

Exploring Design Opportunities for Mitigating Anxious Attachment

Kang, Heimin^a; Lee, KyungHo^a; Jung, Dooyoung^a; Kim, Chajoong*^a; Yoon, JungKyoon^b

^a Ulsan National Institute of Technology, Ulsan, South Korea

^b Cornell University, Ithaca, NY, USA

* cjkim@unist.ac.kr

Due to the widespread presence of social media, social interaction has been more emotionally influencing people than ever before. This phenomenon has induced an increasing interest in emotional well-being in interpersonal relationships. According to literature, it is a contributor to emotional well-being to stabilize our interpersonal attachment. Mitigating negative emotions is also found out to lead to positive contributions toward our emotional well-being. Therefore, this study aims to explore design opportunities for mitigating negative emotions in specific attachment types. The focus is on those who have an anxious attachment which tends to be negatively associated with emotional well-being. For the study, in-depth interviews with a diary study and designer workshop were conducted. As the results, three situations (Underachievement, Self-depreciation, and Future worries) were identified in which anxious attachment people had experienced negative emotions. Furthermore, possible coping methods for the situations were derived as well. Various solutions were suggested for coping with situations where people with anxious attachment undergo. The findings provide design opportunities for mitigating negative emotions of people with anxious attachment and contributing to their emotional well-being.

Keywords: *attachment; attachment stabilization; emotion regulation; design intervention; design for well-being*

1 Introduction

In modern society, it has been aroused as an important issue to take care of people's mental health. The World Health Organization (WHO) announced the importance of mental health (Prince et al., 2007) as well since mental disorders such as anxiety disorder and depression increased leading to

the rapid increase of mortality and suicide rates. To make it worse, Corona blue¹ resulting in anxiety and depression has been also spreading due to the ongoing long-term COVID-19 pandemic. One relevant factor that interrupting mental health is interpersonal relationships. Especially, the popularization of social media led to a negative impact on personal happiness (Brooks, 2015) such as increase depression, anxiety, stress, and reduce self-esteem (Faelens et al., 2019).

Under this circumstance, it can be one of the solutions in mental healthcare to stabilize people's attachment. In psychology, attachment theory (Bowlby, 1982) was related mainly to interpersonal relationship that people tend to form. More recently, the definition of attachment was expanded to a tendency of how people see themselves and others. According to Bartholomew and Shaver (1998), There are four types of attachment: secure attachment, anxious attachment, avoidant attachment, and anxious-avoidant attachment. Those who have a secure attachment type see both themselves and others positively. On the contrary, people with anxious attachment see negatively on themselves but positively on others, leading to negative influence on interpersonal relationships, such as dependency on other people. People with avoidant attachment avoid building intimate relationships with others due to the negative thinking toward others. People with anxious-avoidant attachment have negative thoughts on both themselves and others.

It turned out that the types of attachment are associated with mental healthcare (Cozzarelli et al., 2003; Meng et al., 2015). For example, people with secure attachment tend to have less emotional distress (Simpson, 1990) and less depression (Bifulco et al., 2002). This is positively correlated to subjective well-being and happiness (Öztürk & Mutlu, 2010). On the contrary, people with an anxious attachment tend to often feel negative emotions during daily interactions (Pietromonaco & Barrett, 1997; Tidwell et al., 1996) because they are not supported by stable interaction in stressful situations (Cassidy & Shaver, 2002). Moreover, although negative emotions are a bare essential for mental health and well-being (Schönfeld et al., 2016), people with anxious attachment have poor self-regulatory skills (Mikulincer et al., 2009; Mikulincer & Florian, 1998). For instance, they do control their emotions in an unhealthy way (e.g., by expressing fears and exaggerating distress) (Cassidy & Shaver, 2002). They are also highly dependent on their close partners to regulate their negative emotions (Marmarosh & Tasca, 2013) but worry about their unavailability.

Although secure attachment is desirable in terms of mental healthcare, everyone has no secure attachment. Only half of the population was forming a secure attachment, around 20% an anxious attachment, around 25% an avoidant attachment, and the remaining 3 to 5% an anxious-avoidant attachment (Levine & Heller, 2012). Interestingly, it was found that attachment types could change over time (Fraley, 2019). While such change takes time, possible treatments have been introduced to stabilize insecure attachment types (Arriaga et al., 2018; Green et al., 2011; Johnson, 2009; Taylor et al., 2015). For example, fostering a secure model of self is essential for people with anxious attachment, (Arriaga et al., 2018). Specifically, people could change their negative self-perception positively through experiences pursuing their own goals, enhancing self-efficacy, and being independent. In addition, enhancing emotion regulation skills is a helpful way for people with anxious attachment who feels more negative emotions than people with secure attachment

¹ A combined word of "coronavirus" and "blue" meaning depression

(Mikulincer & Florian, 1998). Most importantly, providing supportive and continuous interaction is another way to stabilize an anxious attachment (Cassidy & Shaver, 2002).

Thus, utilizing the treatments brought from psychological literatures, the study aimed to explore design opportunities to stabilize anxious attachment. Since it is unlikely to change the insecure type of attachment into secure attachment in a short-term intervention, we focused on emotion regulation skills with which anxious attachment become stable. In daily situations, people with secure attachment experience positive emotions more frequently, while those who have anxious attachment experience more negative emotions than secure attachment (Mikulincer & Shaver, 2008). Moreover, positive emotions are a corresponding factor to increase attachment security (McConnell, n.d.). Therefore, the focus of the study was on two aspects: mitigating negative emotions for people with anxious attachment and stabilizing insecure attachment through design interventions.

Two research questions were formulated to achieve the aim of the study:

- What are daily phenomena people with anxious attachment have taken related to anxious attachment?
- How could design leverage emotional well-being in terms of mitigating anxious attachment?

Since the attachment between user and a product (Mugge et al., 2005) has been studied in the field of design, it is also expected that this study could contribute to expanding the current knowledge of product attachment.

2 Methods

In order to answer the research questions, two methods were designed: *in-depth interview* with a *diary study* to understand the phenomenon related to anxious attachment and current coping strategies and *designer workshop* to explore possible design opportunities to mitigate anxious attachment.

2.1 Diary study

2.1.1 Participants

A total of 15 participants who had an anxious attachment was recruited via advertisements on social media such as Facebook and Instagram. Among them, eight participants were male and seven were female. The age ranged between 20 and 31 years old and the average age was 24.7 years old.

2.1.2 Materials

An online questionnaire and a paper diary were designed for the in-depth interview. On the front page of the diary, an instruction to fill the diary was given and examples of positive and negative emotions were provided to help them exactly understand their emotions (Tidwell et al., 1996) (Figure 1). The online questionnaire was made based on an existing attachment type classification questionnaire, aiming to identify and recruit participants who had anxious attachment (Table 1). The paper diary consisted of three parts (Figure 2). In the first part, an emotion graph was provided so that a participant reports an overview of a day's emotional experience. In the second part, a participant was asked to report negative situations s/he experienced on a day and coping strategies to the situations. In the third part, a participant was asked to provide a sketch of desired experience in such negative situations.

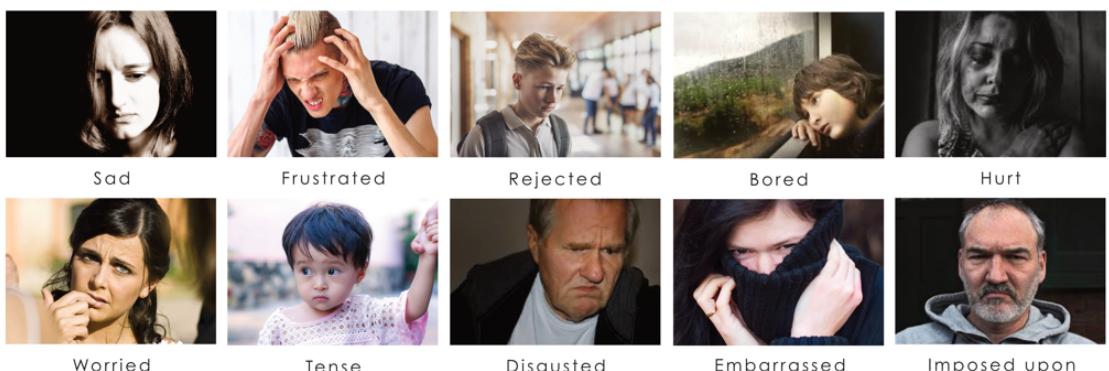
Example of Emotions

Positive emotions:



Happy Comfortable Needed Caring Accepted

Negative emotions:



Sad Frustrated Rejected Bored Hurt
Worried Tense Disgusted Embarrassed Imposed upon

Figure 1. An example of emotions used in user diary.

Table 1. An example questionnaire of attachment type classification.

		Completely true	Mostly true	Somewhat true or false	Mostly false	Completely false
1.	I feel at ease in intimate relationships.					
2.	I fear to be left alone.					
3.	I feel uncomfortable when relationships with other people become close.					
4.	I avoid close ties.					
5.	I find it easy to get engaged in close relationships with others.					
:						



Figure 2. The three parts of user diaries.

2.1.3 Procedure

Due to COVID-19 pandemic, both in-depth interviews and designer workshop were conducted online. The in-depth interview was conducted through three steps: introduction of the interview, filling in the diary, and in-depth interview. All the participants were given a paper diary by post before the introduction. In the introduction, 20 minutes introduction session was done via Zoom for each participant. After the introduction, participants started to write his/her diary for two weeks (14 days). To make sure that they did the diary every day, participants were asked to send photos of their diaries every night. After 14 days of writing the diary, each participant was invited on a Zoom interview, and it took approximately 40 minutes for each.

2.2 Designer workshop

2.2.1 Participants

In order to recruit participants, an announcement was posted on personal SNS and also asked an acquaintance. Five design practitioners were recruited for the workshop, whose expertise included product design, app design, and UX plan. All design practitioners had at least more than three years

professional experience in the field of design. Their age ranged between 26 to 32 years old, and the average age was 29.4 years old. Table 2 shows the information of the participants.

Table 2. Participant information of the designer workshop.

ID	Age	Gender	Occupation	Work Experience
D1	30	Female	UX designer	2 years
D2	29	Male	Product designer, design researcher	2 years
D3	30	Female	Product designer	6 years
D4	26	Female	UX planner	3 years
D5	32	Female	UI/UX designer	3 years

2.2.2 Materials

For the designer workshop, slides and individual handouts were made. The slides consisted of the background knowledge of the research, derived from literature and the diary study, and the instruction of the workshop. The individual handouts were printed on the paper, including templates to sketch and images of target persona, target situation, and design references. In order to provide strong empirical support, the references were brought from already proven psychological data. Specifically, providing positive emotions has been considered as an important strategy to regulate emotions. Thus, example behaviours for upregulating positive emotions were used as a positive intervention (Quoidbach et al., 2015) (Table 3).

Table 3. The example behaviours for positive intervention.

Process of emotion regulation	Positive intervention	Examples
Situation Selection	Acts of kindness	Performing a given number of random acts of kindness every week or everyday
	Behavioural activation	Identifying and reengaging with situations that are reinforcing and consistent with long-term goals
	Goal setting and planning (GAP) training	Developing self-concordant goal setting and planning skills to increase
	Hope therapy	Setting clear approach goals, produce pathways to attain them, summon the mental energy to maintain goal pursuit
	Prosocial spending	Spending a small amount of money on someone else (e.g., friend, stranger, charity)
	Quality of life therapy	Identifying, pursuing, and fulfilling one's most cherished needs, goals, and wishes in 16 valued areas of life said to comprise human well-being and happiness
	Well-being therapy	Keeping track and engaging in positive events. Recognizing cognitions that disrupt happiness.
Situation Modification	Counting kindness	Keeping track of each and every act of kindness one performs daily
	Guided imaginary	Using muscular relaxation and positive mental images to induce psychological and physiological ease

	Intensely positive experience	Writing about a peak positive moment for 20 min each day for 3 consecutive days
	Letter from the future	Writing a letter from the future self to the present self-describing the important goals and wonderful life one has managed to achieve
	Mindfulness-based therapies	Cultivating a moment-by-moment awareness of thoughts, feelings, bodily sensations, and surrounding environment, without judging them
	Reminiscence exercise	Reexperiencing pleasant memories using mental imagery for 10 min twice daily for a week
	Reminiscence intervention	Using prompts to encourage individuals to talk about earlier positive memories
	Savouring exercise	Focus attention on pleasant activities one typically rushes through (e.g., walk in the park, a shower)
	Solution-focused coaching	Monitoring and evaluating progression toward personally meaningful goals. Self-management techniques to help individuals achieve goals.
Cognitive Change	Counting blessing	Making lists of things for which one is grateful on a regular basis
	Well-being therapy	Keeping track and engaging in positive events. Recognizing cognitions that disrupt happiness.
	Intensely positive experience	Writing about a peak positive moment for 20 min each day for 3 consecutive days
	Gratitude visit	Writing and delivering a letter of gratitude in person to someone one wants to thank
	Quality of life therapy	Identifying, pursuing, and fulfilling one's most cherished needs, goals, and wishes in 16 valued areas of life said to comprise human well-being and happiness
	Temporal scarcity	Stressing how little time one has left (e.g., before graduation) through writing exercises to increase the perceived value of one's current situation
Response Modulation	Counting blessing	Making lists of things for which one is grateful on a regular basis
	Aerobic laughter intervention	Engaging in guided non-humour-dependent laughter
	Capitalization intervention	Sharing personal positive experiences with one's partner twice a week
	Guided imaginary	Using muscular relaxation and positive mental images to induce psychological and physiological ease
	Gratitude visit	Writing and delivering a letter of gratitude in person to someone one wants to thank
	Reminiscence intervention	Using prompts to encourage individuals to talk about earlier positive memories

Source: *Positive interventions: An emotion regulation perspective* (Quoidbach et al., 2015).

2.2.3 Procedure

Five design practitioners were simultaneously invited to a Zoom session. First, an ice-breaking session was done by introducing themselves in turn. Then, the goal of the workshop was described, and this was followed by providing the background knowledge related to the study. After this, we explained the target user, target situation, and design considerations more specifically. And then, each design practitioner sketched six ideas as design opportunities for 45 minutes. Lastly, their ideas were shared and discussed each other. It took two and half hours from the beginning to the end.

2.3 Data analysis

To analyse the raw data from the in-depth interviews and the designer workshop, all the data were transcribed. In order to secure objectivity of the analysis, two graduate students at UNIST worked together for categorizing the data (Figure 3). In the categorisation, we firstly analysed situations where participant had reported as the association of negative emotions. Then, coping strategies that participants had taken when negative emotions were raised were analysed. we collected only coping strategies perceived to be helpful among coping strategies, and then categorized them based on a categorization system on mood-regulation strategy (Desmet, 2015). Lastly, the desired experience was classified. Based on the data analysis of the diary studies, a list of requirements was made for the designer workshop. From the designer workshop, various possible experiences for each of three representative situations caused by anxious attachment were identified. We also analysed what to be considered as design opportunities for those who had anxious attachment.



Figure 3. An image shows the process of categorizing.

3 Results

3.1 Current daily experience related to anxious attachment

3.1.1 Negative emotions and situations

From the in-depth interview, it was identified in what situations the participants with anxious attachment had experienced negative emotions in their daily life. The situations were categorised into nine categories (see Table 4). For instance, Underachievement is about a situation when people feel negative emotions because of failure to achieve their self-assessed goal. Self-depreciation refers to a situation where people are not satisfied with themselves to be perfect. Expectation dissatisfaction is a situation in which people get frustrated with others due to dissatisfaction with their expectations. In a Conflict situation, negative emotions occurred when people had superficial conflicts in their relationships with others. In situations of Future worries, people became fearful because of the uncertain future, and empathy of others led transited negative emotions from other people. An Undesirable situation is about an uncontrollable external situation. Breach of morality and Mistakes to others were included in situations where negative situations can be aroused.

Table 4. The categories of situations where negative emotions were experienced.

Category	Definition	Example
Underachievement	Failure to achieve a self-assessed goal	"I'm angry because I'm not focused on what I have to do."
Self-depreciation	A situation in which one feels inadequate and is not satisfied with oneself	"I'm sad because love and study are not perfect."
Expectation dissatisfaction	The situation in which what I expected from others is not satisfied	"I am annoyed because my friend did not reply quickly."
Conflict	A situation in which direct and superficial conflict has arisen between others and themselves	"I am so angry at my mom."
Future worries	Worried about uncertain future	"I'm worried about the research."
Empathy for others	A situation in which he or she has experienced negative feelings due to empathy with other people's feelings	"I'm depressed because my friend broke up."
Undesirable situation	An external, uncontrollable situation that I do not wish for	"I'm anxious that my plan to study in COVID19 has been disrupted."
Breach of morality	A situation in which morality has been violated	"I get angry because of the person who leaked the test questions."
Mistake to others	A situation in which I am sorry that I have done wrong to others.	"I'm sorry I didn't keep my promise."

3.1.2 Coping strategies in negative emotions

When writing a diary, participants evaluated how much their coping behaviours helped to cope with their negative emotions from 1 (Not helpful at all) to 5 (Very helpful). In order to collect the coping behaviours, which was helpful, we filtered the behaviours, which graded 4 or 5 points. Then we categorized them with reference to a paper on mood-regulation strategy (Desmet, 2015). Table 4 shows a detailed definition and an example of each category. For example, the participants with anxious attachment expressed the feeling, gave rewards to themselves, tried to change their mood, or took a rest to regulate their negative emotions. They also focused on other things to forget their feelings, tried to think positively, or look at things from another person's point of view. In addition, interacting with others, meditation, and oppression were used.

Table 5. Coping strategies reported by the participants.

Category	Definition	Example
Vent	Express the feeling	Talking to a friend
Self-reward	Engage in a hobby or other pleasurable activity	Eating delicious food
Refreshment	Behaviour to change the mood	Listening to your favourite songs
Rest	To rest	Going to bed early
Distraction	Focus on other things	Focus more on my work

Positive thinking	To think positively	Thinking about the things my friend did for me last time
Changing positions	To think from another's point of view	Think from my girlfriend's perspective
Detach	Distinguish between the self and the mood	Play music and meditate
Giving up/leaving	Running away from a negative situation	To return home early
Repress	Suppress the feeling	Stop talking to my mom
Problem-solving	An effort to solve a problem	Planning
Analyse	Analysing my feeling	Writing a diary
Social support	Ask someone else for help	Find someone else to do it
Providing social support	To help others	Listen to your friends a lot

3.1.3 Desired experience overcoming negative emotions

Once a week during the diary study, participants wrote and drew about their desired experiences to overcome negative emotions. 30 desired experiences were suggested, and they were classified into seven categories (Table 6). For instance, a participant desired to have something that provides empathy by listening and responding. In addition, essential experiences to cope with negative emotions were desired, such as eliminating negative emotions and providing positive experiences. Participants also wanted to control things in their dream, to get rid of their fatigue, and to be supported by something which helps participants in a lot of ways.

Table 6. Desired experiences to mitigate negative emotions by the participants.

Category	Definition	Example
Empathy	Empathy experience	Something that listens and responds to me
Eliminate negative emotions	To free oneself from negative feelings	Emotion trash can
All-around supporter	A supporting force that helps me in many ways	A robot informing me of my conditions and possible solutions
Dream control	You can do whatever you want in a dream	A lucid dream
Providing a positive experience	Creating a positive emotion	A pill that makes you feel good
Physical fatigue solving	To solve a physical fatigue	A medicine that keeps you from getting tired when I do not get enough sleep
Problem-solving	Solving the problem	The alter ego that could take care of my schedule

3.2 Requirements for mitigating anxious attachment

3.2.1 Target situation

According to the results of the user diary, numerous situations related to negative emotions have been identified. Among them, we narrowed down the situations which have to be targeted based on

the relevance to the anxious attachment. According to the definition of anxious attachment, people with an anxious attachment tend to think negatively about themselves and positively about others (Bartholomew & Horowitz, 1991). Thus, among the nine situations, we chose the situations which are related to the characteristics of anxious attachment (Figure 4). As a result, Underachievement, Self-depreciation, Future worries, and Mistakes to others were selected. At this time, the situation of Mistakes to others was excluded because it is object situations where every people may feel negative emotions regardless of an attachment type. So, the three situations—Underachievement, Self-depreciation, and Future worries—were targeted.



Figure 4. Classification of the target situation.

3.2.2 Target strategies

From the user diaries, we were able to notice current coping behaviours and desired experiences of users. Among them, we aimed to set target strategies that can help people with anxious attachment. To do this, a positioning map was made based on the two axes of *emotion regulation strategy*, which is related to coping with negative emotions, and *interaction level*, which is related to an interpersonal aspect of attachment. The emotion regulation strategy (Gross et al., 2006) informs that emotions can be controlled in two ways: upregulating positive emotions or downregulating negative emotions. For interaction level, the responsiveness of others was selected as a factor. Figure 5 shows the relative positions of participants' coping strategies and desired experience. Among four parts of the positioning map, we chose to target a section corresponding to upregulating positive emotions and responsiveness as the strategy for anxiously attached users. This is because even though the part of upregulating positive emotion and responsiveness is a lacking experience for users, there was a desire of users, but it was not addressed by the current coping strategy. Moreover, positive upregulating strategies have been proven to provide a

lot of positive effects (Quoidbach et al., 2015), leading to enhance people's well-being (Quoidbach et al., 2010). Studies showed that upregulating positive emotions enhances happiness, life satisfaction, and self-esteem (Bryant, 2003). As for responsiveness, attachment theory stresses an intimate, responsive interaction helps to stabilize relationships (Arriaga et al., 2018). Likewise, there could be an opportunity to stabilize people with anxious attachment if the product provides responsiveness to users.

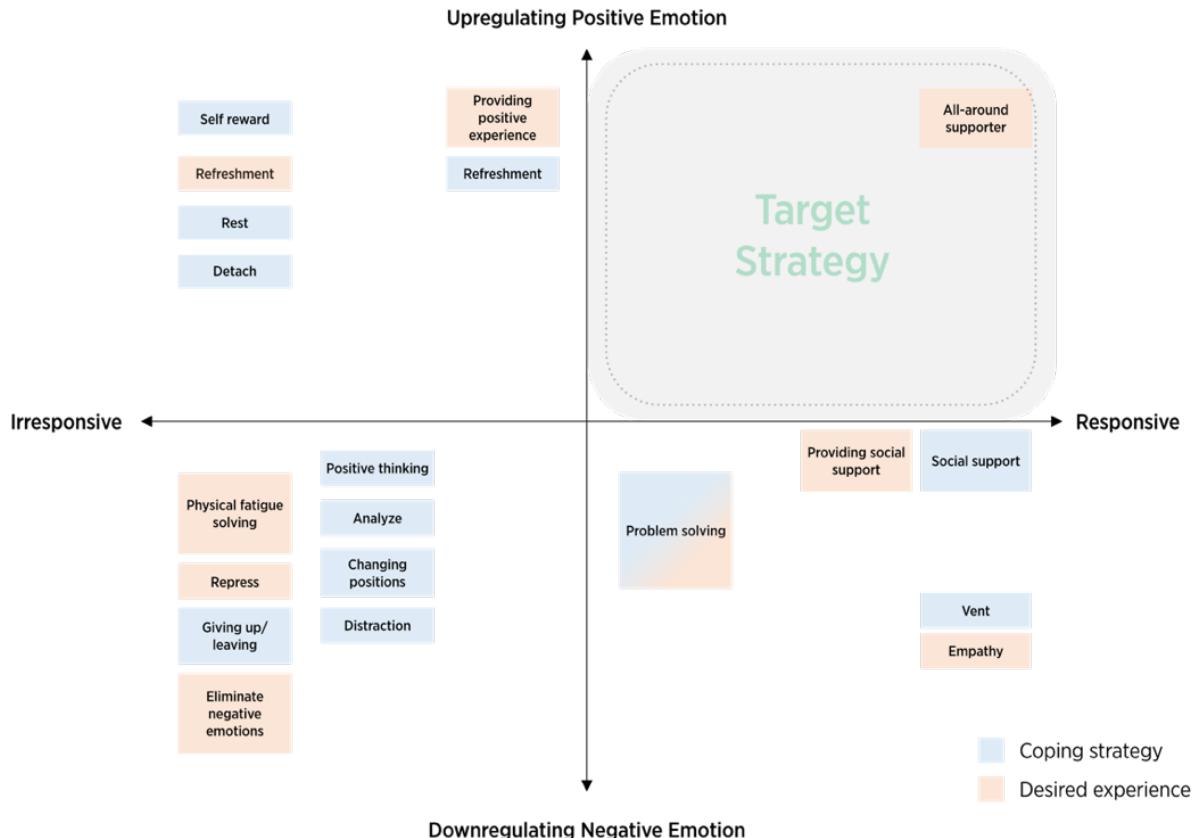


Figure 5. The classification of target coping strategies.

3.3 Possible design opportunities

3.3.1 Underachievement

In the designer workshop, five design practitioners proposed possible experiences that might be suitable to cope with negative emotions in the three situations. Figure 6 is the result of the design ideas for a situation of Underachievement. The first noticeable idea was the products that help plan and manage goals with fun and comfort feedback. One example was an AI speaker that we enter the plan and give words of consolation and feedbacks of sound and light for achievement. Second, philosophical or humanitarian advice to lead the user's cognitive change can be offered. Experiences such as sharing were considered in order to enhance motivation for users. For example, an app that has a function to share the goals with others was suggested.

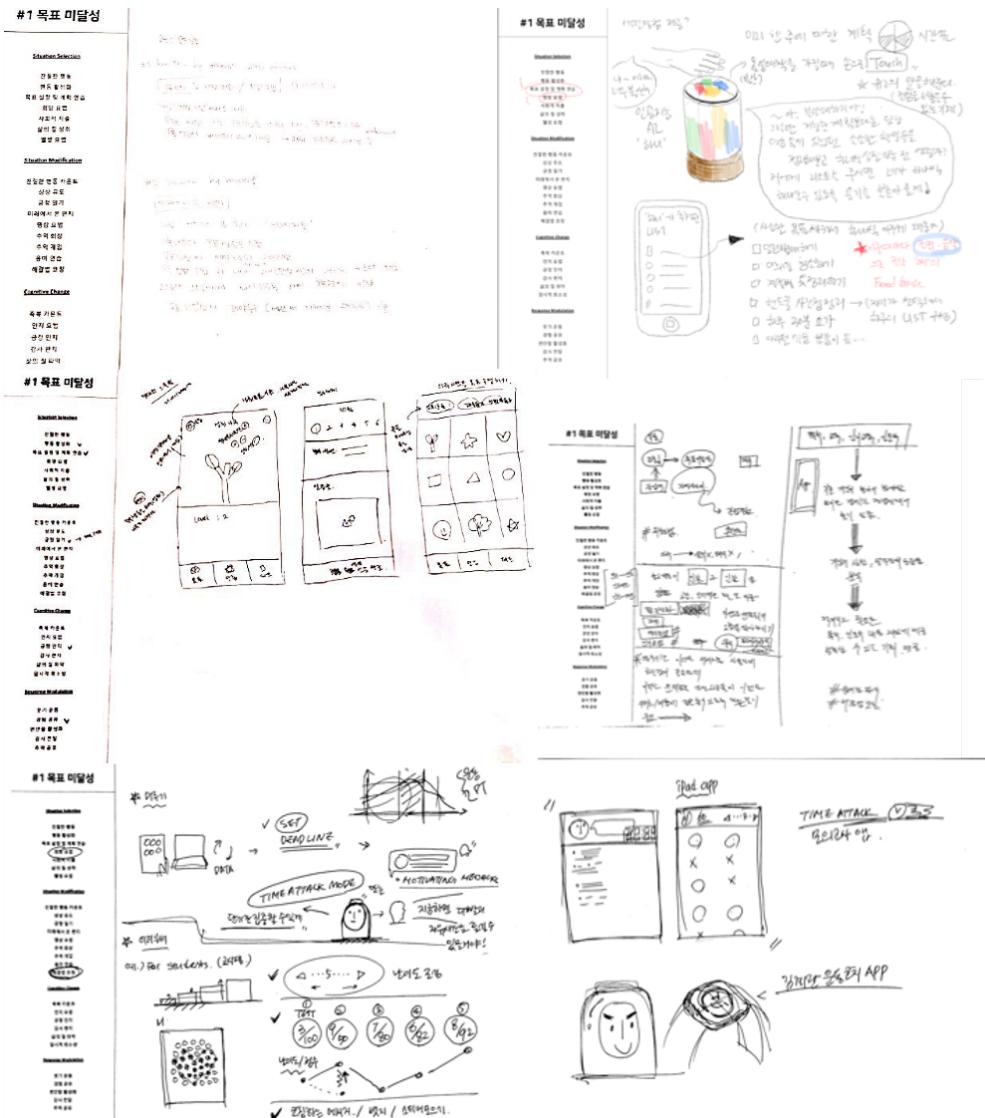


Figure 6. The result of the designer workshop on the situation of Underachievement.

3.3.2 Self-depreciation

When situations of self-depreciation, it is emphasized to think objectively for the negative thoughts about oneself which tend to be exaggerated or to inform users of corrective action. In this regard, image training with an AR or an app was considered. In addition, recalling their own positive memories and meditate or communicate with comfort were also proposed. For example, an AI speaker could be a communicable friend and provides an environment to meditate. Users could recall positive memories by looking at a book or digital frame, including their fun and positive past experiences.

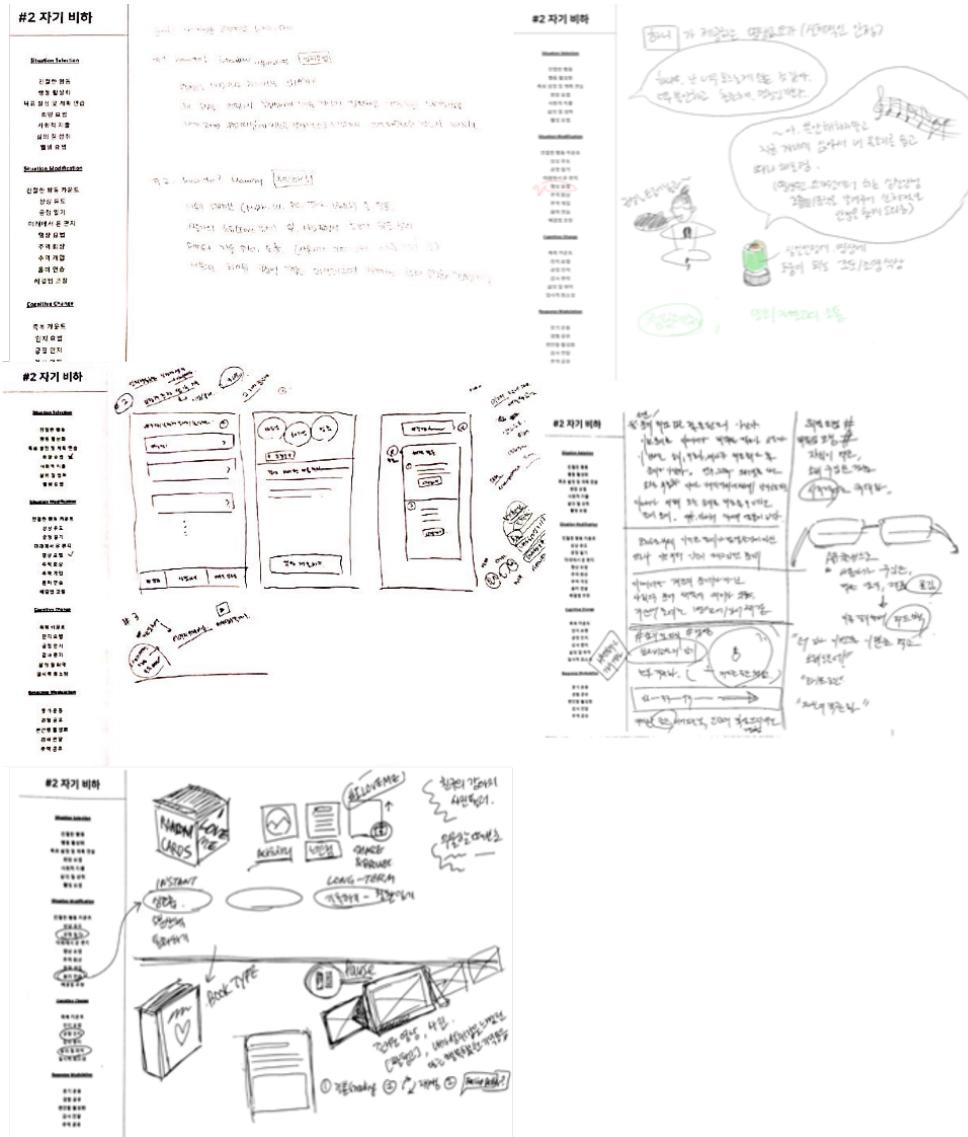


Figure 7. The result of the designer workshop on the situation of Self-depreciation.

3.3.3 Future worries

Figure 8 shows the possible experiences for the situations of Future worries. In the situations of Future worries, methods to help users to think clearly about uncertain future have been suggested. To do this, encouraging to think incrementally, inducing to repeat small achievements. For instance, an app that can write things down in detail and gives a big reaction for small achievement was suggested. To give self-assertion could be provided by writing an imaginary essay of the future. Users also can be encouraged to concentrate on the present by meditating or playing games. Regarding this, write down users' worries and shaking was considered to be helpful.

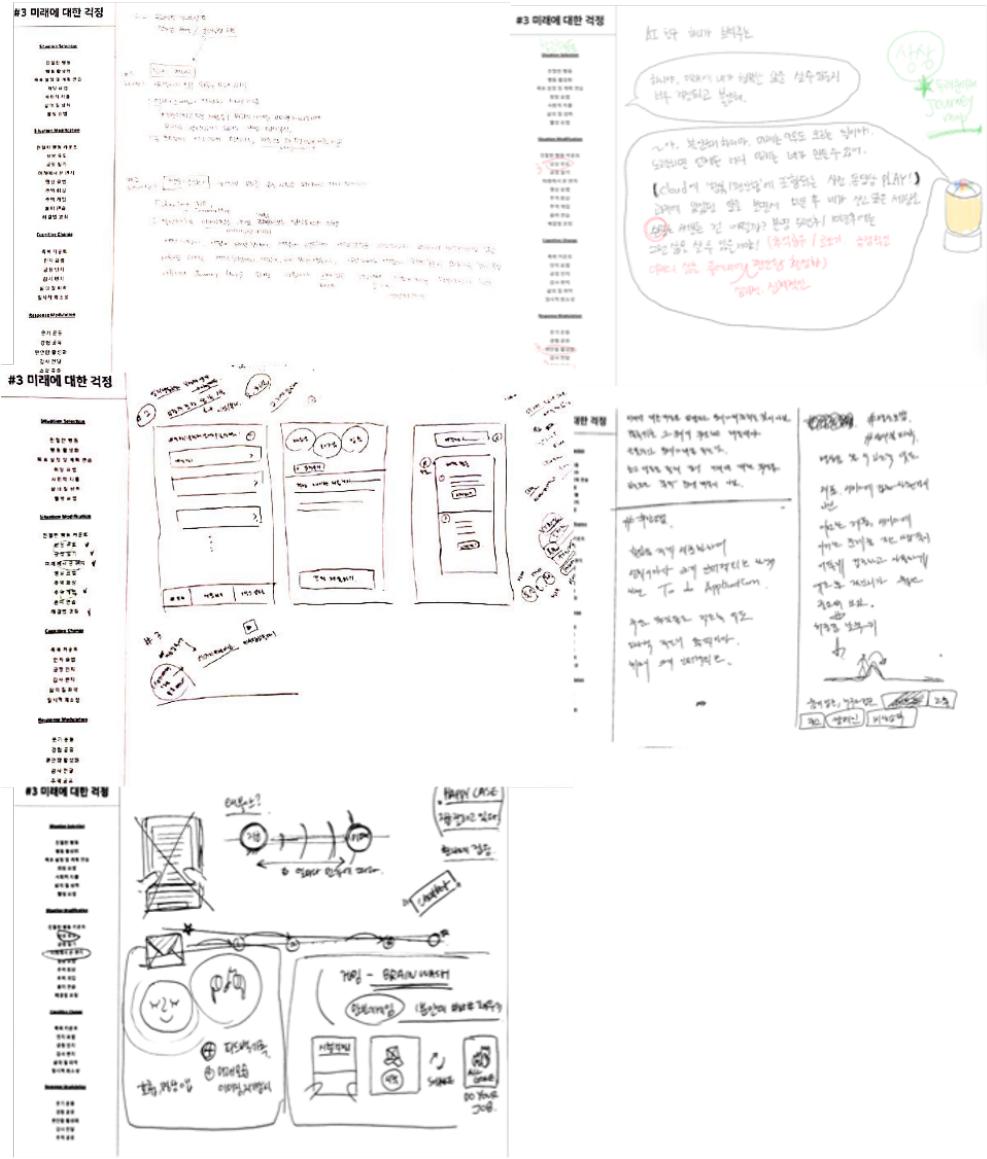


Figure 8. The result of the designer workshop on the situation of Future worries.

4 Discussion

According to many theories in psychology, attachment is deeply related to interpersonal relationships, and ultimately contributes to human well-being. Among four types of attachment, anxious attachment is unlikely to help pursue human well-being because it involves more negative emotional experience than other types. In this study, we attempted to understand people with anxious attachment and then explore design opportunities to mitigate negative emotions of the people. Diary and designer workshop were conducted for the study. From the study, we could better understand people with anxious attachment in their daily situations. Requirements such as target situations and target strategies were derived from the study. Through the designer workshop, various design ideas as design opportunities were generated for each target situation. Doing this, designers referred the existing psychological methods on positive intervention, which were already proved to help improving emotion regulation. Four points in the findings were discussed as follows: expanding attachment in the design field, finding design intervention point on psychological

behaviour, potentials of design opportunities applying a psychological approach, and design considerations for users with anxious attachment.

4.1 Expanding attachment in the design field

It has been known in psychology that a large percentage of the population has insecure attachment types which negatively influence our emotional well-being. As one of the insecure attachment types, the study investigated anxious attachment based on psychological theory to enhance emotional well-being. Despite handling the attachment in social interaction has positive potentials, the term attachment is generally used as a product attachment in design studies, which has been taken into consideration as a means to increase sustainability or brand loyalty (Mugge et al., 2005; Page, 2014; Pedeliento et al., 2016; Schifferstein & Zwartkruis-Pelgrim, 2008). Only a few studies dealt with attachment in human relationships in the field of design. For instance, comparing attachment types with Facebook usage (Kang et al., 2015) and developing the school attachment monitor to assess attachment types (Vo et al., 2017). In this lack of knowledge, this study could provide primary exploration on how to design product/service for insecurely attached users through deep analysis of users and theories in psychology.

4.2 Finding design intervention point on psychological behaviour

Anxious attachment is one of the psychological type of people. These people have certain tendency of behaviour in daily situations. Conducting user research on the tendency of behaviour is challenging because situations that stimulates the psychological tendency could not be predicted. A diary study can be a best method of experience sampling which enables to record real-time emotions and behaviours. In this sense, a diary study was conducted in the study. In addition to tracking users' current behaviours with the diary method, it was important to figure out desired experiences in the negative emotional situations. It is because this information could help find opportunities where additional design intervention would work. For instance, this study was able to narrow down the requirements of design strategy by mapping both current behaviours and desired experiences in a positioning map. This could provide the useful information of where design can best and effectively intervene among various coping behaviour of users.

4.3 Potentials of design opportunities applying a psychological approach

Various knowledge from psychology was considered in the study. It was shown that such knowledge is useful in design research as well. First, type of attachment was a main factor used in this study. This implies that psychological classification could be applied in designing products and services. Especially when designing products for emotional well-being, user segmentation by psychological characteristics and deficiencies might help understand users better and discover better design opportunities for them. Second, when exploring specific design strategies, we used psychological treatments as a reference. In particular, the theory of positive intervention in psychology was transited to product experience as a design opportunity through the designer workshop. This implies that already proven psychological solutions could be a useful source of creating design opportunities for emotional well-being.

4.4 Design considerations for users with anxious attachment

From various design ideas derived for users with anxious attachment, followings are the suggestions when designing specifically for anxious attachment.

4.4.1 Noticeable feedback

For people with anxious attachment, it is better to make it visually noticeable. For example, design practitioners stressed noticeable feedback, such as giving popping feedback with colorful graphics and sounds. This was because it could enhance motivation by arousing positive emotions when feedback has provided.

4.4.2 Friendly appearance

When considering the form of product for anxious attachment, a friendly product was preferred rather than new, unfamiliar objects. For example, products such as dolls, clocks, or calendars were suggested. Likewise, utilizing stable and user-friendly objects would help to form a stable relationship for people with anxious attachment, which tends to be unstable.

4.4.3 Communicable interaction

Many of the ideas were based on communication with the product through text or verbal ways. For example, an AI speaker or an app that enables users to talk about their feelings and receive words of empathy were suggested. Especially, designers preferred using text such as writing diaries about them because it induces users to spend more time thinking carefully.

5 Conclusion

As social media is infiltrating our daily lives, this new challenge on interpersonal relationships has been influencing our emotional well-being. Particularly, those who have an anxious attachment are more likely to be vulnerable due to the challenge. To address the challenge, this study aimed to understand people with anxious attachment and explore design opportunities to mitigate their negative emotions. From the study, three daily situations in which people with anxious attachment feel negative emotions were identified: Underachievement, Self-depreciation, and Future worries. In addition, requirements as responsive and positive intervention were made. Finally, various design opportunities for those who have with anxious attachment were derived. Based on the results of the ideas, design considerations were suggested for design practice. If the findings are taken into account in the product development process, it could help take better care of users with insecure attachments.

Despite such contributions, there are limitations to generalize the findings in the study. First, the study was conducted with a small sample. Second, a short-term period (2 weeks) might be not enough to sketch users' daily experiences. Lastly, design opportunities derived from the study have not yet been proved empirically. Thus, future study will take these limitations into consideration in order to secure generality of our study.

Acknowledgments. This work was supported by the Ministry of Education of the Republic of Korea and the National Research Foundation of Korea(NRF-2020S1A5A2A03045893) and by Korea Institute for Advancement of Technology(KIAT) grant funded by the Korea Government(MOTIE)(P0012725, The Competency Development Program for Industry Specialist).

References

- Arriaga, X. B., Kumashiro, M., Simpson, J. A., & Overall, N. C. (2018). Revising working models across time: Relationship situations that enhance attachment security. *Personality and Social Psychology Review*, 22(1), 71–96.
- Bartholomew, K., & Horowitz, L. M. (1991). Attachment styles among young adults: A test of a four-category model. *Journal of Personality and Social Psychology*, 61(2), 226.
- Bartholomew, K., & Shaver, P. R. (1998). Methods of assessing adult attachment. *Attachment Theory and Close Relationships*, 1998, 25–45.
- Bifulco, A., Moran, P. M., Ball, C., & Bernazzani, O. (2002). Adult attachment style. I: Its relationship to clinical depression. *Social Psychiatry and Psychiatric Epidemiology*, 37(2), 50–59.
- Bowlby, J. (1982). Attachment and loss: Retrospect and prospect. *American Journal of Orthopsychiatry*, 52(4), 664–678. <https://doi.org/10.1111/j.1939-0025.1982.tb01456.x>
- Brooks, S. (2015). Does personal social media usage affect efficiency and well-being? *Computers in Human Behavior*, 46, 26–37.
- Bryant, F. (2003). Savoring Beliefs Inventory (SBI): A scale for measuring beliefs about savouring. *Journal of Mental Health*, 12(2), 175–196.
- Cassidy, J., & Shaver, P. R. (2002). *Handbook of attachment: Theory, research, and clinical applications*. Rough Guides.
- Cozzarelli, C., Karafa, J. A., Collins, N. L., & Tagler, M. J. (2003). Stability and change in adult attachment styles: Associations with personal vulnerabilities, life events, and global construals of self and others. *Journal of Social and Clinical Psychology*, 22(3), 315–346. <https://doi.org/10.1521/jscp.22.3.315.22888>
- Desmet, P. M. A. (2015). *Design for Mood: Twenty Activity-Based Opportunities to Design for Mood Regulation*. 9(2), 19.
- Faelens, L., Hoorelbeke, K., Fried, E., De Raedt, R., & Koster, E. H. (2019). Negative influences of Facebook use through the lens of network analysis. *Computers in Human Behavior*, 96, 13–22.
- Fraley, R. C. (2019). Attachment in adulthood: Recent developments, emerging debates, and future directions. *Annual Review of Psychology*, 70, 401–422.

- Green, B. L., Furrer, C. J., & McAllister, C. L. (2011). Does attachment style influence social support or the other way around? A longitudinal study of Early Head Start mothers. *Attachment & Human Development*, 13(1), 27–47.
- Gross, J. J., Richards, J. M., & John, O. P. (2006). *Emotion regulation in everyday life*.
- Johnson, S. M. (2009). Attachment theory and emotionally focused therapy for individuals and couples. *Attachment Theory and Research in Clinical Work with Adults*, 410–433.
- Kang, B., Lee, S., Oh, A., Kang, S., Hwang, I., & Song, J. (2015). Towards Understanding Relational Orientation: Attachment Theory and Facebook Activities. *Proceedings of the 18th ACM Conference on Computer Supported Cooperative Work & Social Computing*, 1404–1415.
- Kraut, R., Patterson, M., Lundmark, V., Kiesler, S., Mukophadhyay, T., & Scherlis, W. (1998). Internet paradox: A social technology that reduces social involvement and psychological well-being? *American Psychologist*, 53(9), 1017.
- Levine, A., & Heller, R. (2012). *Attached: The new science of adult attachment and how it can help you find-and keep-love*. Penguin.
- Marmarosh, C. L., & Tasca, G. A. (2013). Adult Attachment Anxiety: Using Group Therapy to Promote Change. *Journal of Clinical Psychology*, 69(11), 1172–1182. <https://doi.org/10.1002/jclp.22044>
- McConnell, M. (n.d.). *Attachment across the life span: Factors that contribute to stability and change*. 18.
- Meng, X., D'Arcy, C., & Adams, G. C. (2015). Associations between adult attachment style and mental health care utilization: Findings from a large-scale national survey. *Psychiatry Research*, 229(1), 454–461. <https://doi.org/10.1016/j.psychres.2015.05.092>
- Mikulincer, M., & Florian, V. (1998). *The relationship between adult attachment styles and emotional and cognitive reactions to stressful events*.
- Mikulincer, M., & Shaver, P. R. (2008). *Adult attachment and affect regulation*.
- Mikulincer, M., Shaver, P. R., Sapir-Lavid, Y., & Avihou-Kanza, N. (2009). What's inside the minds of securely and insecurely attached people? The secure-base script and its associations with attachment-style dimensions. *Journal of Personality and Social Psychology*, 97(4), 615–633. <https://doi.org/10.1037/a0015649>

- Mugge, R., Schoormans, J. P., & Schifferstein, H. N. (2005). Design strategies to postpone consumers' product replacement: The value of a strong person-product relationship. *The Design Journal*, 8(2), 38–48.
- Öztürk, A., & Mutlu, T. (2010). The relationship between attachment style, subjective well-being, happiness and social anxiety among university students'. *Procedia - Social and Behavioral Sciences*, 9, 1772–1776. <https://doi.org/10.1016/j.sbspro.2010.12.398>
- Page, T. (2014). Product attachment and replacement: Implications for sustainable design. *International Journal of Sustainable Design*, 2(3), 265–282.
- Pedeliento, G., Andreini, D., Bergamaschi, M., & Salo, J. (2016). Brand and product attachment in an industrial context: The effects on brand loyalty. *Industrial Marketing Management*, 53, 194–206.
- Pietromonaco, P. R., & Barrett, L. F. (1997). Working models of attachment and daily social interactions. *Journal of Personality and Social Psychology*, 73(6), 1409.
- Prince, M., Patel, V., Saxena, S., Maj, M., Maselko, J., Phillips, M. R., & Rahman, A. (2007). *Global Mental Health 1 No health without mental health*. 370, 19.
- Quoidbach, J., Berry, E. V., Hansenne, M., & Mikolajczak, M. (2010). Positive emotion regulation and well-being: Comparing the impact of eight savoring and dampening strategies. *Personality and Individual Differences*, 49(5), 368–373.
- Quoidbach, J., Mikolajczak, M., & Gross, J. J. (2015). Positive interventions: An emotion regulation perspective. *Psychological Bulletin*, 141(3), 655–693. <https://doi.org/10.1037/a0038648>
- Schifferstein, H. N., & Zwartkruis-Pelgrim, E. P. (2008). Consumer-product attachment: Measurement and design implications. *International Journal of Design*, 2(3).
- Schönenfeld, P., Brailovskaia, J., Bieda, A., Zhang, X. C., & Margraf, J. (2016). The effects of daily stress on positive and negative mental health: Mediation through self-efficacy. *International Journal of Clinical and Health Psychology*, 16(1), 1–10.
- Simpson, J. A. (1990). Influence of attachment styles on romantic relationships. *Journal of Personality and Social Psychology*, 59(5), 971–980. <https://doi.org/10.1037/0022-3514.59.5.971>
- Taylor, P., Rietzschel, J., Danquah, A., & Berry, K. (2015). Changes in attachment representations during psychological therapy. *Psychotherapy Research*, 25(2), 222–238.

- Tidwell, M.-C. O., Reis, H. T., & Shaver, P. R. (1996). Attachment, attractiveness, and social interaction: A diary study. *Journal of Personality and Social Psychology*, 71(4), 729.
- Vo, D.-B., Tayarani, M., Rooksby, M., Huan, R., Vinciarelli, A., Minnis, H., & Brewster, S. A. (2017). SAM: The school attachment monitor. *Proceedings of the 19th ACM International Conference on Multimodal Interaction*, 497–498.