct link exists between self-concept and intimate image diffusion among deaf adolescents. Based on the finding, an appropriate recommendation was made.

1. Introduction

The lives of adolescents across the globe have been permeated with digital media. In other words, their lives, academic, social and romantic interactions are largely influenced by digital devices, especially smartphones which are widely used as a means of communication. Despite the numerous benefits associated with the use of smartphones and digital devices, negativities connected with their inappropriate use among adolescents remain a serious concern for parents, teachers, social workers, counselling psychologists, mental health professionals and researchers. Some studies (Ifeyanyi and Chukwuere, 2018; Ng et al., 2017) have indicated that reckless and continual usage of digital devices via social networks (WhatsApp, Facebook and Instagram, among other social networking platforms) has the potential to distract adolescents from active and participatory face-to-face teaching and learning activities. On the other hand, other studies (Boyle & O'Sullivan, 2016; Oyewumi et al., 2015) argued that digital devices remain a potent approach to engage adolescents in the present time and age.

Above all, a plethora of recent studies (Penado et al., 2019; Temple and Lu, 2018; Villacampa, 2017) has raised concern about the increasing rate of smartphone usage and its role in sexually explicit communication exchange (a term which is known as 'sexting') among adolescents. Drouin et al. (2015), as well as Lenhart (2009), aver that sexting is an

interpersonal exchange of self-produced intimate or sexually explicit texts or images (videos, photographs) through internet-enabled smartphones. It is a behaviour that is prevalent among adolescents (Del Rey et al., 2019; Kopecký, 2012; Morelli et al., 2016) but the rate at which males and females send and receive intimate images or sexually explicit content varies. To date, research reports are yet to provide a conclusion on sex variance in the diffusion of sexual/intimate images (Del Rey et al., 2019; Lenhart, 2009; Symons et al., 2018; Van den Abeele et al., 2014) but sexting remains a behaviour common among adolescents who are in romantic relationships (Lawrence and Tokede, 2017; Samimi and Alderson, 2014).

Presently sexting is a problematic behaviour that is seen particularly among adolescents and young adults. It has been publicly debated and has received research attention on the manner, frequency and extent to which adolescents exchange and diffuse intimate or sexually explicit images of themselves to others. Currently, the increase in public outcry, worries and research attention towards sexting among adolescents is linked to possible negative outcomes such as cyberbullying, online sexual exploitation and harassment that may likely emanate from possible misuse of the intimate images and/or broken romantic relationships. While previous research studies on the exchange of intimate images have focused on adolescents with a functional sense of hearing (Crimmins and Siegfried-Spellar, 2014; Lawrence and Tokede, 2017; Makgale and

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Plattner, 2017), studies on intimate image diffusion or sexting *vis-à-vis* its prevalence, causative factors and social-emotional impact among deaf adolescents whose sense of hearing is non-functional is relatively scarce. Therefore, this study advances the existing body of knowledge on the influence of the components of 'self' on intimate image diffusion among deaf adolescents.

Deaf adolescents represent a minority group among young individuals who are transiting between childhood and adulthood. While the deaf also experience pubertal changes and turmoil associated with adolescence (Brice and Strauss, 2016), they contend also with effects associated with the loss of their sense of hearing, especially in circumstances where oral communication prevails. As a minority group, deaf adolescents are not only faced with stigmatization, daily setbacks, discrimination, rejection and explicit prejudice (Adigun, 2016; Jambor and Elliott, 2005) but also sexual exploitation, harassment and cyber-bullying, among other negativities. On the other hand, while they actively engage other sense organs to compensate for their loss of hearing, they also strive to enjoy social bonding and connectedness with peers (hearing and non-hearing). In other words, deaf adolescents appreciate positive affectivity, hence romantic relationships among them are not uncommon (Oyewumi et al., 2015; Terleksi et al., 2020). During adolescence, peer interaction is very salient, thus many deaf adolescents often turn to their peers for intimate discourses, feedback and approval seeking rather than their parents (Prinstein and Giletta, 2016).

According to Prinstein and Giletta (2016), feedback and approval seeking from peers is a phenomenon that contributes to changes in the establishment of a sense of self among deaf adolescents. In the existing literature, the concept of 'self' has gained wider research attention but the implications of self-esteem, self-efficacy and self-concept on intimate image diffusion (sexting), especially among deaf adolescents, is yet to be determined. Until now, self-esteem remains a primary component of social maturity and mental health. It is a construct used to describe individuals' evaluation of worthiness and totalities of qualities or attributes (Rosenberg et al., 1995). As indicated by Jambor and Elliott (2005), self-esteem is an integral and pervasive component of adolescence with a capacity to impact on emotion, cognition, motivation and behaviour of deaf adolescents. Hence, while intimate image diffusion, particularly among adolescents, remains a risky sexual behaviour that is linked to an individuals' motive and emotion (Lawrence and Tokede, 2017), self-esteem as a perceived sense of worth may thus influence how deaf adolescents engage in diffusion of such intimate or sexually explicit images. Unfortunately, the implication of self-esteem on intimate image diffusion, particularly among deaf adolescents, is scarce in the existing literature but past studies which have examined the relative impact of non-deaf adolescents' self-esteem on sending and receiving of sexual content and images via online mediums have presented conflicting results.

In some previous studies, self-esteem has been linked to behaviours identified with the exchange of sexual images via internet-enabled mobile phones among non-deaf adolescents (Hudson, 2011; Klettke et al., 2019; Scholes-Balog et al., 2016), whereas some other studies, for instance the one by Wachs et al. (2017), show a partial mediation of self-esteem with intimate image and content diffusion among adolescents. On the other hand, Van den Abeele et al. (2014) and Temple and Choi (2014) noted a non-predictive influence of self-esteem on the exchange of sexual content among adolescents with a functional sense of hearing. Furthermore, a 2018 study conducted by Gregg et al. among 314 in-school adolescents from an urban area in Michigan found no link between self-esteem and sexting. In a similar study among 570 adolescents from Tema in Ghana, Baidena et al. (2020) reported an insignificant association between self-esteem and sexting. Above all, while studies on the status of exchange of intimate images among deaf adolescents are scarce, available evidence from Klette et al. (2019) revealed inconsistencies in the evidence provided on the predictive influence of self-esteem on the diffusion of sexual content among adolescents.

Additionally, the role of self-efficacy on adolescents' problem behaviours such as drug use and abuse (Dijkstra and DeVries, 2000); alcoholism (Christiansen et al., 2002); inability to resist sexual encounters (Rostosky et al., 2008), as well as engagement in risky sexual activities (Mahat and Scoloveno, 2010) has been previously reported. Described as the degree of an "individual's perception of his or her ability to perform a specific behaviour" (Bandura, 1997), self-efficacy may influence or control an intention to initiate, exhibit or resist certain behaviour such as the diffusion of intimate images to others via social networking sites (SNSs). However, a paucity of research studies on the role of self-efficacy on intimate image diffusion among deaf adolescents exists. A study among some 404 college students in the United States stated that self-efficacy influences the creation and sharing of sexually explicit user-generated content via online media (Sirianni and Vishwanath, 2012). According to Banduras' (2006) proposition on self-efficacy, adolescents' strong perception of self may produce self-desired results based on their action and thus they may initiate, adopt and maintain a socially desirable behaviour that promotes healthy living. Those with a weaker perceived self-efficacy due to emotional distresses, fear of rejection, however, may have an increased likelihood of engaging in an exchange of sexually explicit/intimate images with another individual.

In their study, Houck et al. (2014) identified that adolescents who engage in exchanges of sexual images and content are those with heightened emotional difficulties and deflated self-efficacy. They further established that individuals with elevated emotional trauma and deflated or lowered self-efficacy are potentially vulnerable to impulsive behaviours motivated by feelings. Thus if individuals without disabilities are faced with emotional trauma they may develop lowered self-efficacy, which increases their tendencies for risky sexual practices. Even though existing literature on the influence of self-efficacy and sexting among deaf adolescents is scarce, it is assumed that the extent of their impulsive behaviour, such as the indiscriminate diffusion of sexually explicit images and messages among deaf adolescents via social networking sites, may be more alarming. Hence, this present study is poised to establish the role of self-efficacy on the diffusion of intimate images and messages via SNSs among deaf adolescents.

Furthermore, irrespective of sex (biologically differentiating male from female), sexual curiosity and exploration is a common phenomenon during adolescence which is motivated by self-concept (Harter, 2006; Rostosky et al., 2008). Van Gurp (2001) indicated that self-concept is a dynamic construct of individuals' perceptions of personal self, capable of guiding adolescents' behaviour towards the satisfaction of needs. When approved of by peers, worries and anxiety are eliminated and the adolescents are able to develop the social interaction ability necessary for psychosocial adjustments. On the other hand, an adolescents' self-concept is capable of influencing diverse behaviours, including but not limited to risky sexual behaviour attributed to the exchange of sexually explicit or intimate images (Rostosky et al., 2008). Importantly, research endeavours have rarely studied the relationship between self-concept and intimate image diffusion, especially among deaf adolescents. Deaf adolescents, like many others with various forms of disabilities, experience rejection, self-regret and depleted self-concept which are amplified by the challenges of how to cope and favourably compete with non-hearing impaired peers in a 'world of words'. Based on the foregoing Bat-Chava (1993), Hsu et al. (2015) and Van Gent et al. (2011) in their various studies recommended the need to further research activities to understand the role of self-concept on social adaptabilities of the deaf.

Prior studies with considerable concerns for the self-concept of deaf adolescents have linked positive adjustment and lowered psychosocial challenges to positive self-concept, but the majority of such studies focused on the academic outcomes and communication, as well as social adjustment of deaf adolescents as the minority group in predominantly hearing communities (Bat-Chava, 1993; Marschark and Hauser, 2008; Hintermair, 2008; Van Gent et al., 2011). Although there is not yet an established research study that has provided a link between self-concept

and intimate image diffusion, especially among deaf adolescents, other studies (Rostovsky et al., 2008; Hsu et al., 2015; Jiannine, 2018) predominantly among non-deaf adolescents have shown that self-concept may influence risky sexual behaviour but not as it relates to sexting or intimate image diffusion via social networking sites. Studies have predominantly examined the impact of the components of 'self' (self-esteem, self-efficacy and self-concept) independently of each other on various forms of sexual behaviour among non-deaf adolescents, but little research exists on the same for the deaf who are members of a minority group in a predominantly hearing society. These deaf adolescents have a higher risk of online sexual exploitation, harassment and cyberbullying, therefore, they need an enhanced component of 'self' to moderate their intimate image diffusion via social networking sites. Such effort geared towards the development of self of deaf adolescents will reduce their unsafe sexual practices and the mental health challenges that may arise from online sexual exploitation, harassment and cyberbullying. Hence, it is worthy to examine the component of 'self' (self-esteem, self-efficacy and self-concept) holistically rather than independently in terms of how it influences intimate image diffusion among deaf adolescents.

2. Theoretical framework

This study was underpinned by the Theory of Planned Behaviour (TPB) (Ajzen, 1991) which assumes that human behaviour is predicted by a matching intention. In other words, a behaviour is said to be exhibited when a matching intention is stronger. Therefore, the TPB remains relevant for forecasting and describing the offline and/or online social behaviour of an individual based choice (Ajzen et al., 2004; Michel et al., 2014). While this current study examined the online behaviour of deaf adolescents, the TPB was preferred as the framework because whether in an online or offline context, it provided a lens through which to examine and understand inter-individual behaviours as well as intra and inter-individual behavioural intentions predicted by attitude, subjective norms, and perceived behaviour control which are individual specific. In previous studies, individual specificity of deaf adolescents has been associated with several components of 'self' (Bandura, 2006; Bat-Chava, 1993; Jambor and Elliott, 2005; Jiannine, 2018; Sirianni and Vishwanath, 2012). Furthermore, components of 'self', namely self-esteem, self-efficacy and self-concept, have largely been identified in literature as intra-individual concepts that influence the behavioural intention, attitude and perception of an individual to exhibit an observed behaviour. Hence, based on the model presented in Figure 1, this study hypothesises that the various components of 'self' (self-esteem, self-efficacy and self-concept) will not predict intimate image diffusion among in-school deaf adolescents. Also, there is an indirect relationship between self-esteem, self-efficacy and self-concept and intimate image diffusion when examined from the perspective of the gender of the participants.

3. Methods

3.1. Design and participants

The descriptive cross-sectional research design was employed for this study. Two hundred and seventy-six deaf adolescents (male = 39.5%; female = 60.5%) aged between thirteen and nineteen years ($M = 16.5$; $SD = 0.40$) who were in grade nine (20.5), grade ten (41.3%) and grade eleven (38.2%) respectively were purposively selected from five senior secondary (3 integrated and 2 inclusive) schools from mainland Lagos, Nigeria. The participants all had a smartphone each with the WhatsApp application. In addition to WhatsApp usage, 198 (71.7%) had a Facebook profile and also used Facebook messenger for communication exchange. Due to their hearing difficulties, all participants communicated via WhatsApp on a daily basis, more so than they did via Facebook. A total of 64 (23.2%) and 14 (5.07%) of the respondents had Instagram and Twitter accounts respectively.

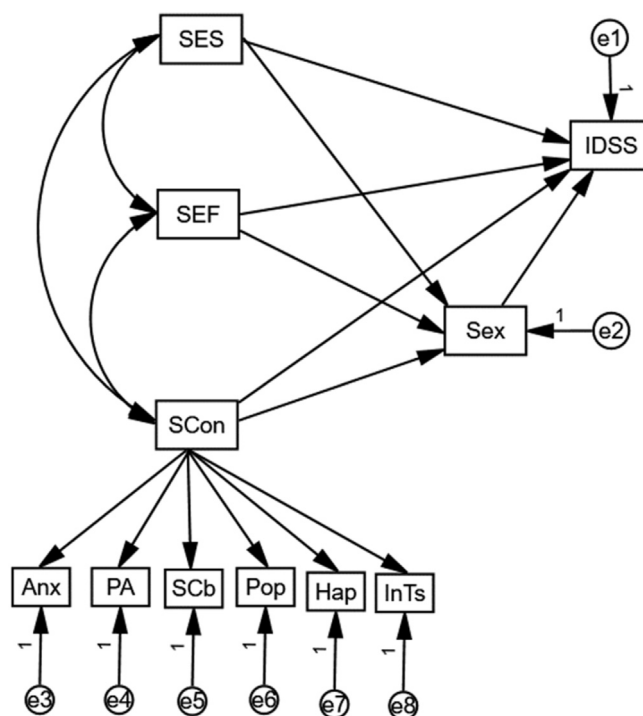


Fig. 1. Model theories: Self-esteem, self-efficacy, self-concept, sex and intimate image diffusion. SES = self-esteem; SEF = self-efficacy; SCon = Self-concept; Anx = Anxiety; PA = Physical appearance; Pop = popularity; Hap = Happiness; InTs = Intellectual status; IDSS = Intimate image diffusion.

3.2. Measures

In addition to the demographic information obtained from the participants, which sought information regarding their age at their last birthday, their sex and grade levels, other measures adopted and employed for data collection in the study were as follows:

Rosenberg Self-esteem Scale (Rosenberg, 1965): This was a ten-item self-esteem scale with five positively and five negatively worded statements. The Rosenberg Self-esteem Scale (RSES) was a 4-point Likert scale of 1–strongly disagree, 2–disagree, 3–agree and 4–strongly agree. The five negatively worded statements were reversed during data coding. A revalidation of the self-esteem scale among 20 in-school deaf adolescents in Ibadan, Oyo State gave a Cronbach's alpha of 0.86.

General Self-efficacy Scale (Schwarzer and Jerusalem, 1995): This was a 10-item scale designed in a 4-point Likert scale format of 1–“not true at all”, 2–“hardly true”, 3–“moderately true”, and 4–“exactly true”. A revalidation of the self-efficacy scale of 20 in-school deaf adolescents in Ibadan, Oyo State gave a Cronbach's alpha of 0.71.

Adolescents' Self-concept Short Scale (ASCSS) (Veiga and Leite, 2016): This was a 30-item, 6-subscaled instrument designed in a 6-point response format of 1–“total disagreement”, 2–“disagreement”, 3–“more disagreement than agreement”, 4–“more agreement than disagreement”, 5–“agreement”, and 6–“total agreement”. Nineteen negatively worded statements on the ASCSS were reversed during data coding. A 2017 study by Felizardo found a strong reliability coefficient for the ASCSS scale ($\alpha = .87$). In the 6 sub-scales of the ASCSS, reliability coefficients of $\alpha = .85$; $\alpha = .80$; $\alpha = .72$; $\alpha = .71$; $\alpha = .70$ and $\alpha = .63$ were reported for happiness, behaviour, physical appearance, intellectual status, popularity and anxiety respectively. In this current study, the reliability coefficient was $\alpha = .77$, while the sub-scales of anxiety, physical appearance, behaviour, popularity, happiness and intellectual status had a Cronbach's alpha of 0.62, 0.75, 0.73, 0.77, 0.76 and 0.72 respectively for anxiety, physical appearance, behaviour, popularity, happiness and intellectual status respectively.

Intimate Image Diffusion Scale (IIDS) (Penado et al., 2019): This was a 19-item, 5-point Likert scaled instrument; where the 5-point Likert response format scale was 1- “never”, 2- “rarely (once or twice a month)”, 3- “occasionally (2 or 3 times a month)”, 4- “often (2 or 3 times a week)”, 5- “frequently (every day)”. Penado et al. (2019) reported a high reliability coefficient of 0.97 for the Intimate Image Diffusion Scale among adolescents aged 12 and 19 years in their study. In this study among in-school deaf adolescents aged 13 and 19, a reliability coefficient of $\alpha = .81$ was obtained for the Intimate Image Diffusion Scale.

3.3. Data collection procedure

Participants recruited for the study were those who had access to and used smartphones. In particular, those who had at least one profile on social networking sites such as Facebook, WhatsApp, Instagram and Twitter were identified and purposively sampled for the study. School heads, teachers and all respondents gave their consent to participate in the study. Participants were adequately briefed about the purpose of the study, using sign language as the means of communication. They were assured of total confidentiality of their responses. The questionnaire was distributed to the participants in a classroom conducive to the process, with the help of two research assistants who were sign language interpreters. The school councillor and teachers in the identified schools also assisted in the arrangement of the respondents. Respondents used an average of 37 min to complete and properly fill out the various sections of the research instrument.

3.4. Ethical consideration

The researcher obtained permission to conduct the study in the education district of Mainland Lagos. The approval obtained was presented to the school heads, who later assigned either the school counsellor or teachers to assist in getting consent from parents or guardians of participants younger than 16 years of age. The study adhered to the ethics of research and those of the University of Zululand Research and Ethics Committee (UREC 171110-030).

3.5. Analysis technique

Data obtained by means of the questionnaire were analysed in terms of descriptive frequency counts, simple percentages, mean and standard deviations, as well as inferential statistics of the Pearson's product moment correlation coefficient using the IBM SPSS statistical software version 22.0 for Windows. The Pearson's product moment correlation coefficient was employed to determine the relationships between self-esteem, self-efficacy, self-concept, sex and intimate image diffusion among in-school deaf adolescents. Furthermore, in order to determine the contributions made by self-esteem, self-efficacy, self-concept and sex to intimate image diffusion, structural equation modelling (SEM) was utilised using the IBM AMOS version 26.0 programme. The IBM AMOS was used to develop the theoretical model and used to perform the structural equation analysis.

4. Results

The findings in Table 1 revealed a relationship between self-esteem, self-efficacy, self-concepts and intimate image diffusion.

Table 1 shows correlations between pairs of variables in the model. As revealed, intimate image diffusion positively correlated to self-esteem ($r = .17, p < 0.01$), self-efficacy ($r = .43, p < 0.01$), as well as to components of self-concept [(Anxiety, $r = .16, p < 0.05$; physical appearance ($r = .21, p < 0.01$); behaviour ($r = .20, p < 0.01$); popularity ($r = .44, p < 0.01$), intellectual status ($r = .13, p < 0.05$), but negatively correlated with happiness ($r = -.41, p < 0.01$)].

SEM was conducted to establish the accuracy of the developed model that explained the role of self-esteem, self-efficacy and self-concept on

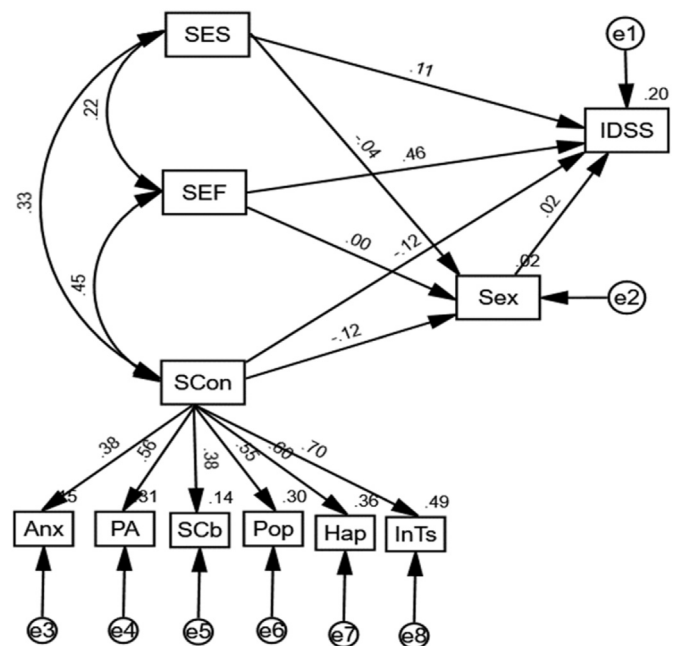


Fig. 2. Structural equation model.

intimate image diffusion among in-school deaf adolescents. To determine the fitness of the model, the goodness of fit indices (GFI), the normalised fit index (NFI), the incremental fit index (IFI), the Tucker–Lewis index (TLI), and the comparative fit index (CFI) were determined, so as to validate its compatibility with the empirical data obtained. According to Bentler (1990), large values for the incremental fit index (IFI), Tucker–Lewis index (TLI), and the comparative fit index (CFI) indicate that a model has a good fit. Hence the values of $\geq .90$ obtained were an indication of a fit model and a root-mean-square error of approximation (RMSEA) values of .06 or lower would indicate a closely fitting model (Browne and Cudeck, 1993; Senol-Durak and Durak, 2011), while .08 would indicate a fairly fitting model, and .10 a marginally fit for purpose model (Hu and Bentler, 1999). In order to further determine the fitness of a model, Kline (2005) and Senol-Durak and Durak (2011) stated that the Chi-square (χ^2) ratio to degree of freedom (df) should be less than 3.

SEM was also conducted using IBM AMOS version 26.0 to determine the role of the observed variables (self-esteem, self-efficacy and self-concept) with or without the mediating role of sex (male or female) on intimate image diffusion. The results here also indicated that the model was adequate. The model showed that self-esteem, self-efficacy and self-concepts were significantly linked with intimate image diffusion. In addition, all the fit measures fell within the acceptable range ($\chi^2 = 104.34, df = 39, \chi^2/df = 2.67, GFI = 0.92, CFI = 0.91, NFI = 0.93, IFI = 0.91$ and $RMSEA = 0.54$) (see Table 2).

In describing the influence of the indicator of self-concept as a latent variable, it could be seen in Figure 2 that all indicators of self-concept had a positive statistically significant relationship at $p < 0.001$. Among the indicators of self-concept, intellectual status was the indicator that showed the highest correlation coefficient ($r = 0.70$), followed by happiness ($r = 0.66$), physical appearance ($r = 0.56$) and popularity ($r = 0.55$), while anxiety and behaviour both had a correlation coefficient of 0.38 each. As shown in the model, self-esteem ($\beta = 0.11, p < 0.05$) and self-efficacy ($\beta = 0.46, p < 0.001$) both had a positively direct significant relationship with intimate image diffusion, while self-concept ($\beta = -0.12, p < 0.05$) had a negatively direct significant relationship with intimate image diffusion. This implies that self-esteem and self-efficacy contributed 11% and 46% respectively to intimate image diffusion. In other words, with higher self-esteem and self-efficacy, deaf adolescents may not share intimate images of themselves on social media platforms. However, self-concept had an inverse 12% contribution to intimate

Table 1. Mean, Standard deviation and correlational matrix of variables used for SEM.

Variables	M	SD	1	2	3	4	5	6	7	8	9
IDSS	60.54	8.82	1								
SES	29.94	3.67	.170**	1							
SEF	25.74	3.92	.433**	.224**	1						
ANX	24.42	2.55	.155*	.023	.029	1					
PA	21.09	2.96	.212**	.208**	.389**	.084	1				
BEH	20.94	3.30	.198**	-.045	.233**	.178**	.245**	1			
POP	20.76	4.05	.442**	.444**	.534**	.072	.393**	-.005	1		
HAP	21.45	5.55	-.411**	.086	.048	.058	.045	-.057	.044	1	
INTS	26.03	2.97	.130*	.370**	.297**	.212**	.230**	.157**	.303**	.434**	1

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

Table 2. Structural model values.

Relationship between variables	Estimates	S.E.	C.R.	P
SEX ← SCON	-0.005	0.003	-1.659	.097
SEX ← SEF	-0.001	0.008	-0.066	.947
SEX ← SES	-0.005	0.008	-0.587	.558
SCB ← SCON	0.107	0.016	6.793	***
POP ← SCON	0.188	0.017	10.793	***
HAP ← SCON	0.284	0.023	12.506	***
INTS ← SCON	0.176	0.011	16.171	***
PA ← SCON	0.140	0.013	11.108	***
ANX ← SCON	0.083	0.012	6.868	***
IDSS ← SCON	-0.090	0.047	-1.903	.043*
IDSS ← SEF	1.045	0.136	7.676	***
IDSS ← SES	0.257	0.138	1.868	.049*
IDSS ← SEX	0.381	0.868	0.390	.696

image diffusion, hence with a lowered self-concept, in-school deaf adolescents had a 12 per cent chance of sharing or diffusing intimate images of themselves. However, a non-significant indirect association was found between the latent variables (self-esteem, $\beta = -0.04$, $p > 0.05$; self-efficacy, $\beta = 0.00$, $p > 0.05$ and self-concept, $\beta = -0.12$, $p > 0.05$) and intimate image diffusion, when moderated by the sex ($\beta = 0.02$, $p > 0.05$) of the participants. This implies that irrespective of sex (male or female), in-school deaf adolescents engaged in intimate image diffusion based on their psychological status.

5. Discussion

The role played by self-esteem, self-efficacy and self-concept on intimate image diffusion among in-school male and female deaf adolescents has not been examined in literature. With the theory of planned behaviour (Ajzen, 1991) as the theoretical framework, this study examined the role of self-esteem, self-efficacy and self-concept on intimate image diffusion among 276 in-school deaf adolescents in Nigeria. The role of the latent variables (self-esteem, self-efficacy and self-concept) on intimate image diffusion was observed to be mediated by the sex of the participants. The sample of participants used in this study was a representative sample of the cohort of deaf adolescents in Nigeria. In Nigeria, deafness is a condition that affects about 10 per cent of the population (Zazove et al., 2006), hence persons who are deaf represent a minority faced with threats to their functional quality of life and their positive psychosocial wellbeing, with an increased potential for additional traumatic experiences resulting from emotional, physical and sexual abuse occasioned by social networking sites (Oyewumi et al., 2015). They are otherwise a heterogeneous population bound by similar cultural and visual language identities.

The current study brought to the fore the positive, directly significant relationship between self-esteem, self-efficacy and intimate image diffusion among deaf adolescents; while self-concept was inversely related to intimate image diffusion by the deaf participants in this study. These results imply that a good and moderate to high self-esteem and self-efficacy will predict a low rate of intimate image diffusion among deaf adolescents; while a negatively associated self-concept with intimate image diffusion predicts a higher rate of intimate image diffusion among the study participants. The findings of this study showing the link between self-esteem and intimate image diffusion among in-school deaf adolescents are in agreement with reports from previous international studies (Hudson, 2011; Klettke et al., 2019; Oyewumi et al., 2015; Scholes-Balog et al., 2016) on self-esteem and sexting. Scholes-Balog et al. (2016), in a study in Australia conducted among 466 females and 117 males aged between 18 and 26 years, established a link between sexting and variations in levels of self-esteem. Other studies by Eugene (2015); Hudson (2011); and Klettke et al. (2019), although among non-deaf adolescents, have at various times and locations found an existing relationship between self-esteem and how adolescents send and receive sexually explicit images or content to each other. Hence, the findings of this present study which established a relationship between self-esteem and intimate image diffusion among in-school deaf adolescents are not contrary to the previous findings of Eugene (2015) and Klettke et al. (2019). However, this study disagrees with the results reported by Temple and Choi (2014); and Baiden et al. (2020) on the insignificant role of self-esteem on sexting.

Furthermore, the findings obtained in this study were consistent with the findings of Bandura (1997, 2006), Rostosky et al. (2008); and Sir-ianni and Vishwanath (2012); as well as those of Houck et al. (2014) who stated that risky sexual behaviours, sexting and reckless diffusion of

sexually explicit images via social media were influenced by an individuals' self-efficacy. According to Bandura (2006), emotional distress and trauma, fear, anxiety and rejection could deflate an individual's self-efficacy, and result in an increased likelihood of them engaging in antisocial behaviours. Specifically, Houck et al. (2014) established that individuals with elevated emotional trauma and deflated or lowered self-efficacy were potentially vulnerable to impulsive behaviours motivated by their feelings. In their studies, Crowe (2020) and Findley et al. (2015) noted that individuals with disabilities had increased levels of psychological distress and difficulties which were associated with discrimination, poor mental health, impaired self-efficacy and lower self-esteem, as well as intimate partner violence as a result of compulsive diffusion of intimate/sexually explicit images. The findings in this study provided support for previous studies among deaf individuals who reported a relationship between self-efficacy and reported incidents of negative behaviour and stressful life events, such as sexting (Lenhart, 2009; Makgale and Platterner, 2017), sexual and physical assault (Anderson et al., 2017; Crowe, 2020; Mahat and Scoloveno, 2010), alcohol abuse (Christiansen et al., 2002) and communication and social barriers (Cuevas et al., 2019; Marschark et al., 2018).

This study found self-concept to be a negatively significant factor that influenced intimate image diffusion among deaf adolescents. It thus supports studies by Bat-Chava (1993) and Hsu et al. (2015), whose studies on the role played by self-concept in the (online and offline) interaction and development of the deaf found a strong affinity between self-concepts and everyday activities and communication processes. Also, Van Gent et al. (2011) suggested that lowered friendship and popularity scores, as well as less social acceptability resulted in lowered self-concepts observed among some deaf adolescents. Likewise, the comparative study of Capelli et al. (1995) noted that deaf adolescents active on social media experienced self-concept problems. Therefore, to expand their social capital, deaf adolescents may have been forced or pressured into sexting. The existence of the associated negative role of self-concept on intimate image diffusion among deaf adolescents was found in this study to be significant. This finding therefore confirmed the previous research evidence (Hsu et al., 2015; Jiannine, 2018; Rostosky et al., 2008) that linked self-concept to the diffusion of intimate/sexual images and or contents.

An indirect relationship between self-esteem, self-efficacy, self-concept and intimate image diffusion in relation to the sex of the participants was found to be insignificant in this study. This implies that irrespective of their sex (male or female), the sharing or diffusion of intimate images among adolescents is largely predicted by psychological variables (Crowe, 2020; Klettke et al., 2019; Makgale and Platterner, 2017; Rostosky et al., 2008). In line with this study, earlier studies have shown that irrespective of their gender, adolescents and young adults engaged in sending and receiving sexually explicit images or content (Spencer et al., 2015; Yeung et al., 2014). Although the percentage rate of the exchange of sexually explicit images or content occurring among adolescents differed (Kopecký, 2012; Lippman and Campbell, 2014; Madigan et al., 2018), self-esteem (Rostosky et al., 2008) and self-efficacy (Houck et al., 2014) were identified as determinants of sexting among adolescents.

6. Conclusion

The role of self-esteem, self-efficacy and self-concept concerning intimate image diffusion in a sample of in-school deaf adolescents has been advanced by this study. The findings have further extended the research ideas and understanding of the implications of self-esteem, self-efficacy and self-concept *vis-à-vis* adolescents' online interaction and diffusion of intimate images and/or content. Therefore, the outcome of this study may assist parents, teachers, social workers, counselling psychologists, mental health professionals and researchers to identify definite guidelines for managing the online activities of deaf children and adolescents; and identify preventive measures to avoid the

indiscriminate diffusion of personal intimate images. The outcome of this study will further assist counselling psychologists and researchers to foster psychotherapeutic interventions to enhance the components of 'self' among deaf children and adolescents. Counselling psychologists should endeavour to promote social acceptance - the acceptance of deaf children and adolescents within the family and their community - while programmes that will boost the 'self' of the deaf are encouraged. Also, parents, teachers, social workers, counselling psychologists, mental health professionals and other related stakeholders should endeavour to educate deaf adolescents on how to stay safe and establish positive interpersonal relationships in an online environment.

7. Limitation of the study

This study examined the role of three psychological variables (self-esteem, self-efficacy and self-concept) on intimate image diffusion among 276 in-school deaf adolescents. The cohort of deaf adolescents is a fraction of the total population of deaf adolescents in a country (Nigeria) with about 180 million people. While the study examined just three psychological variables in relation to intimate image diffusion, it should be noted that there could be many other factors that are actually very influential on one's desire to diffuse intimate images, which this current study has not identified. While this study acknowledged the contributory role of adolescence in sexual behaviour, the study did not assess the number of hours spent on social networking sites, school factors or family structure as potential causal factors for intimate image diffusion.

8. Suggestion for further study

Arising from the limitations of this study, generalising the findings from this study should be done with caution, and further research endeavours on self-esteem, self-efficacy, self-concept and intimate image diffusion are necessary. Future studies on intimate image diffusion among the deaf may delineate between senders and receivers of intimate images *vis-à-vis* time spent on social networking sites. Also, longitudinal research studies or studies that employ quasi-experimental research designs are encouraged to further establish the implications of the components of 'self' on cyber-intimate image diffusion among deaf adolescents. Future studies may dichotomise the endogenous variables used in this study in a bid to further understand their influence on intimate image diffusion among deaf adolescents. Lastly, future studies may consider family dynamics and peers' influence on the components of 'self' and intimate image/content diffusion among deaf adolescent in an online environment.

Declarations

Author contribution statement

O. T. Adigun: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

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The authors declare no conflict of interest.

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