Full length article

Mobile attachment: Separation from the mobile phone induces physiological and behavioural stress and attentional bias to separation-related stimuli

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ABSTRACT

Humans have a biological predisposition to form attachment to social partners. This attachment, however, is not restricted to humans: non-human and inanimate targets are often involved. People are increasingly engaged with their mobiles but whether their behaviour toward these devices can be regarded as an attachment behaviour has not yet been experimentally tested.

Here we hypothesized the existence of mobile attachment. We expected people to seek the proximity of the mobile and give stress response upon separation from it, which manifests both at behavioural and physiological level. We also predicted that separation from the mobile should induce specific separation-related emotions, which leads to increased attention to separation-related stimuli. We applied a version of the Strange Situation Test using a mobile phone, with behavioural, physiological, cognitive and self-report measures, and the emotional Stroop test. Additionally, we constructed a questionnaire to self-assess mobile attachment.

Separation from the mobile induced behavioural and physiological stress, proximity seeking behaviour, and an attentional bias to separation-related stimuli for participants with higher mobile attachment. These effects were only observable when no other mobile was present. According to the questionnaire, secure base and safe haven are also relevant aspects of attachment to a mobile.

These results support that humans form attachment toward their mobile which is similar to social attachment. This could emerge by cultural recycling of the attachment system's evolutionary structures.

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1. Introduction

According to Bowlby (1969), humans and many animal species are born with an attachment system that motivates them to maintain proximity to the parent. In contrast to many animal species, this system in humans plays an important role also in adulthood and in different kinds of relationships (Fraley, Brumbaugh, & Marks, 2005; Markiewicz, Lawford, Doyle, & Haggart, 2006). Fraley (Fraley & Shaver, 2000; Fraley et al., 2005) assumed that in these cases, the attachment system has been 'co-opted' by natural selection to serve other survival and/or reproductive functions. Furthermore, people often develop attachment even toward non-human targets, e.g. companion animals (Archer & Ireland, 2011; Zasloff & Kidd, 1994), places (Scannell & Gifford, 2010) or material objects (Cipriani & Kreider, 2009; Myers, 1985). In all forms of attachment, the proximity of the attachment figure provides a sense of security to the individual, a secure base for exploring the environment and a safe haven in stressful situations so that the separation from it results in separation anxiety (Bowlby, 1969; Hazan & Shaver, 1994).

Attachment to material objects has rarely been studied, and such behaviour in adulthood has long been considered pathological (Hooley & Wilson-Murphy, 2012; Winnicott, 1971). However, there is evidence in support that healthy, well-functioning adults also report significant emotional attachment to special objects (Myers, 1985; Wapner, Demick, & Redondo, 1990). The possession of these objects seems to be soothing in times of stress (George, 2013) and contributes to greater psychological health (Wiseman & Watt, 2004).

One of the most prevalent material objects of modern society is

the mobile phone. The number of active mobile subscriptions exceeds the total world population (Ericsson, 2014). Young adults in the USA use their mobile for 5.2 h a day (Salesforce Marketing Cloud, 2014). Researchers assume that excessive mobile usage can become an addiction as it is accompanied by features including withdrawal, tolerance, etc. (Walsh, 2014). However, mobile addiction is not currently an accepted diagnostic category (it has not been included in the DSM-5; American Psychiatric Association, 2013). Additionally, there is neither a standard measure for this type of addiction nor a consensus about terminology (terminology includes "mobile addiction": Davazdahemami, Hammer, & Soror, 2016; "mobile dependence": Toda, Monden, Kubo, & Morimoto, 2006; "problem mobile use": Bianchi & Phillips, 2005, pp. 39–51).

Besides these concerns, some degree of dependence on the mobile seems to be a general and increasingly prevalent phenomenon. For example, 79% of smartphone owners keep their mobile with them for all but 2 h of their hours awake (Levitas, 2013). About two thirds of mobile users report distress on being separated from their mobile ("nomophobia": Bivin, Mathew, Thulasi, & Philip, 2013) and this proportion is even higher in young adults (Sharma, Sharma, Sharma, & Wavare, 2015). Such data suggest that certain dependence on mobiles is not an extremity or a disorder but a normative phenomenon, which may have biological basis and function.

Konok, Gigler, Bereczky, and Miklósi (2016) proposed that our relationship with the mobile phone is an object attachment, as it shares the main features of social attachment: proximity seeking, separation anxiety, secure base and safe haven (Bowlby, 1969). Utilising a questionnaire, Konok et al. (2016) showed that young people seek the proximity of their mobile and experience distress upon separation. Clayton, Leshner, and Almond (2015) demonstrated that experimental separation from a mobile resulted in increased anxiety; however, participants could experience anxiety not only because of the mere fact of separation, but because they were prevented to answer their phone that the experimenters rang during separation. Cheever, Rosen, Carrier, and Chavez (2014) also separated participants from their mobile but separation anxiety did not increase compared to the control condition.

Thus, although people report distress upon separation from their mobile (Bivin et al., 2013; Konok et al., 2016), we have no experimental data to support this. Here we test the hypothesis that mobile attachment exists, and address whether the main features of social attachment (secure base and safe haven effect) are relevant to our attitudes and behaviour toward our mobiles. We also test whether the presence of an unfamiliar mobile affects separation anxiety from an individual's own mobile.

1.1. Hypotheses

We hypothesized that humans show similar attachment to their mobile phone as towards people. To investigate this hypothesis, we used multiple research approaches: self-report questionnaires and experimental assessments of mobile attachment. For the latter, we applied a modified version of Ainsworth's Strange Situation Test (Ainsworth, Bell, & Stayton, 1971), where we manipulated not only the presence of the participants' own mobile (attachment figure), but also the presence of an unfamiliar mobile (the test is called 'mobile SST' henceforth). Separation anxiety was assessed by self-reports, and cognitive performance, non-verbal behaviour and physiological responses (heart rate and heart rate variability) during behavioural tests. In addition, attentional bias to separation-related words was tested in an emotional Stroop test (Bentall & Kaney, 1989) to investigate whether anxiety is driven by separation.

From our research hypothesis, we predicted the followings for the questionnaire and the mobile SST:

1.1.1. Prediction for the questionnaire

The main features of human social attachment (proximity seeking, separation anxiety, secure base and safe haven) are relevant to mobile attachment, so that these should emerge as principal components of a Mobile Attachment Questionnaire.

1.1.2. Predictions for the mobile SST

Participants separated from their mobile should show more anxiety than participants not separated from their mobile. In particular, we expected separated participants to report higher levels of anxiety, and perform worse in the cognitive task because anxiety interferes with attention (Egloff & Hock, 2001; Eysenck, Derakshan, Santos, & Calvo, 2007). Furthermore, we expected separated participants to show more non-verbal stress behaviour (displacement activity) and approach more frequently the place of their separated mobile (proximity seeking behaviour) than those not separated. Regarding the physiological responses, we expected separated participants to have higher and less variable heart rates, with frequency distributions characteristic to physiological stress (i.e. higher power in the lower frequency and lower power in the higher frequency bands, cf. Delaney and Brodie, 2000).

In addition, we expected separated participants to react slower to separation-related stimuli in the emotional Stroop test than unseparated participants. Emotionally relevant stimuli require more attentional resources (MacLeod, Mathews, & Tata, 1986) and therefore, decrease participant's performance on tasks where the processing of such information is irrelevant for the task. In the Stroop test, specifically, the processing of the words' meaning interferes with the task (i.e. identifying the colour of the word). Thus, participant's performance is weaker for words which are connected to their emotional disturbances or actual emotional state (e.g. Thorpe & Salkovskis, 1997; MacLeod & Rutherford, 1992).

Based on human attachment research (Spangler & Grossmann, 1993; Spangler & Schieche, 1998), we also predicted that the presence of an unfamiliar mobile in separated participants should result in a reduced level of anxiety for all of the above behavioural and physiological responses (i.e. we expected intermediate responses between full separation and no separation).

2. Method

2.1. Participants

To determine sample size, we performed power calculations using the effect size obtained in a comparable recent study on the effects of mobile phone separation (Clayton et al., 2015). We determined that our sample would require 88 individuals (22 per condition); however, we tested additional subjects in order to compensate for potential data loss or exclusion of individuals/subtests. The participants were 93 Hungarian university students (42 men and 51 women, median age: 21 years (range: 18–26 years). This age group was chosen because they are considered to be "cell phone natives" (Forgays, Hyman, & Schreiber, 2014), therefore we expected that mobile attachment will be most pronounced in this age group. Eighty-seven of the 93 participants (94%) had a smartphone, and participants had possessed their actual mobile for 0.5–86 months (median: 15 months). The participants were studying at different universities and came from a variety of fields of interests. We recruited the participants by the means of poster advertisements, flyers, and Facebook posts and they received a small compensation for their participation (soft drink/beer and chocolate).