

The effects of “phubbing” on social interaction

Varoth Chotpitayasunondh  | Karen M. Douglas

School of Psychology, University of Kent

Correspondence

Varoth Chotpitayasunondh, School of Psychology, Keynes College, University Rd, University of Kent, Canterbury CT2 7NP, UK.
Email: vc216@kent.ac.uk

Abstract

This research experimentally investigated the social consequences of “phubbing” – the act of snubbing someone in a social setting by concentrating on one’s mobile phone. Participants viewed a three-minute animation in which they imagined themselves as part of a dyadic conversation. Their communication partner either phubbed them extensively, partially, or not at all. Results revealed that increased phubbing significantly and negatively affected perceived communication quality and relationship satisfaction. These effects were mediated by reduced feelings of belongingness and both positive and negative affect. This research underlines the importance of phubbing as a modern social phenomenon to be further investigated.

1 | THE EFFECTS OF “PHUBBING” ON SOCIAL INTERACTION

Smartphones have recently overtaken personal computers and laptops as the most common device that people use to access the Internet (Buckle, 2016). They enable people to communicate with anyone anywhere, facilitating social interactions with people who are very close by, or at the other side of the world. However, despite their obvious advantages in bringing people together, smartphones may sometimes pull people apart (Turkle, 2012). In particular, people often ignore others with whom they are physically interacting in order to use their smartphone instead. This phenomenon, called *phubbing*, seems to have become normative in everyday communication (Chotpitayasunondh & Douglas, 2016). One recent study reported that 90% of respondents used their smartphones during their most recent social activity, and also perceived that 86% of the others involved in the social interaction did the same (Ranie & Zickuhr, 2015). Another recent study showed that nearly half of adult respondents reported being phubbed by their romantic partner (Roberts & David, 2016). Despite the apparent prevalence of this phenomenon, research into its social consequences is limited. The current study aimed to address this gap, focusing on the effects that phubbing has on the perceived quality of communication and relationship satisfaction, and the mechanisms that drive these effects.

1.1 | Background

The term *phubbing* is a portmanteau of the words “phone” and “snubbing”, and describes the act of snubbing someone in a social setting by paying attention to one’s phone instead of talking to the person

directly in one’s company (Haigh, 2012). This term was originally coined in a campaign by the Macquarie Dictionary to represent a growing problem of smartphone misuse in social situations (Pathak, 2013). In a social interaction, a “phubber” can be defined as a person who starts phubbing his or her companion(s), and a “phubbee” can be defined as a person who is a recipient of phubbing behavior.

Some recent research has investigated the antecedents of phubbing behavior. The most important determinant appears to be smartphone addiction (Chotpitayasunondh & Douglas, 2016; Karadağ et al., 2015). More distal predictors such as Internet addiction, fear of missing out, and self-control have been found to predict smartphone addiction, which in turn predicts phubbing behavior. Also, Chotpitayasunondh and Douglas (2016) have demonstrated that phubbing behavior itself predicts the extent to which people are phubbed, so that being a phubber can result in a vicious, self-reinforcing cycle of phubbing that makes the behavior become normative. Research on the effects of phubbing suggests that it may create negative, resentful reactions such that people perceive their interaction to be of poorer quality (Ranie & Zickuhr, 2015), are less satisfied with their interactions (Abeele, Antheunis, & Schouten, 2016), trust their interaction partner less (Cameron & Webster, 2011), feel less close to their interaction partner when a phone is present (Misra, Cheng, Genevie, & Yuan, 2014), and experience jealousy (Krasnova, Abramova, Notter, & Baumann, 2016) and deflated mood (Roberts & David, 2016).

Therefore, researchers have learned valuable information about some of the factors that may cause phubbing behavior, and what some of the effects of phubbing might be. However, research on this topic is still in its infancy and there is much still to discover. In the current research, we aim to complete another piece of the puzzle. Specifically, although we know that phubbing has some negative social

consequences, it is not clear exactly why this is the case. For example, what drives the relationship between phubbing behavior and decreased relationship satisfaction? Why is phubbing associated with poor perceived communication quality? To answer these questions, the current research frames phubbing as a specific form of social exclusion that threatens fundamental human needs and leads to deflated affect.

Social exclusion – or *ostracism* – is defined by Williams (2001) as “being invisible and being excluded from the social interactions of those around you” (p. 2). This experience of being a social outcast is critical to an individual’s wellbeing (Baumeister, 2005). Social exclusion usually leads to negative emotional disturbances such as aggression (Twenge, Baumeister, Tice, & Stucke, 2001), anxiety (Baumeister & Tice, 1990), depression (Leary, 1990), and loneliness (Stillman et al., 2009). Moreover, social exclusion can lead to detrimental effects on four fundamental human needs: the need to belong, the need for self-esteem, the need for meaningful existence, and the need for control (Gerber & Wheeler, 2009; Williams, 2001; Zadro, Williams, & Richardson, 2004), which in turn lead to reactions such as immediate physiological arousal, making self-affirmations in the short term, and self-imposed isolation in the long-term (Williams, 2001).”

First, social exclusion threatens an individual’s need to *belong*, demonstrating either explicitly or symbolically to a person that they are not wanted or valued (Jamieson, Harkins, & Williams, 2010). Second, social exclusion threatens the need to maintain high *self-esteem* since in some situations it can act as a form of punishment, forcing the individual to wonder what they did wrong (or what is wrong about them), or may lead to the feeling that they are not worthy of attention (Ferris, Lian, Brown, & Morrison, 2015; Williams, 1997). Third, an individual’s need for *meaningful existence* is threatened by social exclusion because it represents social “death” and creates the feeling of invisibility (Case & Williams, 2004; Williams, 2007). Finally, social exclusion can threaten the need for *control* as people attempt to work out the uncertain situation (i.e., why are they being ignored?) but are unable to influence the situation, leading to feelings of hopelessness and helplessness (Bandura, 2000).

Immediately after being socially excluded, rejected individuals respond with threats to fundamental needs, physical and social pain, and negative affect (Williams, 2009a). We propose that people will respond to the experience of phubbing in a similar way. Specifically, we argue that phubbing can be considered as a specific form of ostracism or social exclusion that threatens the four fundamental needs and also leads to negative emotional experiences. Phubbing has the crucial element of social exclusion in that individuals are ignored by others – whilst they remain in the physical presence of other people, they are nevertheless shut out of social interaction. Like other forms of ostracism (see Williams, 1997), people may phub others either deliberately or without necessarily knowing they are doing so (Ranie & Zickuhr, 2015). Moreover, features and characteristics of phubbing, such as the withdrawal of eye contact, may further be interpreted (or misinterpreted) as being given the “silent treatment”, or being socially rejected (Silk et al., 2012; Wirth, Sacco, Hugenberg, & Williams, 2010). Averted gaze is a passive form of social exclusion (Wirth et al., 2010), and a signal of disinterest (Richmond, McCroskey, & Hickson, 2008), and

individuals on the receiving end tend to experience lower satisfaction of the four fundamental human needs compared to those who receive direct eye contact (Wirth et al., 2010). Phubbing therefore displays many of the most common features of social exclusion and it is therefore plausible to suggest that phubbing could have similar detrimental effects on the fulfillment of social needs, and how people feel.

While mobile-phone-induced ostracism has negative effects on need-threats and moods (Gonzales & Wu, 2016), thwarted needs and negative affect tend to have a corrosive effect on relational outcomes at the same time. For example, targets who are deprived of the need for control tend to terminate or change the pattern of the relationship between source and target (Zadro, Arriaga, & Williams, 2008). Losing a sense of belongingness can also be a symbolic message of losing a relationship or attachment to another individual or group. However, in some cases, targets with threatened needs may attempt to regain them by strengthening their bonds and relationships with others (Williams, 2001). Besides threatened needs, emotions aroused by being phubbed may also play an integral role in the functioning of interpersonal relationships. According to the theory of attachment (Bowlby, 1969, 1988), many emotions serve adaptive functions in human survival. Positive affect brings people closer, which in turn helps individuals to form, ensure, and maintain their relationships with others. In addition, positive emotions induce a greater likelihood of successful social interactions (Vaugh & Fredrickson, 2006). By contrast, studies have revealed that negative affect does not lead to close relationships and relationship satisfaction (Levenson & Gottman, 1983). Moreover, extreme negative emotions (e.g. anger) can lead to deleterious effects such as poor relationship functioning and high interpersonal conflict (Sanford & Rowatt, 2004).”

In addition to having a negative impact on fundamental needs and affect, we further propose – following previous research – that phubbing will be associated with negative perceived interaction quality and negative relationship satisfaction (e.g., Abeeel et al., 2016; Ranie & Zickuhr, 2015; Roberts & David, 2016). However, we more specifically propose to test the hypothesis that phubbing indirectly influences perceived interaction quality and relationship satisfaction, because it threatens people’s fundamental needs to belong, have control, have high self-esteem, experience meaningful existence, and it also dampens their affect. In other words, the effects of phubbing on relationship satisfaction and perceived interaction quality should be mediated by threats to fundamental needs, and affect. We also consider some potential moderators of these hypothesized effects. One of the possible moderators influencing the relationships between phubbing, threats to fundamental needs, affect, and perceptions of interaction outcomes is the extent to which people interpret phubbing behaviour as socially normative (Chotpitayasunondh & Douglas, 2016). If people view phubbing as normative, they may not view it as a form of social rejection and they may not find phubbing distressing or concerning. Further, people’s experiences of phubbing may be moderated by their sensitivity to rejection (Kang & Chasteen, 2009). Phubbees who have lower sensitivity to rejection may cope with phubbing better and maintain their affect and fundamental needs satisfaction more easily than highly

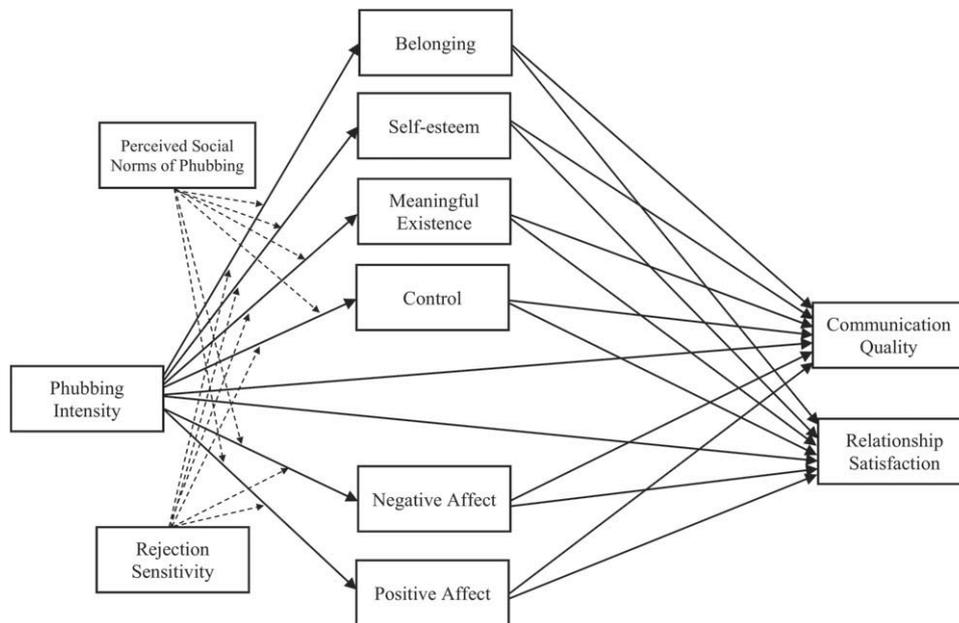


FIGURE 1 Proposed model of the effects of being phubbed on the communication quality and relationship satisfaction

sensitive people. We therefore included these two potential moderating factors in the current study.

1.2 | The current research

Although phubbing has become a growing area of interest in recent years, research on the social consequences of phubbing is limited. Moreover, there is no research to our knowledge that investigates the mechanisms underlying the effects of phubbing, except for factors such as jealousy within romantic relationships (Krasnova et al., 2016). In this study, we aimed to explore these mechanisms in detail. Specifically, we investigated (a) the effects of being phubbed on perceived interaction quality and relationship satisfaction, and (b) the extent to which phubbing functions similarly to social exclusion and these effects are mediated by threats to fundamental needs, and affect. We also explored whether these effects are moderated by the perceived normativity of phubbing and rejection sensitivity.

Participants were asked to view a three-minute animation depicting a conversation between two people. They were asked to imagine themselves as one of the people in the animation. There were three conditions in which the participant's conversation partner varied in terms of their mobile phone use during the conversation: no phubbing, partial phubbing, and extensive phubbing. After viewing the video, participants responded to each of the dependent measures and potential mediating and moderating variables. We have developed a research model to explicate the mechanisms underlying the effects of phubbing. The predicted model is depicted conceptually in Figure 1. Specifically, we hypothesized that:

H1: Participants who were phubbed extensively would experience greater threat to fundamental needs (belonging, self-esteem, meaningful existence, and control), would experience greater negative affect, and would

experience less positive affect, than those who were phubbed partially, or were not phubbed.

H2: Participants who were phubbed extensively would perceive their social interaction to be lower quality and would experience lower relationship satisfaction, than those who were phubbed partially, or not phubbed.

H3: Threat to fundamental needs and dampened mood would mediate the effect of phubbing on relationship satisfaction and the perceived quality of communication.

H4: We tentatively hypothesized that the perceived social normativity of phubbing, and individuals' rejection sensitivity, would moderate the effect of phubbing on fundamental human needs and affect.

2 | METHOD

2.1 | Participants

One hundred and fifty-three participants (19 men and 134 women) ranging in age from 18 to 36 years of age ($M = 19.72$, $SD = 2.23$) were undergraduate students at a British university who participated for course credit. Twenty-five participants (16.34%) who failed to answer attention check questions correctly were excluded (six from the control group, six from the partial phubbing group, and 13 from the extensive phubbing group; see explanation in next section).¹ In total, 128 participants (14 men and 114 women) ranging in age from 18 to 34 ($M = 19.62$, $SD = 1.79$) remained in the study (45 from the control group, 45 from the partial phubbing group, and 38 from the extensive

¹Including these participants in the analysis did not affect the pattern or significance of any of the results.

TABLE 1 General characteristics of participants by gender

Characteristics	Male (n = 14) % (n)	Female (n = 114) % (n)	Total (n = 128) % (n)
Age (years)			
Mean \pm SD	19.50 \pm 1.29	19.63 \pm 1.85	19.62 \pm 1.79
Occupation			
Attending university full-time	100.00 (14)	87.72 (100)	89.06 (114)
Attending university and working part-time	0.00 (0)	12.28 (14)	10.94 (14)
Ethnicity			
White/Caucasian	57.14 (8)	62.28 (71)	61.72 (79)
Black British Caribbean	0.00 (0)	2.63 (3)	2.34 (3)
Black British African	14.29 (2)	5.26 (6)	6.25 (8)
Other black background	0.00 (0)	2.63 (3)	2.34 (3)
Asian British Indian	7.14 (1)	2.63 (3)	3.13 (4)
Asian British Pakistani	0.00 (0)	2.63 (3)	2.34 (3)
Asian British Bangladeshi	0.00 (0)	0.88 (1)	1.59 (1)
Chinese	0.00 (0)	1.75 (2)	0.78 (2)
Other Asian background	14.29 (2)	7.02 (8)	7.81 (10)
Other (including mixed ethnicity)	7.14 (1)	12.28 (14)	11.72 (15)

phubbing group). The demographics of the sample are presented in Table 1.

2.2 | Manipulation

The 3-dimensional (3D) animations used in this research were created by a professional animator using Autodesk Maya software. The first step in building the animations was to design characters to suit the research content, then create storyboards and discuss these with the authors to determine the direction and nature of the animations. Lastly, these were developed into 3D animations. Participants watched a three-minute silent animation that depicted two people having a conversation. Participants were asked to watch the animation carefully and imagine themselves as the person closest to the screen (i.e., the person with their back turned to the screen). Participants were instructed to imagine as vividly as they could that they were this person and that they were engaged in this conversation with the other person. The characters of the participant and conversation partner were designed to be neutral in gender and ethnicity, which were thought to be possible confounding factors in this study. Voice was also removed from the animation, so the effect of being phubbed could not be influenced by the content of the conversation. However, the characters moved their mouths when they were talking so that the conversation looked like both people were speaking in turn, as they would in a typical face-to-face interaction. Participants were randomly assigned to one of three different animation conditions: (1) the conversation partner did not phub at all, (2) they phubbed part of the time, and (3) they phubbed most of the time. In the “no phubbing” condition (control condition), the conversation partner, with smartphone in his/her left hand, comes and sits opposite to the participant. The conversation partner immediately puts their smartphone on the table and does not pick it up throughout the three-minute conversation. The first experimental animation created the “partial phubbing” situation, in which participants are phubbed by their conversation partner about half of the time. The

first 30 seconds of the animation are similar to what can be seen in the control condition video, but then the conversation partner picks their smartphone up from the table and starts phubbing for 30 seconds. During this phubbing time, as shown in Figure 2, the conversation partner looks down to the smartphone, completely averts eye gaze from the participant, swipes the screen on the device, and keeps smiling and laughing about something he/she has just read. The partial phubbing animation also repeats this sequence periodically in the second and the third minute of the conversation. The final experimental animation represents the “extensive phubbing” situation, in which the participant's conversation partner comes and sits, then immediately starts phubbing and continues this behavior throughout their conversation.

2.3 | Measures

2.3.1 | Needs satisfaction

The Need-Threat Measure (NTM), developed by Jamieson et al. (2010) contains 20 items measuring the extent to which an individual feels the satisfaction/threat to the four fundamental needs following ostracism (e.g., Williams, 2009b; e.g., “I felt I belonged to the group” and “I felt powerful; 1 = *not at all*, 5 = *extremely*; $\alpha = .90$, $M = 2.87$, $SD = 1.20$ for



FIGURE 2 Screenshot from the partial phubbing situation animation

belonging, $\alpha = .90$, $M = 2.70$, $SD = 1.02$ for self-esteem, $\alpha = .91$, $M = 2.93$, $SD = 1.17$ for meaningful existence, and $\alpha = .77$, $M = 2.11$, $SD = .82$ for control). Items for each domain were reverse-coded as appropriate. Since the NTM was originally designed to measure needs satisfaction in the cyberball game experiment we modified some items such as "I felt the other players interacted with me a lot" to "I felt that the conversation partner interacted with me a lot".

2.3.2 | Positive and negative affect schedule

This is a 20-item measure (Watson, Clark, & Tellegen, 1988) asking participants to rate how well different feeling and emotions (e.g., "Interested", "Distressed", "Excited", and "Upset") describe them on a 5-point scale (1 = *very slightly or not at all*, 5 = *extremely*; $\alpha = .92$, $M = 18.77$, $SD = 8.03$ for Positive Affect and $\alpha = .83$, $M = 16.16$, $SD = 5.52$ for Negative Affect).

2.3.3 | Quality of communication

The Iowa Communication Record (ICR), which assesses the quality and impact of communications within specific conversational contexts (Schwarz, 2008), is a 10-item questionnaire asking participants to read 10 bi-polar descriptors (e.g. "Attentive - Poor Listening", "Formal - Informal", "Smooth - Difficult"; Duck, Rutt, Hoy, & Strejc, 1991) and rate the conversation on each via a seven-point scale. Two additional descriptors (Schwarz, 2008) were used to add meaningful dimensions of communication quality that are not included in the original version of the ICR (i.e., "Enjoyable - Not Enjoyable" and "High Quality - Low Quality"; overall $\alpha = .82$, $M = 5.47$, $SD = 1.34$). Reliability of the scale which included the two additional items $\alpha = .88$ for friends and $\alpha = .89$ for intimate and family relationship (Schwarz, 2008). In our path analysis, we reversed this score and labeled it as communication quality.

2.3.4 | Relationship satisfaction

The Relationship Assessment Scale (RAS; Hendrick, 1988) was developed to measure general satisfaction with romantic relationships and consisted of seven items, which were modified here to measure satisfaction with the animated conversation (e.g., "In general, how satisfied were you with the conversation?" Participants responded on a five-point scale (1 = *low satisfaction*, 5 = *high satisfaction*; $\alpha = .94$, $M = 2.58$, $SD = 1.04$).

2.3.5 | Perceived social norms of phubbing

The Perceived Social Norms of Phubbing Scale (PSNP; Chotpitayasunondh & Douglas, 2016) contains three items measuring descriptive norms, which are based on observations of others' behavior such as "Do you think that phubbing behavior is typical amongst people around you?", and two items measuring injunctive norms, which are related to the inference of others' approval of phubbing such as "Do you think that other people view phubbing behavior as appropriate?" using a five-point scale (1 = *not at all*, 5 = *very much*; $\alpha = .44$, $M = 16.12$, $SD = 2.63$). Both norms measurements were combined to a general measure of perceived social norms of phubbing which was proposed as a moderator.

2.3.6 | Rejection sensitivity

The Adult Rejection Sensitivity Questionnaire (A-RSQ), is a modification of the original RSQ (Downey & Feldman, 1996). Participants rated the extent to which 18 statements accurately describe them on a six-point scale (e.g., "How concerned or anxious would you be over whether or not your family would want to help you?" and "I would expect that they would agree to help me as much as they can", 1 = *very unconcerned/very unlikely*, 6 = *very concerned/very likely*), and coding allows for a score between 1 and 36; $\alpha = .70$, $M = 9.15$, $SD = 2.55$). Rejection sensitivity was also proposed as a moderator in this study.

2.4 | Procedure

After giving their informed consent, participants were placed in individual cubicles, each with a personal computer, and completed an online questionnaire designed via Qualtrics software. The study was a three-group (phubbing: none/partial/extensive) between-participants experimental design. The dependent measures were perceived communication quality and relationship satisfaction. Fundamental needs threat (belonging, self-esteem, meaningful existence, and control) and affect (negative and positive), were included in the model as potential mediators and perceived social norms of phubbing and rejection sensitivity were included as potential moderators (see Figure 1).

Participants first completed the Adult Rejection Sensitivity Questionnaire. They then viewed the phubbing manipulation animation. Next, participants were asked to answer two questions about what they saw in the video in order to serve as an attention check. Specifically, we asked the participants to indicate the colour of the conversation partner's shirt (the correct answer was white), and the name of the object on the table (the correct answer was a bottle). Next, participants were asked to complete the ICR, the RAS, the NTM, the positive and negative affect schedule (PANAS), and the PSNP, respectively. Finally, participants completed some basic demographic data. At the conclusion of the study, they were thanked and debriefed.

3 | RESULTS

3.1 | Correlation analyses

All statistical tests were performed using SPSS Statistics version 24.0. In order to test interaction effects of the moderators, we created interaction products from centered A-RSQ and centered PSNP variables. Spearman's rank-order correlations were computed to assess the non-parametric relationship between phubbing intensity and dependent variables, and Pearson product-moment correlations were used to assess the relationship among other variables. All correlations between the phubbing conditions and other variables, with the exception of both proposed moderators and their interaction terms, were statistically significant in the expected directions. Intensity of being phubbed in the dyadic conversation negatively correlated with RAS ($r = -.72$, $p < .001$), positive affect ($r = -.53$, $p < .001$), and all NTM subscales ($r = -.39$ to $-.74$, $p < .001$), whereas intensity of being phubbed positively correlated with ICR ($r = .71$, $p < .001$) and negative affect

TABLE 2 Descriptive statistics and correlation coefficients among study variables (n = 128)

Variables	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Phubbing intensity	-	-	-												
2. Belonging (NTM)	2.87	1.20	-.74*	(.90)											
3. Self-esteem (NTM)	2.70	1.02	-.62*	.80*	(.90)										
4. Meaningful existence (NTM)	2.93	1.17	-.68*	.85*	.83*	(.91)									
5. Control (NTM)	2.11	.82	-.39*	.63*	.70*	.68*	(.77)								
6. PANAS negative	16.16	5.52	.44*	-.62*	-.60*	-.60*	-.45*	(.83)							
7. PANAS positive	18.77	8.03	-.53*	.61*	.70*	.68*	.65*	-.30*	(.92)						
8. ICR	5.47	1.34	.71*	-.84*	-.74*	-.78*	-.58*	.60*	-.55*	(.82)					
9. RAS	2.58	1.04	-.72*	.87*	.80*	.83*	.68*	-.54*	.73*	-.85*	(.94)				
10. A-RSQ	9.15	2.55	.06	-.03	-.17	-.10	-.16	.11	-.07	.06	-.11	(.62)			
11. PSNP	16.12	2.63	-.14	.07	.08	.03	-.02	.04	.12	-.04	.06	-.09	(.44)		
12. Phubbing intensity* A-RSQ	.13	5.32	-.03	-.01	-.15	-.07	-.11	.11	-.07	.06	-.08	.92*	-.09	-	
13. Phubbing intensity* PSNP	-.24	5.36	-.11	.08	.11	.03	.00	.04	.12	-.06	.08	-.09	.92*	-.12	-

Cronbach's alphas are shown in the diagonal.

A-RSQ = adult rejection sensitivity questionnaire; ICR = iowa communication record; NTM = need-threat measure; PANAS = positive and negative affect schedule; PSNP = perceived social norms of phubbing; RAS = relationship assessment scale.

* $p < .001$.

($r = .44, p < .001$), as shown in Table 2. Neither of the proposed moderators correlated with the dependent measures or potential mediators (nor did the interactions between the proposed moderators and the independent variable).

3.2 | Effect of moderators

We then explored the potential moderating effects of rejection sensitivity and perceived social norms of phubbing on the relationship between phubbing intensity and fundamental needs, negative affect, and positive affect, as seen in Figure 1. We used Hayes and Preacher's (2013) PROCES procedure for SPSS (model 9, 20,000 resamples, bias corrected). The result showed no moderating effects of rejection sensitivity and perceived social norms of phubbing in our path model. The results revealed no significant relationships between the phubbing intensity * A-RSQ interaction term and fundamental needs; belonging ($p = .96$), self-esteem ($p = .86$), meaningful existence ($p = .72$), and control ($p = .32$). No significant relationship was found between this interaction term and both PANAS scores; negative ($p = .52$) and positive ($p = .07$). The results also showed no significant relationships between the phubbing intensity * PSNP interaction term and fundamental needs; belonging ($p = .71$), self-esteem ($p = .27$), meaningful existence ($p = .97$), and control ($p = .44$). Moreover, no significant relationship was found between this interaction term and both PANAS scores; negative ($p = .96$) and positive ($p = .54$). Due to this and the low reliability of the PSNP, both moderators were therefore omitted from our path model.

3.3 | Effect of phubbing on communication outcomes

A one-way multivariate analysis of variance was conducted to determine the effects of being phubbed on the combined

dependent variables. There were linear relationships, as assessed by scatterplot, and no multicollinearity ($r = -.85 - .87, p < .001$). Tabachnick and Fidell (2013) suggest that no correlation should be above $r = +/- .90$. There was homogeneity of variance-covariances matrices, as assessed by Box's test of equality of covariance matrices ($p < .001$). The difference between conditions on the combined dependent variables was significant, $F(16, 236) = 9.91, p < .001$; Wilks' $\Lambda = .36$; partial $\eta^2 = .40$.

The mean difference between groups of participants on the dependent variables is presented in Table 3. Follow-up univariate analysis of variances (ANOVAs) showed that ICR scores ($F(2, 125) = 66.89, p < .001$; partial $\eta^2 = .52$) and RAS scores ($F(2, 125) = 68.95, p < .001$; partial $\eta^2 = .53$) were significantly different across the different phubbing conditions, using a Bonferroni adjusted α level of .025. These were both medium-sized effects.

We investigated further with post hoc tests to determine where exactly the differences lay between conditions. The Tukey post hoc test was used to compare all possible combinations of group differences when the assumption of homogeneity of variances was met, as assessed by Levene's Test of Homogeneity of Variance ($p > .05$). The Games-Howell post hoc test was used in this study when the assumption of homogeneity of variances was violated. As predicted, participants in the control group showed significantly lower ICR than participants who either were phubbed part of the time or most of the time, as seen in Figure 3. Meanwhile, control group participants showed significantly higher RAS mean scores than participants in either the partial phubbing or extensive phubbing groups, as seen in Figure 4. Post hoc test results of the dependent variables are shown in Table 4. The Cohen's d values ranging between 1.09 - 2.69 represented large effects.

TABLE 3 Means and standard deviations of measures by groups of participants

Measures	No phubbing (n = 45)		Partial phubbing (n = 45)		Extensive phubbing (n = 38)	
	M	SD	M	SD	M	SD
Iowa communication record	4.26	1.07	5.71	.90	6.62	.82
Relationship assessment scale	3.52	.85	2.40	.76	1.68	.47
Need-threat measure						
Belonging	4.01	.83	2.62	.88	1.82	.65
Self-esteem	3.52	.92	2.52	.78	1.96	.65
Meaningful existence	3.95	.80	2.70	.88	1.99	.87
Control	2.58	.89	1.96	.72	1.75	.57
Positive and negative affect schedule						
Negative	13.42	4.27	17.04	6.25	18.37	4.63
Positive	23.78	8.51	17.62	6.81	14.18	5.17

3.4 | Effect of phubbing on fundamental needs as mediators

The mean difference between groups on the proposed mediators can be seen in Table 3 and Figure 5. Using a Bonferroni adjusted α level of .025, follow-up univariate ANOVAs showed that all domains of need satisfaction following ostracism: belonging ($F(2, 125) = 80.75, p < .001$; partial $\eta^2 = .56$), self-esteem ($F(2, 125) = 41.17, p < .001$; partial $\eta^2 = .40$), meaningful existence ($F(2, 125) = 57.13, p < .001$; partial $\eta^2 = .48$), and control ($F(2, 125) = 14.26, p < .001$; partial $\eta^2 = .19$) were significantly different across the different phubbing conditions. The partial η^2 values ranging between .19 – .56 revealed small to medium effects.

Further, we used post hoc tests to determine where the differences lay between conditions. As predicted, participants in the no phubbing group showed significantly higher overall needs satisfaction – and also in each separate domain – than participants who either were phubbed part of the time or most of the time. Post hoc test results of the mediating variables are shown in Table 5. Post hoc tests revealed a non-significant difference between the partial and extensive phubbing groups in needs of control ($p = .30$). The other group differences

showed significant differences with medium and large effects (Cohen's d ranging between .76 – 2.93).

3.5 | Effect of phubbing on positive and negative affect as mediators

The mean difference between groups on both mediators is presented in Table 3 and Figure 6. Using a Bonferroni adjusted α level of .025, follow-up univariate ANOVAs showed that both domains of affect: negative ($F(2, 125) = 10.52, p < .001$; partial $\eta^2 = .14$), and positive ($F(2, 125) = 20.00, p < .001$; partial $\eta^2 = .24$) were significantly different across the different phubbing conditions. Both partial η^2 values revealed small effects.

Further, we used Games-Howell post hoc tests to determine where the differences lay between conditions. As predicted, participants in the no phubbing group showed significantly higher positive affect and lower negative affect than participants who either were phubbed part of the time or most of the time. Post hoc test results of the mediating variables are shown in Table 6. Post hoc tests revealed a non-significant difference only between the partial and extensive

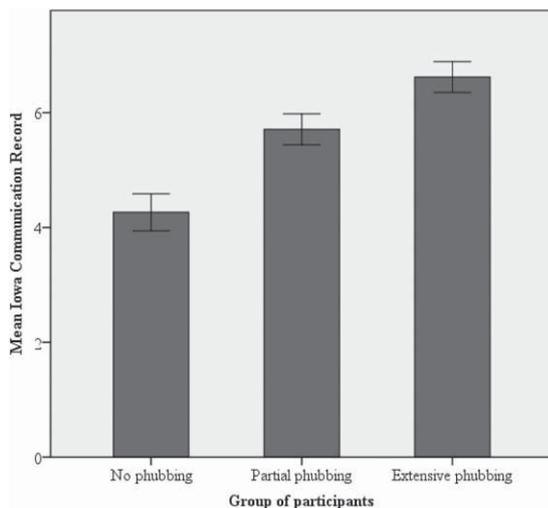


FIGURE 3 Mean difference between groups of participants on ICR

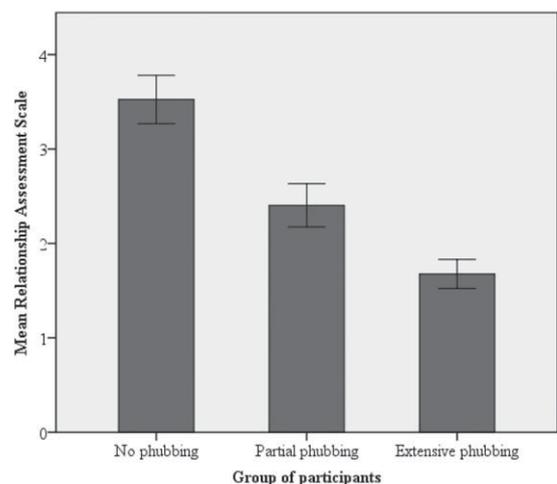


FIGURE 4 Mean difference between groups of participants on RAS

TABLE 4 Post hoc tests of ICR and RAS

Dependent variable	Post hoc test	(I) Phubbing condition	(J) Phubbing condition	Mean diff (I-J)	SE	Sig.	95% CI		Cohen's d
							Upper	Lower	
ICR	Tukey HSD	No phubbing	Partial phubbing	-1.45	.20	<.001	-1.92	-.98	1.47
			Extensive phubbing	-2.36	.21	<.001	-2.85	-1.86	2.47
		Partial phubbing	No phubbing	1.45	.20	<.001	.98	1.92	1.47
			Extensive phubbing	-.91	.21	<.001	-1.40	-.42	1.09
		Extensive phubbing	No phubbing	2.36	.21	<.001	1.86	2.85	2.47
			Partial phubbing	.91	.21	<.001	.42	1.40	1.09
RAS	Games-Howell	No phubbing	Partial phubbing	1.12	.17	<.001	.71	1.53	1.39
			Extensive phubbing	1.85	.15	<.001	1.49	2.20	2.69
		Partial phubbing	No phubbing	-1.12	.17	<.001	-1.53	-.71	1.39
			Extensive phubbing	.73	.14	<.001	.40	1.05	1.15
		Extensive phubbing	No phubbing	-1.85	.15	<.001	-2.20	-1.49	2.69
			Partial phubbing	-.73	.14	<.001	-1.05	-.40	1.15

phubbing groups in negative affect ($p = .51$). The other group differences showed significant differences with medium and large effects (Cohen's d ranging between .60 - 1.36).

3.6 | Path analyses

We then tested the potential mediating effect of threats to fundamental needs on the relationship between phubbing and both communication outcomes, without moderators which were dropped at the previous stage. The new model proposed in this study assumed that a significant correlation existed between phubbing intensity, threats to four fundamental human needs (belonging, self-esteem, meaningful existence, and control), affect (negative and positive), communication quality (reversed ICR score), and relationship satisfaction. Analyses were conducted using the AMOS version 24.0 program. Model fit was evaluated using the chi-square test of model fit (χ^2), the root mean square error of approximation (RMSEA), and the comparative fit index (CFI).

The model depicted in Figure 1 (minus the moderators), did not adequately fit the data, $\chi^2(128) = 25.89, p < .001, CFI = .98, RMSEA = .44$. However, the model was re-specified by modifying

one path at a time on the basis of critical ratios and modification indices in order to find the most parsimonious model. A perusal of the model critical ratios showed that the paths between positive affect and communication quality ($p = .82$), between self-esteem and relationship satisfaction ($p = .60$), between control and communication quality ($p = .52$), between negative affect and relationship satisfaction ($p = .48$), between meaningful existence and relationship satisfaction ($p = .37$), between meaningful existence and communication quality ($p = .35$), between self-esteem and communication quality ($p = .29$), and between control and relationship satisfaction ($p = .13$), should be dropped respectively. An examination of model modification indices indicated adding a covariance path between communication quality and relationship satisfaction. The results of structural path estimates of the proposed model and final model are presented in Table 7. The modified model's goodness-of-fit was satisfactory, $\chi^2(128) = 9.93, p = .27, CFI = 1.00, RMSEA = .04$. The chi-square difference between the hypothesized and final model was statistically significant ($\Delta\chi^2 = 15.96, p < .001$). The result of the path analysis with standardized regression coefficients and statistical significance is presented in Figure 7.

As seen in Table 7 and Figure 7, results from the path analysis provided support for H1, which posited significant negative relationships between phubbing intensity and four fundamental needs satisfaction; belonging ($\beta = -.74, p < .001$), self-esteem ($\beta = -.62, p < .001$), meaningful existence ($\beta = -.68, p < .001$), and control ($\beta = -.41, p < .001$), and affect, both negative ($\beta = .37, p < .001$) and positive ($\beta = -.49, p < .001$). H2, which predicted that participants who were phubbed extensively would perceive their communication to be lower quality ($\beta = -.24, p < .001$) and would experience lower relationship satisfaction ($\beta = -.14, p = .01$), was supported. H3 was partially supported. All paths from self-esteem needs, meaningful existence needs, and needs of control along with one path from negative affect and one from positive affect, were dropped following model-trimming process. However, the results revealed that depletion of needs of belongingness mediates the effect of phubbing on the perceived quality of communication ($\beta = .58, p < .001$) and relationship satisfaction ($\beta = .59, p < .001$), increase of negative affect mediates the effect of phubbing on the

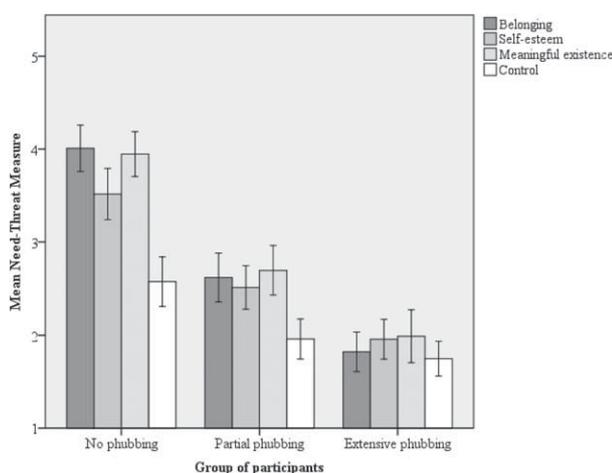


FIGURE 5 Mean difference between groups of participants on NTM domains

TABLE 5 Post hoc tests of all need-threat measure domains

Dependent variable	Post hoc test	(I) Phubbing condition	(J) Phubbing condition	Mean diff (I-J)	SE	Sig.	95% CI		Cohen's d
							Upper	Lower	
Belonging	Games-Howell	No phubbing	Partial phubbing	1.39	.17	<.001	.99	1.79	1.62
			Extensive phubbing	2.19	.18	<.001	1.77	2.61	2.93
		Partial phubbing	No phubbing	-1.39	.17	<.001	-1.79	-.99	1.62
			Extensive phubbing	.80	.18	<.001	.38	1.22	1.04
		Extensive phubbing	No phubbing	-2.19	.18	<.001	-2.61	-1.77	2.93
			Partial phubbing	-.80	.18	<.001	-1.22	-.38	1.04
Self-esteem	Tukey HSD	No phubbing	Partial phubbing	1.00	.17	<.001	.60	1.40	1.17
			Extensive phubbing	1.56	.18	<.001	1.14	1.97	1.96
		Partial phubbing	No phubbing	-1.00	.17	<.001	-1.40	-.60	1.17
			Extensive phubbing	.56	.18	.01	.14	.97	.78
		Extensive phubbing	No phubbing	-1.56	.18	<.001	-1.97	-1.14	1.96
			Partial phubbing	-.56	.18	.01	-.97	-.14	.78
Meaningful existence	Tukey HSD	No phubbing	Partial phubbing	1.25	.18	<.001	.82	1.67	1.48
			Extensive phubbing	1.96	.19	<.001	1.51	2.40	2.34
		Partial phubbing	No phubbing	-1.25	.18	<.001	-1.67	-.82	1.48
			Extensive phubbing	.71	.19	.01	.26	1.15	.81
		Extensive phubbing	No phubbing	-1.96	.19	<.001	-2.40	-1.51	2.34
			Partial phubbing	-.71	.19	.01	-1.15	-.26	.81
Control	Games-Howell	No phubbing	Partial phubbing	.62	.17	.001	.21	1.02	.76
			Extensive phubbing	.83	.16	<.001	.44	1.22	1.11
		Partial phubbing	No phubbing	-.62	.17	.001	-1.02	-.21	.76
			Extensive phubbing	.21	.14	.30	-.13	.55	.33
		Extensive phubbing	No phubbing	-.83	.16	<.001	-1.22	-.44	1.11
			Partial phubbing	-.21	.14	.30	-.55	.13	.33

perceived quality of communication ($\beta = -.14, p = .01$), and depletion of positive affect mediates the effect of phubbing on relationship satisfaction ($\beta = .29, p < .001$). Furthermore, this integrated model accounts for 47% of the variance in communication quality and for 18% of the variance in relationship satisfaction.

4 | DISCUSSION

The present research was conducted to further understand the effects of phubbing on social interaction. As expected, our findings revealed

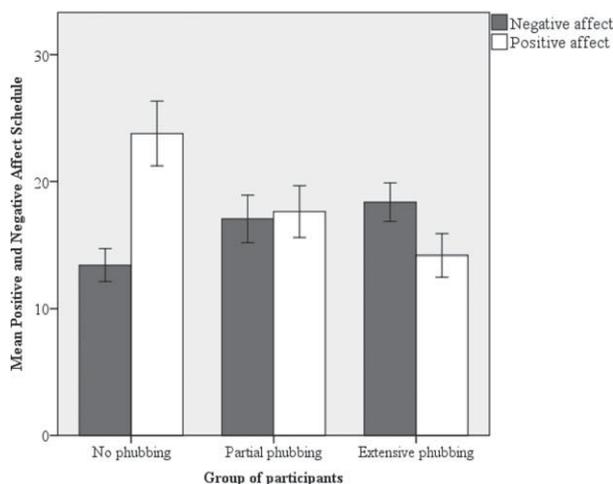


FIGURE 6 Mean difference between groups of participants on PANAS

that the experience of phubbing in a controlled dyadic conversation had a negative impact on perceived communication quality and relationship satisfaction. Theoretically, we proposed that these effects would occur because phubbing lowers mood and threatens the four fundamental needs of belongingness, self-esteem, meaningful existence, and control. We also found some support for this idea. Specifically, we found that people who had been phubbed experienced greater threats to these needs, and one case, threat mediated the effect of phubbing on communication outcomes. Specifically, the need for belongingness mediated the effect of phubbing on perceived communication quality and relationship satisfaction. However, the need for meaningful existence, self-esteem, and control did not mediate any of these effects. Further, negative affect mediated the effect of phubbing on perceived communication quality and positive affect mediated the effect of phubbing on relationship satisfaction. In many cases therefore, phubbing may negatively affect important social outcomes because it threatens the same needs and affect that are threatened when people are socially excluded. Concerns about the negative influence of smartphone use during conversations therefore appears to be warranted.

The current research makes an important contribution to the literature on ostracism. It shows that threats to fundamental needs can occur as a result of an everyday communication phenomenon that a significant majority of people report having experienced. Traditionally, the effects of social exclusion have been studied in games such as the cyberball paradigm (Hartgerink, van Beest, Wicherts, & Williams, 2015). However, as people become more and more reliant on their smartphones, social exclusion has perhaps become a pervasive feature of everyday social interaction. Unlike other more well-studied forms of

TABLE 6 Post hoc tests of PANAS negative and positive

Dependent variable	Post hoc test	(I) Phubbing condition	(J) Phubbing condition	Mean diff (I-J)	SE	Sig.	95% CI		Cohen's d
							Upper	Lower	
PANAS negative	Games-Howell	No phubbing	Partial phubbing	-3.62	1.13	.01	-6.32	-.93	.68
			Extensive phubbing	-4.95	.99	<.001	-7.30	-2.59	1.11
		Partial phubbing	No phubbing	3.62	1.13	.01	.93	6.32	.68
			Extensive phubbing	-1.32	1.20	<.001	-4.18	1.53	.24
		Extensive phubbing	No phubbing	4.95	.99	.51	2.59	7.30	1.11
			Partial phubbing	1.32	1.20	.51	-1.53	4.18	.24
PANAS positive	Games-Howell	No phubbing	Partial phubbing	6.16	1.62	.00	2.28	10.03	.80
			Extensive phubbing	9.59	1.52	<.001	5.96	13.23	1.36
		Partial phubbing	No phubbing	-6.16	1.62	.01	-10.03	-2.28	.80
			Extensive phubbing	3.44	1.32	.03	.30	6.58	.60
		Extensive phubbing	No phubbing	-9.59	1.52	<.001	-13.23	-5.96	1.36
			Partial phubbing	-3.44	1.32	.03	-6.58	-.30	.60

social exclusion, phubbing can take place anywhere and at any time as someone reaches for their phone and ignores their conversation partner. People may therefore have their fundamental needs threatened more regularly during the course of routine, everyday conversations, providing new avenues for research on ostracism. This research represents an early attempt to understand the consequences of phubbing. Therefore, it is important to consider its strengths, limitations, and some directions for future research. First, the study has several strengths. In particular, it contributes a novel method for studying social exclusion in dyadic conversations by using animations. We know from previous experiments using the cyberball paradigm that socially

excluded participants experience negative impact on fundamental needs, affect, and various other constructs (Hartgerink et al., 2015). In particular, individuals have an automatic mechanism detecting social ostracism (Panksepp, 2003) and the ostracizers do not even need to be real humans for targets to have reflexive responses (Zadro et al., 2004). The current method therefore offers an additional controlled way of studying social exclusion. A further advantage is that the animations can also be easily adapted to study the effects of varying degrees of phubbing, as well as features of the communication protagonists and features of the communicative context. They are therefore easily adaptable to different research purposes. However, the use of

TABLE 7 Results of structural path estimates of study models

Dependent variable	Independent variable	Proposed Model				Final model			
		B	SE	β	p	B	SE	β	p
Phubbing intensity	Belonging	-1.10	.09	-.74	<.001	-1.10	.09	-.74	<.001
	Self-esteem	-.79	.09	-.62	<.001	-.79	.09	-.62	<.001
	Meaningful existence	-.99	.09	-.68	<.001	-.99	.09	-.68	<.001
	Control	-.42	.08	-.41	<.001	-.42	.08	-.41	<.001
	Negative affect	2.51	.57	.37	<.001	2.51	.57	.37	<.001
	Positive affect	-4.84	.77	-.49	<.001	-4.84	.77	-.49	<.001
	Communication quality	-.38	.12	-.23	.00	-.39	.12	-.24	<.001
	Relationship satisfaction	-.20	.07	-.15	.01	-.18	.07	-.14	.01
Belonging	Communication quality	.45	.12	.40	<.001	.64	.09	.58	<.001
	Relationship satisfaction	.38	.07	.44	<.001	.51	.05	.59	<.001
Self-esteem	Communication quality	.13	.12	.10	.29				
	Relationship satisfaction	.04	.08	.04	.60				
Meaningful existence	Communication quality	.11	.12	.10	.35				
	Relationship satisfaction	.07	.07	.07	.38				
Control	Communication quality	.07	.11	.04	.52				
	Relationship satisfaction	.11	.07	.08	.13				
Negative affect	Communication quality	-.03	.02	-.14	.02	-.18	.07	-.14	.01
	Relationship satisfaction	-.01	.01	-.03	.48				
Positive affect	Communication quality	-.01	.01	-.02	.82				
	Relationship satisfaction	.03	.01	.25	<.001	.04	.01	.29	<.001

B = unstandardized coefficients; SE = standard error; β = standardized coefficients.

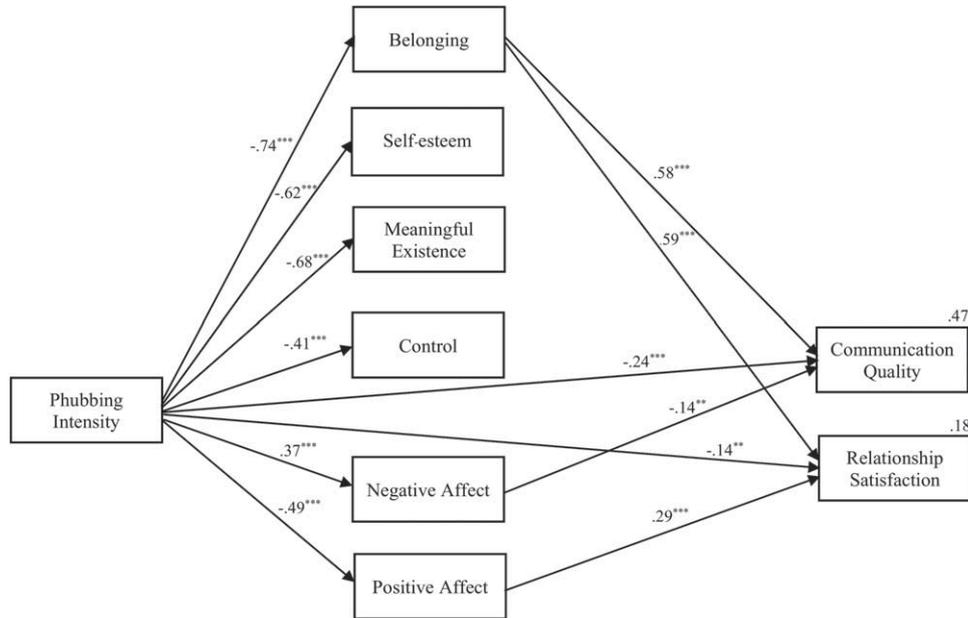


FIGURE 7 Path analysis of the final model

animations also comes with some limitations. For example, whilst they ensure a rigorous level of experimental control, this may come at the cost of external validity. The animations presented cartoon-like figures on a screen (see Figure 2) and are therefore limited in the extent to which they offer the opportunity to study real-life conversations between strangers, acquaintances and friends. It may also be possible that participants became aware of the purpose of the study and responded in a socially desirable manner. Although we feel that this is unlikely given the minimalness of the animation and manipulation, and the privacy of participants' responses, appropriate checks should be made in future research.

The measures in our study present some other issues that need to be considered. First, the proposed moderators (i.e., perceived social norms of phubbing and rejection sensitivity) had no impact on any of the effects we observed. Perhaps this can be explained by the nature of people's instant responses to ostracism. Individuals have immediate indiscriminate reflexive reactions to social exclusion, then cope and recover during a later reflective stage (Williams, 2009a). Immediate responses to ostracism are robust and appear insensitive to moderation by individual differences and situational factors (Williams, 2009b). A further consideration is that meaningful existence predicted neither perceived communication quality or relationship satisfaction. Further, need for control only predicted relationship satisfaction. We can only speculate about the reasons for these non-significant effects. The relatively low reliability of the PSNP should also be addressed in future research.

A further limitation of our research is that the sample size was relatively small and not very diverse. Future research should address this limitation. It is also possible that the mere presence of smartphones in all animations can interfere with relationship outcomes (Misra et al., 2014), which is something else that should be considered. Finally, the

current study only varied the extent to which participants were phubbed during the dyadic conversation, and not the number of times participants were phubbed. The frequency of being phubbed may have an impact on relationship outcomes.

There are also other potential avenues for future research that we would like to highlight here. First, to understand people's coping and longer term responses to phubbing behavior, we need to examine in more detail the temporal need-threat model proposed by Williams (2009b). This model suggested three stages of the ostracism effect: (1) a reflexive (or immediate) stage, (2) a reflective (or coping) stage, and (3) a resignation (or long-term) stage (Williams, 2009a). In this study, we limited ourselves to examining only the initial and immediate responses to being phubbed (i.e., the reflexive stage). Future research should therefore investigate what happens in the second and third phases of ostracism as a result of phubbing behaviour. For example, it is interesting to note that the majority of our participants who failed the attention checks were in the extensive phubbing condition, suggesting that people may 'tune out' after some time being phubbed. Studying the reflective stage will enable researchers to more fully understand the longer term effects of phubbing.

Future research should also examine additional mechanisms to explain the effects of phubbing on relationship outcomes. We have focused on ostracism in the present study and our findings do support the prediction that phubbing threatens at least one of the fundamental needs and also dampens mood. However, another recent investigation proposed and found evidence to support the idea that mobile phone use during face-to-face interactions influences impression formation as a result of conversational norm violation (Abeele et al., 2016). This relates to the construct of expectancy violation more generally. Individuals develop expectations about the behavior of communicators, and as a result, they assign a positive or negative valence judgement when

they notice that their communication partner's behavior deviates significantly from expectancies (Burgoon, 1993; Burgoon & Hale, 1988). Miller-Ott & Kelly (2015) found that participants expected undivided attention in some social contexts. Excessive mobile phone usage in social interactions might therefore violate communicative expectations and lead to negative relationship satisfaction (Kelly, Miller-Ott, & Duran, 2017). Furthermore, "technostress"—or feelings of distress associated with mobile phone use—may be another mechanism underlying phubbing behavior (Gonzales & Wu, 2016). Further research exploring the mechanisms underlying phubbing effects is therefore needed.

Further research should also examine phubbing effects in different relationships contexts. For example, research could explore the effects of phubbing by different individuals (e.g., friends/enemies) and groups (ingroups/outgroups). Gonsalkorale and Williams (2007) found that being ostracized even by a despised outgroup lowers mood and has a negative impact on fundamental needs. Future research could examine if similar effects occur for phubbing. For example, is it worse to be phubbed by a friend than an enemy, or by someone from one's ingroup than by an outgroup member? Research such as this would allow scholars to further align phubbing with the ostracism literature and investigate possible differences between phubbing and other forms of social exclusion.

Future research should also consider more naturalistic communication settings to increase external validity, actual behaviors of participants on the receiving end of phubbing (e.g., nonverbal responses, eye tracking responses), and the extent to which social exclusion in the form of phubbing produces different outcomes to other types of social exclusion such as cyberostracism. Finally, emerging findings on the effects of phubbing and the mechanisms that drive these effects may inform interventions to address the negative effects of phubbing.

5 | CONCLUSIONS

This research breaks new ground by demonstrating that phubbing violates fundamental human needs and reduces affect. In turn, a sense of belonging, and both positive and negative affect lead to negative communication outcomes. It extends upon research on the antecedents and consequences of phubbing by further highlighting some of the potentially negative consequences of mobile phone use for social interactions. We anticipate this to be a fruitful line of research as scholars further investigate the effects of modern technologies on social life.

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ORCID

Varoth Chotpitayasunondh  <http://orcid.org/0000-0002-4253-4153>

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