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# Emotion Regulation Tool Design Principles for Arts and Design University Students

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## Abstract

Emotions are a vital part of people's life and mental health. Facilitating proper emotion regulation (ER) is important for an individual's well-being, aiming to maximise satisfaction or minimise discomfort. While how to effectively design an emotion regulation tool, which helps individuals to change their emotions from negative to positive ones in-the-moment emotional need, is still an open challenge without good design-for-emotion regulation guidelines. Thus, exploring general and feasible design principles for designing smart emotion regulation tools is needed. In this study, we firstly propose a design-for-emotion regulation framework for Arts and Design university students based on personality-supported emotion regulation strategies. Secondly, we identify daily scenarios that could cause negative emotions in university students based on a focus group study with design thinking methods, and then interpret the related emotion regulation strategies into specific design tactics (principles). Thirdly, we conduct a questionnaire survey (N=65) of university students to confirm and enrich typical real-life scenarios causing negative emotions and further refine ER tool design principles. Finally, we discuss the future research on smart ER system design is presented, including personality-supported ER material design and technology-based interaction design for personalised emotion regulation.

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## 1. Introduction

In our daily life, it is inevitable to live with our emotions. Emotions can be defined as multicomponent responses of what people feel or experience [1]. Emotions can be generally classified as positive (e.g. joy, surprise) and negative (e.g. fear, anger, sadness, disgust). Since the COVID-19 pandemic outbreak, many people have suffered from negative emotions and even mental distress [2]. Negative emotions may lead to heart disease, sleep problems, and severe health consequences. Whilst positive emotions still play a critical role in human mental health and well-being they broaden people's thought-action repertoires in terms of physical, intellectual, social, and psychological resources [7, 8].

Emotion regulation (ER) is a term generally used to describe a person's ability to effectively manage and respond to an emotional experience [5]. Regulation of the emotions themselves is construed as a goal-oriented process usually considering to maximise pleasure (i.e. increase positive emotions) or minimise pain (i.e. decrease positive emotions) [10, 11]. The main functions of ER are to improve the satisfaction of hedonic needs, while facilitating goal achievement, and optimising global personality functioning [7].

As part of human-centred design work, designers are committed to absorbing emotional psychology knowledge as a cornerstone in design innovation to improve the understanding of users' needs and emotional experience [8]. Thus, 'emotional design' [9], 'design and emotion' [10], 'design for emotion'

[11], ‘design for positive emotions’ [8], and ‘design for emotion regulation’ [12] were proposed in design research and practice. The research into design for emotion or ER is an interdisciplinary research field involving psychological, engineering, and design studies [13]. For example, with the trending topic of chatbot (e.g. ChatGPT), researchers are exploring neural-based or psychology-based frameworks for emotion regulation to satisfy users’ emotional needs [14]. Although researchers explored design for ER field, it is still an open challenge to acknowledge how to effectively design an ER tool that meets individuals’ in-the-moment emotional needs without solid design-for-emotion regulation guidelines [5]. Individuals’ emotion regulation is a complex process, and it can be affected by different influence elements, such as emotion regulation situations (e.g. achieving personal objectives or dealing with unexpected circumstances), personality traits, gender, and environments [15].

This paper is based on personality and scenario-oriented exploratory research of design for individuals’ ER study. This includes supportive psychological theories, ER theories/strategies, design thinking methods, and practical investigation with university students. The aim is to develop a set of ER tool design principles to support personality-based and scenario-oriented emotion regulations for university students in Arts and Design subject areas. This study focuses on answering the following research questions (RQs):

RQ1: What are negative emotions often elicited in university students’ daily routines? How do these negative emotions influence university students?

RQ2: How can we apply design thinking methods to reframe design principles (i.e., specific tactics) for individuals’ emotion regulation?

The contribution of this paper includes 1) identifying the common emotion regulation strategies for personality traits with A, E, &O for university Arts and design student, 2) identifying typical scenarios usually causing negative emotions, and 3) developing a set of emotion regulation tool design principles from qualitative studies.

## 2. Related theoretical background

### 2.1 Big Five personality traits profile of Arts and Design students and emotion regulation strategies

Some research has revealed the relationship between personality traits and the effectiveness of emotion regulation strategies [19, 20]. Common personality traits are commonly known as the Big Five traits, which are: Neuroticism (N), Extraversion (E), Openness to experience (O), Agreeableness (A), and Conscientiousness (C) [20, 21]. Vedel and her colleagues suggested that there are group personality differences among various academic backgrounds, compared to other subjects, they found that Arts and Design students scored significantly higher on O, A, E traits [19]. People with high levels of O, A, or E are positively related to some emotion regulation strategies (as summarised in Table 1) [24, 25].

Table 1. Arts students group personality traits and key shared ER strategies

Big Five personality traits	Positively related to ER strategies	Key shared ER strategies for Arts students group
Openness to experience (O)	Cognitive restructuring Problem-solving Mindfulness Worry Reappraisal	Cognitive restructuring Problem-solving Mindfulness
Agreeableness (A)	Cognitive restructuring Problem-solving Mindfulness Emotional social support Reappraisal	Emotional social support
Extraversion (E)	Cognitive restructuring Problem-solving Mindfulness Emotional social support Reappraisal Acceptance	

### 2.2 Current digital technologies for emotion regulation

The pervasive and widespread use of information and communication technologies (ICT) in society, can be regarded as an overwhelming trend that impacts on digital emotion regulation of users’ daily life. For instance, the use of video games, pre-programmed text messages, instant-messaging tools, and social-networking sites available on smartphones, laptops, and wearable equipment can relax or comfort individuals’ emotions. Overall, current digital technologies-based ER intervention methods can be classified into three categories: (1) Ecological momentary interventions, (2) Just-in-time adaptive interventions, and (3) Other intervention applications [23].

## 3. Research from designers’ viewpoint

### 3.1 Early iterations in emotion regulation strategies and design principles

Since the design for emotion regulation lacks systematic design knowledge-based principles to guide design practice from the designers’ perspective [24], shared emotion regulation strategies were proposed (Table 1) to derive design principles from the key related literature, as shown in Table 2. The listed design principles are interpreted from the designer’s point of view because they suggest some design actions which are typically used in current design practice both in academia and industry. It is worth noting that the actual terms are also a set of emotion regulation strategies stated in different ways by psychologists (see references cited in Table 2).

Problem-solving is an action-taking process aiming at changing one’s emotional status [25]. Firstly, the motivation to tackle problems is a key factor in encouraging people to seek certain information for problem-solving [26]. Secondly, reward mechanisms are commonly used to promote problem-solving motivation [33]. Thirdly, adding entertainment elements helps to attract users engaged in the process. For example, games and gamification actions can increase positive emotions during the

entertainment process and enhance the students' motivation and engagement in learning new skills [27].

Table2. Early iterations in emotion regulation strategies and design tactics

ER strategies	Design principles
Problem-solving [20]	<ol style="list-style-type: none"> <li>1. Enhance motivations to solve emotion-leading problems [26].</li> <li>2. Improve reward mechanisms to engage users to solve the problems [33].</li> <li>3. Add entertainment elements to attract users involved in the process [27].</li> </ol>
Mindfulness [20]	<ol style="list-style-type: none"> <li>1. Awaken the five senses of humans to deploy attention in peaceful activities [31]</li> <li>2. Build a "linking" between body and perception, internal awareness and external actions [31].</li> <li>3. Attract and keep users' interest to the "observing-self" process [32].</li> </ol>
Cognitive restructuring [21]	<ol style="list-style-type: none"> <li>1. Transfer negative perspectives to positive perspectives [21].</li> <li>2. Recall happiness and enjoyment of past positive events to influence current states [36].</li> <li>3. Imagine happiness, enjoyment, or success of future to influence current states [36].</li> </ol>
Emotional social support [21]	<ol style="list-style-type: none"> <li>1. Deliver pre-designed or direct emotional support through visual, hearing, olfaction, taste, and touch interactive actions [34].</li> <li>2. Indirect emotional support to change people's emotions [35].</li> </ol>

Mindfulness is rooted in the fundamental activities of consciousness: attention and awareness [28]. Specifically, attentional deployment consists of mindfulness [29], which involves changing how we feel by selecting the information we focus on [25]. A meditation practice concept of The Wheel of Awareness was proposed by Siegel [30], which guides intra-personal attuning. From this perspective, meditation practice builds a "linking" connection between the body and the individual perception [31], including (a) the five senses (visual, hearing, olfaction, taste, and touch); (b) the sixth sense or perception of self-internal and body; (c) the seventh sense (thoughts, emotions, attitudes, and beliefs); (d) the eighth or relational sense (sensations of personal connections with others). However, beginners may feel tiredness and experience boredom [32] with the traditional mindfulness meditation practice. Thus, a new approach is proposed based on different aesthetics (e.g., visual and sound pleasure) and virtual reality technology which aims to make the mindfulness process more attractive and engaging [32].

Cognitive restructuring is defined as looking at the bright side of a bad situation with a positive perspective, identifying benefits arising from the situation, or finding a humorous side to the stressor [21]. For example, positive mental time travelling backward (e.g., recalling happy memories) or forward (e.g., engaging people positive future) [36] is a branching strategy of cognitive restructuring by letting an individual vividly remembers or anticipates positive events.

Emotional social support includes comfort, empathy, and closeness with others, communicating feelings, and seeking social support [21]. Communication is a critical element of emotional support, which can be acquired from people or products through comfort sentences, touch, and actions. When emotional social support is translated into design principles, these can be divided into direct and indirect ways. The

differences between them are dependent on the support methods. Direct emotional support (method) involves face-to-face communication and interaction with the person experiencing emotional distress. For example, direct emotional support can be a hug from a friend, or a long comfort talk from a chatbot. For instance, smart products (e.g. the ALEXA from Amazon, and Siri smart system from Apple) can deliver pre-designed emotional support through visual, hearing, and touch interactive actions [34]. Indirect emotional support refers to providing support through indirect means (e.g., books, articles, and videos), rather than through direct communication or interaction [35].

Although these ER strategies provide positive psychology insights to designers, they still need to be transformed to tangible and actionable design tactics [24]. How to implement different ER strategies should consider people feelings and present situations [5]. Thus, reframing design principles is necessary research requiring providing practical design tactics that consider users' daily scenarios.

### 3.2 Reframe design principles through focus group research with Arts & Design students

Table3. Key findings summary from focus group discussion

Questions Discussion - Q1		
P	Scenario answers	Key situations summary
P1	I feel sad when I know bad news, such as someone in the family being ill.	Healthy concerns
P2	I usually feel bad when I have tried my best and the outcome is not satisfactory.	Academic stress
P3	When I feel or receive authoritative or forceful instructions or suggestions from my parents, I will be unsatisfied.	Authoritative, compulsory situations
P4	I would be annoyed if someone interrupted my plans.	Unexpected interruption or disturbance
P5	I feel pressured when my parents expect too much of me and compare my ability with others.	Family or peer pressure
Questions Discussion - Q2		
A1	For my understanding of mindfulness is mentally to focus your attention and physically to help change attention or relax yourself to focus on something peaceful inside.	
A2	We feel it makes sense that problem-solving is seeking motivation.	
A3	One possible action for cognitive restructuring is reframe the cause effect. Design change from the challenge perspective to opportunity perspective.	
A4	How to apply different design principles depend on detailed tasks and may through change personal perception to improve positive emotions.	
A5	For emotional support, it depends on forceful or unforceful intervention, when I feel sad or unhappy, it is not always mean I need emotional help. Even forceful intervention would cause worse feelings.	

In our focus group design research, design thinking methods [37], incorporating with the think aloud and infographics methods were applied in the focus group involving postgraduate design students from Northumbria university. Based on a practical guide to focus-group research [38], those

qualitative research methods were appropriately combined to reframe the design principles for guiding smart ER tool design. The expectation from this action research was to explore diverse ideas and stimulate dialogues around students' responses to a set of research questions, instead of establishing any kind of 'representativeness' from the group discussion [39] itself. The focus group consisted of six Ph.D. students (three males and three females) of different ages, experiences, but all sharing a similar design background. A focus group facilitator, moderated the two-hour discussion about reframing design principles for ER, and provided a deeper understanding and new insights about scenario-oriented design principles [38].

Based on Krueger's categories [40] of questions, the initial task was to answer the opening questions, "Q1: What are negative emotions often elicited in university students' daily routines? How do these negative emotions influence university students?", "Q2: Given those early iterations from psychological emotion regulation defined terms to design principle, how would you think or comment about these design principles?". After transcribing, we obtained answers to Question 1 in the form of summarised key scenarios leading to negative emotions. Then, the key answers to Question 2 were interpreted qualitatively from the discussions (listed in Table 3).

### 3.3 Improving scenarios-oriented design principles from a questionnaire study

To better answer RQ1, a self-completed questionnaire with single and multiple questions was provided to each participant. The survey included questions about the respondent's age, academic background, gender, cultural background, negative scenarios, frequency and level of negative emotions elicited along with scenarios, emotion regulation means, and frequency. Overall, 65 Northumbria University students with different academic backgrounds completed the questionnaire. Female students were 33, and male students were 32. In this study, international students were over the half of the sample (44.6% UK home students compared to 55.4% international students). Participants fell into different academic fields (Medicine, Psychology, Law, Economics, Political Science, Natural Sciences & Engineering, Management, Arts & Design & Humanities). Among these 32.3% of students from Natural Science and Engineering, 53.8% from Arts & Design & Humanities, and 13.9% from other academic backgrounds. Participants were mainly aged between 18-30 years (N=65, 93.8% in 18-30 years, 6.2% in 31-40 years), 35 were undergraduate students (53.8%) and 30 postgraduate students (46.2%).

A staggering 75.4% of participants reported that they experienced negative emotions in last 30 days through 11 common scenarios that lead to negative emotions. They are academic stress, social isolation, financial stress, homesickness, career uncertainty, life transitions, healthy concerns, relationship problems, family or peer pressure, authoritative, or compulsory situations. The survey data analysis with SPSS indicated that most university students feel *anxiety* when under academic stress (86.2%), *sadness* under homesickness situation (66.2%), *anxiety* under career uncertainty (58.5%), *anxiety*

under financial stress (47.7%), and *anxiety* under life transitions (46.2%).

## 4. Discussion

### 4.1 Data analysis of focus group discussion and questionnaire study - Scenarios that lead to negative emotions

Through questionnaire analysis, the top three typical scenarios (chosen by over 50% of students) and most common negative emotions were identified. Firstly, academic stress is the scenario most chosen by university students, as they usually feel anxiety about exams, academic performance, and outcomes (this is the same result from the focus group). Secondly, for either UK home or international students, they generally feel sadness when they are away from home or familiar surroundings. Thirdly, most university students are anxious about the future and unsure about their career paths.

When the focus group discussed daily scenarios that could cause negative emotions, participants considered the fact that different people may have different experiences and understandings. They agreed that some negative emotions are related to the individual's perspectives and perceptions. Gross's model of emotion regulation also proposed the "P" (perception component) which refers to a perception of whatever that valuation system is tuned to "see." Then, the "V" (valuation component) evaluates the "bad for me" or "good for me" based on perception component [5]. For example, Ippei Matsumoto designed the digital clock-like product "Life counter" which allowed users to decide how many years they would like to live and then start counting back [41]. Some people feel excited when they see their lifetime dragging on, and others feel sad when they see the seconds flashing before their eyes.

Essentially perceptions include two dimensions: factual and perspectival dimensions. The perspectival dimension of perception specifies how things look from an individual's perspective [42]. When participants mentioned specific scenarios that lead to negative emotions, these are affected by what the individual's perspective to understand the situation. For instance, a respondent P2 stated that 'I usually feel bad when I have tried my best, and the outcome is not satisfactory', which is taking a pessimistic view instead of reviewing their achievements. Another participant P3 admitted that 'When I feel or receive authoritative or forceful instructions or suggestions from my parents, I will be unsatisfied' showing how this situation is experienced depending on how recipients' perceptions of the imposed task requirements. If they consider those demands against their personal boundaries, it could lead to negative emotions.

This case could help explain why the homesickness and career uncertainty scenarios were not particularly mentioned in the Focus Group with the more experienced 6 Ph.D. students, whereas survey results suggest that with less experienced undergraduate (53.8%) and postgraduate (46.2%) respondents often have homesickness and career uncertainty issues.

#### 4.2 Proposed personality-supported and scenario-oriented ER design principles for Arts and Design students

In addition to identifying the scenarios, answers about university students' emotion regulation, under each scenario, were collected as a means to extrapolate ER trends. When students feel anxiety or sadness under *academic stress*, *homesickness*, or *career uncertainty*, talking to friends, family, or professional staff (i.e. ask for emotional social support), is the most common students' first choice, followed by watching videos (under *academic stress*, *career uncertainty*) or playing games with friends (*homesickness*).

The survey results suggest that they chose to play or listen to music as the second means to relax from sadness or anxiety under *academic stress* or *homesickness*. Besides, doing exercises is a popular means to reduce anxiety under academic or future career uncertainty stress. Based on personal life experiences, participants expressed their preference to use mindfulness means. Mindfulness is related to attention and awareness, physically and mentally [36]. Various activities or sensory stimulation are typically used to guide people's peaceful reactions or get rid of current negative thoughts or judgments [31].

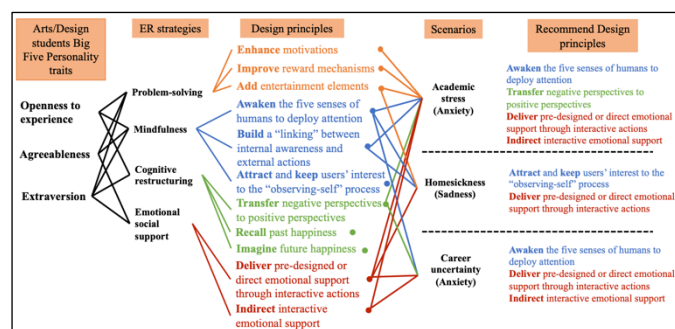


Fig. 1. Personality and scenarios-oriented ER tool design principles

Under *academic stress*, some students also chose to calm down and rethink their status. Cognitive restructuring is an emotion regulation strategy that directs individuals to shift their thoughts in adaptive ways. Cognitive flexibility is an essential element of cognitive restructuring, which is one aspect of executive functioning, allowing individuals to consider different ideas, and flexibly shift cognitive sets when environmental situations change [43].

Through the focus group and survey studies, reframed design principles against daily scenarios and Arts and Design Students' personality traits are summarised and recommended in Figure 1 to explain how it works from the designers' perspective.

#### 4.3 Limitations

The limitations of this research are mainly in the sample diversity and saturation. We applied the questionnaire and focus group discussion as research methods to research and reframe the design principles. However, firstly, the present questionnaire used a broad sample of university students from different academic backgrounds, and Arts and Design students were just over half (53.8%). Besides, research saturation is not

achieved by one session of focus group discussion [44]. Secondly, our research focuses on design students with O, A, E traits. It is a limitation for individuals' emotion regulation design principles applied to other backgrounds.

In addition, we have not fully explored the relationship between "design for emotion" and "design for emotion regulation". Design for emotions' methodologies and principles are normally used for the development of products or systems, not for the development of tactics for tackling the individual's emotion regulation. While designing emotion regulation tools requires a different set of design principles-based on psychology theories from the function design point of view; but from a tool design point of view, (assistive) emotion regulation tool is a product/a service system for users to use and engage, in this sense, it is somehow linked to design for emotion. So, we can call it design for "deep" emotion.

#### 5. Conclusion and Future study

The research aims to explore how to design for individual's emotion regulation by smart tools with stimulation materials for subjects (arts and design university students) with negative emotional problems to improve their mental health and well-being. Design for individuals' emotion regulation is a fertile and fascinating area of investigation with a promising future to test and apply practical design actions to different scenarios and situations. The detailed tool design principles to match some personality traits and scenarios for bettering individuals' (Arts and design students) emotion regulation were defined and reframed. Besides, the interdisciplinary research through design methods was supported by psychological theories and explored despite some limitations as discussed above. Thus, for future research, design methods will be still applied to involve a greater number of designers and design students from different backgrounds and life experiences to co-design and assess smart tool design for individuals' ER considering emotional engineering methods [45]. Another aim is to explore the design principles for other personality traits and apply scenarios to develop a digital prototype of a smart ER model for evaluating its feasible, usability and user experience.

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