# The Relationships Between Persuasive System Design and Engagement In The Context Of Digital Mental Health Interventions

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#### Abstract

Digital mental health interventions (DMHIs) can aid in improving mental health, however engagement is an important factor for DMHIs to successfully carry this out. Engagement can be defined by its behavioural, cognitive and affective aspects. Furthermore, persuasive system design (PSD) is another important factor when designing for an effective DMHI. Both concepts have gained attention in research over the last decade, however research on how PSD influences engagement has been sparse. Because of this significant gap in research, the aim of this study is to examine the relations between PSD features and engagement.

This study utilised a mixed methods approach. Participants (N = 6) completed a DMHI while wearing an eye-tracker. Engagement scores were measured using the Twente Engagement with Ehealth Technologies Scale (TWEETS). Additionally, think-aloud sessions and semi-structured interviews were taken after the participants finished the DMHI. The TWEETS scores were analysed using a Mann Whitney U test and a Freedman test. The rest of the data was thematically analysed.

No significant differences were found when analysing the influence of PSD features on engagement, from the Mann Whitney U test (P = .66, P = .36) and the Friedman test (P = .06, P = .15). The thematic analysis of the think-aloud sessions, together with the eye-tracking analysis, show that participants perceived the PSD features rehearsal and tailoring as most influential to engagement. The thematic analysis of the interviews shows that the relaxation exercises, the text structure and the written content of the DMHI also had an influence on engagement.

To conclude, although the quantitative findings report no significant influence of PSD features on engagement, the qualitative findings suggest that some PSD features might have an influence on engagement under certain circumstances. Future research should focus on exploring under which circumstances certain PSD features have an influence on engagement.

#### Introduction

The use of digital mental health interventions (DMHIs) has become increasingly more popular over the last decade (Milne-Ives et al., 2024). A DMHI may particularly benefit those that need additional support for improving their physical and mental health. Additionally, DMHIs are inexpensive to implement, and are able to reach a widespread population (Short et al., 2018). One of the main issues with DMHIs however, is that in practice they tend to have a high rate of non-adherence, e.g. not completing all the steps in a program or not using all the functions necessary in an app, which makes the digital intervention less effective (Kelders, Kip, et al., 2020). Although a certain level of adherence is important for achieving positive effects with a DMHI (Kelders, Van Zyl, et al., 2020), there are also other aspects that are at least as important, when looking for positive effects through DMHIs. When users feel involved with the intervention, can identify themselves with it, and have a positive subjective experience with it, the positive effects of DMHIs can be increased even more, which can be linked to the concept of engagement (Kelders, Van Zyl, et al., 2020).

## **Engagement**

The concept of engagement has changed over the years in research studies (Barello et al., 2016). As a consequence, there is currently no established overarching definition of engagement in the context of DMHIs, however more and more researchers are agreeing on certain aspects and functions that seem to be part of engagement (Milne-Ives et al., 2024; Kelders et al., 2024). In earlier years, engagement has often been used as a term for interaction with an intervention, or the level of involvement of the user, or even as adherence. Even though adherence and engagement have often been interchangeably used in research, they are fundamentally different concepts. Engagement contains a behavioural, cognitive and an affective aspect. The behavioural aspect is to some extend related to the frequency of intended use, but compared to adherence it is more about the quality of use, e.g. how easy it is

to use the DMHI effectively, developing habits with it and adapting the use of the DMHI to the user's personal goals (Kelders et al., 2024). The cognitive aspect is related to the interests and goals of the user. This entails that a cognitively engaged user believes the DMHI is aiding them in achieving their goal, shows interest in, and pays attention to the DMHI, e.g. by it giving the user new insights related to their personal goals (Kelders et al., 2024). And lastly the affective aspect is related to the user's feelings towards the intervention and their interactions with it. For example, the positive feelings of achieving their goals with it, or the frustration when struggling with a roadblock, or even the motivation they experience to overcome a roadblock. Furthermore, identity is also part of the affective aspect, as identifying themselves with the intervention has an influence on their affect towards it (Kelders et al., 2024).

## Mixed methods approach

Next to conceptualising engagement, recent research has also focused more on effectively measuring engagement with DMHIs (Milne-Ives et al., 2024). Although this has led to the development of differing methods within varying aspects of engagement, most recommendations for practical measurements suggest a mixed-methods approach, mainly in order to capture the complex nature of engagement as much as possible (Madujibeya et al., 2022; Milne-Ives et al., 2024; Short et al., 2018). Some examples for methods suggested in this approach are interviews, think-aloud activities, sensor data, and questionnaires.

Interviews and think-aloud activities can measure people's general experience, cognitive processes and emotional reactions, when going through a DMHI (Madujibeya et al., 2022). Sensor data can provide insights from real-time behaviour measurements during the application of an intervention, e.g. by participants wearing an eye-tracker (Madujibeya et al., 2022). Questionnaires for engagement can measure people's subjective experiences with the intervention, as well as provide data for their micro and macro engagement (Madujibeya et

al., 2022).

One questionnaire developed to measure engagement is the TWente Engagement with Ehealth Technologies Scale (TWEETS). This scale was made to assess engagement as a multifaceted concept that can contribute to predicting outcomes of interventions (Kelders, Kip, & Greeff, 2020), and is therefore a good fit for this research. Milne-Ives et al. (2024) recommend to use this scale when aiming to gather holistic measurements, capturing multiple elements of engagement without comparing those to each other, as the scale measures the behavioural, cognitive, and affective components.

## Persuasive systems design

Another concept that has become relevant for DMHIs is Persuasive Systems Design (PSD). PSD is the concept of making technology more persuasive, in order to aid it's users to achieve what the technology aims to achieve, without using coercion or deception. For example, in eHealth it is important that the product is used more often and in a specific way, and PSD can help motivate the users to use it in that specific way and with sufficient frequency (Gemert-Pijnen, L, 2018).

In order to help design persuasive systems, Oinas-Kukkonen and Harjumaa (2009) introduced the PSD model. They created a list of categories and features for PSD. The features relevant for this study are: (a) tailoring, adapting the intervention's content and usability to its user's needs and context; (b) rehearsal, providing the means for the users to rehearse a behaviour to aid them in their behaviour change process; (c) praise, which makes users more open for persuasion; (d) similarity, users who recognise themselves in the intervention in a meaningful way are persuaded more readily; (e) expertise, the system can be more persuasive if it has elements of perceived expertise; (f) verifiability, making the intervention more credible by perception through displaying outside sources; (g) normative influence, which can make the intervention more persuasive through peer pressure; (h) social

facilitation, which can make users more likely to perform a certain behaviour if they perceive that others are performing this behaviour alongside them (Oinas-Kukkonen & Harjumaa, 2009).

# PSD and engagement

Since it has been established, the PSD model has gained popularity in DMHIs and has seen a more widespread use than other persuasive system frameworks, which is likely because of the model's flexibility and adaptability to the goals of the system designer (Idrees et al., 2024). However, there has been little research that connect the concepts of PSD and engagement. Most studies that have addressed aspects of that topic did not use the current conceptualization of engagement, but some of their findings could be applicable when connecting PSD and engagement (Comello et al., 2016; Coopmans, 2021; McGowan et al., 2024).

An example of such a study was conducted by Comello et al. (2016). They examined if game-inspired visual support in a DMHI could facilitate engagement and information processing. The main visual support that they found had a positive effect on engagement was a progress bar, which tracked the user's progress towards their own goal. This progress bar increased the users' positive emotional tone and attitude towards the product more, compared to a traditional way of progress tracking (Comello et al., 2016). This concept could be linked to the PSD feature liking, as the visually attractive design made this feature more persuasive. Comello et al. (2016) highlight in their explanation that the design for visual appeal bar had significant influence on the users' affect and attitude, which in turn facilitated their engagement.

#### Research gap

Although the topic of engagement has gained more attention in research over the last decade, the conceptualisation of engagement is currently still being finalized (Kelders et al., 2024; Milne-Ives et al., 2024). Research about what influences engagement is still sparse, including research about the effect of PSD features on engagement. Exploring this topic might provide insights for designing engaging DMHIs. Therefore, the aim of this study is to examine the relationships between PSD features and engagement, within the context of DMHIs. Since this is an explorative study, the focus will be to gain insight from the perspectives and perceptions of this study's participants. The first research question this study will explore is: To what extend do PSD features have a perceived effect on engagement in a DMHI?

Furthermore, although PSD has been reviewed in the past, most of those studies reviewed persuasive systems as a whole, looking at the effect of the intervention (Idrees et al., 2024). Currently there is a significant gap in research about the effects of individual persuasive strategies and features, especially in comparing the different features to each other in the same context (Idrees et al., 2024). Gaining more insight into this topic will likely aid in understanding which persuasive features are better applicable in certain contexts (Idrees et al., 2024). Therefore, this study will also aim to explore which persuasive features have a better influence on engagement within a DMHI. The second research question of this study is:

Which implemented PSD features have the most perceived influence on engagement in a DMHI?

Lastly, to provide a comparison for the relationship between PSD features and engagement, and since this study will focus on the perspectives and perceptions of it's participants, this study will have an auxiliary aim to explore how design features without PSD of a DMHI influence engagement. Gaining insight into this aspect will provide a perspective to compare the influence of PSD features with. Therefore, this study will have the third

research question: What is the perceived effect of the design features without PSD of the utilised DMHI on engagement?

#### Method

## Design

To answer the research questions, this study used a mixed methods design. In order to research to what extend PSD features have a perceived effect on engagement, the TWEETS questionnaire was used. To research which PSD features have the most perceived influence on engagement, eye-tracking and think-aloud sessions were utilised. To research what the perceived effect is of the design features of the utilised DMHI on engagement, the interview was used. During the study, the participants went through an online relaxation module, which had two versions. Utilising a crossover design, version A had in it's first session PSD features implemented in it's design, and did not have those in it's second session. Version B had no PSD features in it's first session, and did have those implemented in it's second session. For the rest the content was the same between the two versions. The participants were randomly assigned between the two versions of the module (Version A and Version B). Sessions with PSD were compared to sessions without PSD, both within and between versions. This study was approved by the BMS ethical committee of the University of Twente (approval number 241085c).

# **Participants**

The sample group for this study was students at the University of Twente. The only inclusion criteria was that participants needed to be students at this university, and there was no exclusion criteria. Participants were recruited through SONA, utilising a voluntary response sampling method, and 100% of the participants that signed up participated in the study. The reward for participating in this study was 2.5 SONA credits. Because the crossover

design allows for a smaller sample size, the intended sample size was at minimum 5 participants and preferred 10 participants. The sample for this study consisted of 6 students, 4 of which were male and 2 were female. Their age ranged between 20 and 25 years old (M = 22.5, SD = 2.07). One participant was a master student, the 5 others were bachelor students. Only one participant declared to have an eye condition that could possibly affect the interaction with the online module.

#### **Procedure:**

An overview of the procedure is displayed in Table 1. Before the participant was invited into the room, the researcher randomly assigned them to either group A or group B and prepared the corresponding version of the relaxation module (Version A or Version B). When the participant was seated in the room, they received a brief explanation from the researcher about the goal of the study and what they were about to do, and filled in the consent form and demographics online after the researcher left the experiment room. The consent form is listed in Appendix A. In the same survey, they then filled in the demographics questionnaire and the TWEETS to establish a baseline score (TWEETS-0). As the last step before the participant began with the relaxation module, the researcher installed the eye-tracking glasses and set up the module.

The participant then went through the module. After they were done with the first session they filled in the TWEETS (TWEETS-1), and continued the module with the second session. Similarly, when they were done with the second session they filled in the TWEETS (TWEETS-2) for the last time. Up until now, the researcher was only in the room together with the participant to set up the surveys, module and eye-tracker, and provide information. The participant was left alone in the room when they filled in surveys and while going through the module. From this point on, the researcher was constantly present in the room with the participant.

During the last part of the experiment, the researcher firstly removed the eye-tracker, and prepared the think-aloud session setup and recording. During the think-aloud session, the researcher displayed the eye-tracking recording to the participant, alongside the online module itself. The researcher went through the module slide by slide, and asked the participant questions about their experience with the current slide. When conversing, the researcher was able pause the eye-tracking recording. The think-aloud session ended when they had gone through the whole module, after which the semi-structured interview started. During the interview, no visuals were displayed on the screens initially, however the participant was allowed to go to a slide of the module to refresh their memory. When they went through all the questions, the experiment ended and the participant was rewarded with their SONA credits. One pilot participant performed a pilot test, from which the data was not included in the data set. On average, participants spent roughly 15 minutes on the relaxation module, and the duration of the think-aloud session and interview combined ranged from roughly 30 minutes to two hours per participant.

**Table 1**Overview of the procedures during the experiment

	Step 1	Step 2	Step 3	Step 4
Pre participant	Determine	Prepare module		
arrival	group A or B	version A or B		
Before the	Consent form	Demographics	Baseline	Install eye-
module			TWEETS-0	tracker
During the	1st Session	TWEETS-1 for	2 <sup>nd</sup> Session	TWEETS-2 for
module		first session		second session
After the	Remove eye-	Think-aloud	Interview	
module	tracker	session		

#### Think-aloud session

To gather participants' experience with the relaxation module, they were guided with questions through a think-aloud session. This took place after the participants had gone through the relaxation module. While looking back at the eye-tracking recording, the participants were prompted to think aloud about their behavioural, cognitive, and affective engagement and experience during the session. Example prompts were: "How was your reaction to this page?", "Do you remember what were you thinking or feeling when you were at this page?", "Can you tell me what you were doing?". During a pilot test another prompt arose, to ask questions about what aspects of the module added to the experience of the participants, positively and negatively. An example prompt is: "Is there anything that aided you in this process?". An overview of the prompts is included in Appendix B.

#### Interview

To gain insight in participants' engagement with the relaxation module, a semi-structured interview was conducted after the think-aloud session. The structure of the scheme was as follows: First some general questions about the participants' overall experiences with the module. An example question for this section is: "How was your experience with the relaxation module?". Afterwards, questions were asked about their experience with the first session, tailored to behavioural, cognitive, affective aspects of engagement. Some example questions are: "Was there anything that made you interested in this session? Why?", and "What would make this session more engaging for you? Why?". When this was completed, the same questions were asked again, but this time about their experiences with the second session. To close the interview, some exit questions were asked, for example: "Is there anything you would like to discuss or share about the module that we did not talk about today?". The complete interview scheme is included in Appendix B.

## **Materials**

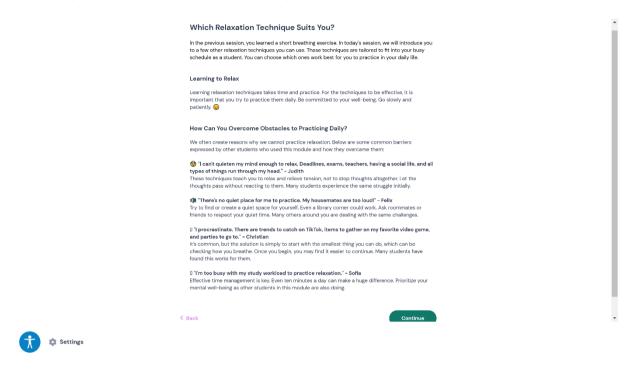
#### Online relaxation module

The system for the relaxation module the participants went through is CIAS, screen shots of the two versions A and B of the module are listed in Appendix C. The content of the module was about relaxation exercises. Participants read information about the relaxation exercises, about dealing with stress in general, and performed the relaxation exercises, while going through the module. The PSD features included in the module's design are listed in Table 2. Note that these PSD features were only included in one session per version. An example of some of the implemented PSD features is displayed in Figure 1. The participants went through the module on a PC, in an experiment room at the BMS Lab of the University of Twente.

Table 2PSD features included in the module's design

PSD feature	Implementation		
Tailoring	Information was tailored to students,		
	through inclusion of emojis and specific		
	wording of the text		
Rehearsal	Exercises were provided with additional		
	instructions for clarity and repetition;		
	Reflection and goal setting exercises were		
	provided with the option to write down		
	answers.		
Praise	Participants were praised for their		
	accomplishments.		
Normative influence	In some parts of the text there were quotes		
	from students included as examples of		
	implementations of the module's content.		
Verifiability	A source to the NICE guidelines was		
	provided.		
Expertise	An image and description of an expert was		
	displayed, as reinforcement to the content.		
Similarity	The artificial companion was designed to be		
	similar to a student's life.		
Social facilitation	A number of other people going through the		
	same module is mentioned in the text.		

**Figure 1**Example of implemented PSD features Tailoring and Similarity.



*Note*. The Tailoring PSD feature is implemented by the display of emojis, and the wording of the text, for example "...your busy schedule as a student." The Similarity PSD feature is implemented by making the examples related to students and quoted by a student's name.

#### Measurement instruments

The TWEETS (Kelders, Kip, et al., 2020) was used to measure overall engagement levels. It consists of 9 items with a 5-point Likert scale, with 3 items measuring behavioural engagement, 3 items cognitive engagement, and 3 items affective engagement. An example item is "[this technology] makes it easier for me to work on [my goal]." Cronbach alpha values of the TWEETS were above .85, indicating good internal consistency. Qualtrics was used to fill in the TWEETS. To measure where the participants' visual attention was directed

throughout the module, Tobii Pro Glasses 3 and the software Glasses 3 (version 1.19.1) were used for eye-tracking. To play back the eye-tracking recordings during the think-aloud sessions and to generate heatmaps, Tobii Pro Lab (version 1.241.54542) was used. During the think aloud-sessions, a laptop with Microsoft Teams was used for screen recording, to match the audio with the eye-tracking recording. For both the interviews and the think-aloud sessions, audio was recorded on a phone.

## **Data Analysis**

### Survey Data Analysis

To answer the first research question, the quantitative data from the surveys was analysed in RStudio (R-4.4.0). Descriptive statistics (means, frequencies and standard deviations) were utilised to analyse the demographic data. The data from the TWEETS questionnaires was analysed with two approaches, using non-parametric tests due to the small sample size. Firstly, a between-subject approach was taken to analyse the differences between Group A and Group B in their responses to TWEETS-0, TWEETS-1 and TWEETS-2, using a Mann-Whitney U test. Secondly, a within-subject approach was taken to analyse if the PSD features influenced engagement throughout the whole module using a Friedmann test. Here, the data from TWEETS-0, TWEETS-1 and TWEETS-2 were compared to each other. This was done separately for group A and group B.

# Eye-tracking analysis

To answer the second research question, the eye-tracking and think-aloud session data were utilised. The eye-tracking recordings were analysed in Tobii Pro Lab (version 1.241.54542). Where automatic gaze mapping was possible this was utilised, otherwise the recordings were mapped on to screenshots of the module manually. Heatmaps were generated

in the same program once all of the recordings were mapped. The heatmaps were compared to the think-aloud session data and analysed whether a relation could be formed between those.

# Think-aloud session analysis

To answer the second research question, a thematic analysis was performed for the think-aloud session data. The audio recordings of the think-aloud sessions were transcribed using Amberscript (2024) and prepared for coding. The coding and thematic analysis was done by hand in Word. An inductive approach was used for coding, in order to explore which design features influenced the participants' engagement. A code was created if a participant described a design feature in the module as influential to their engagement. Furthermore, it was also recorded which codes originated from which participant. If one participant mentioned a design feature multiple times (excluding elaborations), it was treated as multiple separate codes. This was done to represent both the frequency and the perceived salience of the design features. When the codebook was finished, these codes were then screened for if they were connected to a PSD feature, and if so which specific PSD feature. Moreover, themes were created deductively as gatherings of codes revolving around the same PSD feature. The end result was each implemented PSD feature as overarching themes, consisting of each related influential design feature.

#### Interview analysis

To answer the third research question, a thematic analysis was performed for the interview data. Similar to the think-aloud session data, the audio recordings were transcribed using Amberscript (2024), and coded and analysed inductively by hand using Word. The coding process was done similar to the think-aloud session, creating a code if the participant mentioned that a design feature of the module influenced their engagement. This includes any visual design features of the module, as well as any content of the module, such as the written

topic or the exercises. When all the codes were collected, they were screened for if they included any PSD features or not. Themes were created if multiple codes revolved around the same aspect of the module, that did not include any PSD features, and had an influence on either the behavioural, cognitive or affective element of engagement. A sub-theme was created if multiple codes influenced engagement in a similar way. The end result was categories of influential design features without PSD as overarching themes, consisting of codes about how an implemented design feature influenced the participants' engagement, with similar ways of influence listed under a sub-theme.

## **Results**

#### **TWEETS**

The descriptive statistics for the TWEETS scores are displayed in Table 3 and Figure 2. The Mann Whitney U test yielded no significant results for each questionnaire. No significant difference was found for session 1 (W = 6, P = .66), indicating that there is no significant difference in engagement score between version A and B. Furthermore, no significant difference was found for session 2 (W = 7, P = .36), indicating that there is no significant difference in engagement score between version A and B. For comparing the baseline scores, no significant difference was found between the two versions (W = 7, P = .38).

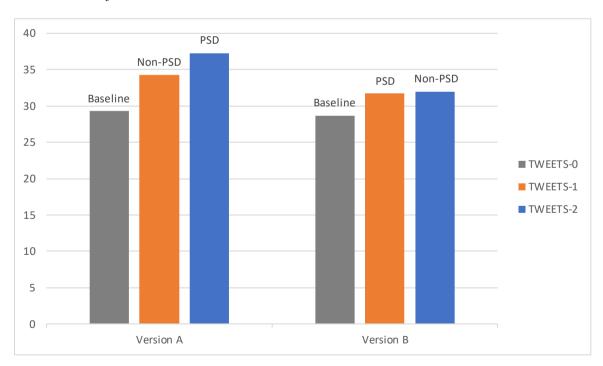
The Friedman test yielded no significant results for each version. No significant difference was found for version A (Chi-squared = 5.64, P = .06), indicating that there is no significant difference in engagement score between session 1 and 2. Furthermore, no significant difference was found for version B (Chi-squared = 3.8, P = .15), indicating that there is no significant difference in engagement score between session 1 and 2.

**Table 3**Means and Standard Deviations of the TWEETS scores

Version	A		В		
	Mean	SD	Mean	SD	
TWEETS-0	29.3	3.21	28.7	3.06	
TWEETS-1	34.3	4.16	31.7	2.52	
TWEETS-2	37.3	4.62	32.0	2.65	

Figure 2

Mean scores of the TWEETS



*Note:* For each version, it is noted above the bar if the session included PSD features or not.

## Thematic analysis think-aloud and eye-tracking

This thematic analysis consists of eight themes and 90 coded quotes. Each theme is explained with how the participants described it as influential for their engagement, and how many times it was mentioned throughout the think-aloud sessions. Moreover, if a heatmap pro vides relevant data, it is included with the description of the relevant theme. A list of all the ge nerated heatmaps can be found in Appendix D. The PSD-feature Rehearsal had the most ment ions as a theme, increasing behavioural engagement the most. The PSD-feature Tailoring had the second most mentions as a theme, and is the only feature reported to increase behavioural, cognitive and affective engagement.

# **Tailoring**

The implementations of the PSD feature Tailoring were generally described as engaging, primarily by participants from group A. They described the emojis as attention grabbing, making the text more fun to read, and as facilitating thought processes: "...about the emojis? I don't know, they, like, attracted my eyes to it. It made it feel like it was just a fun little read." Other less frequent descriptions of the emojis include: feeling disinterested if a page did not include any emojis, any form of pictures being helpful with reading the text, and not influencing any feelings specifically. The implementation of tailoring the text to students was mentioned less often. Only one participant mentioned that a specific part of the text was funny: "And then I remember staying stuck on the We stan Queen Lana Del Rey in this house. I thought it was funny." In total, this theme was mentioned 16 times by four participants as having a positive influence on engagement, and two times as having a neutral influence by one participant.

The heatmap of Figure 3 shows that participants in group A directed little visual attention towards the emojis, despite describing their positive influence earlier. Furthermore,

there are some concentrated focus points on the tailored words, but not more than focus points located at other parts of the text.

**Figure 3**Heatmap tailoring version A





# Rehearsal

All participants described several implementations of the PSD feature Rehearsal as engaging. Overall, the improved instructions were described as easy to understand and activating: "I think there's a part where it says look, feel into your hands and arms. Try to focus on feeling that. I think that is helpful. And the words, the sentences are helpful.". The step-by-step format of the improved instructions were generally described as helpful and easy to follow: "I like the bold and I like, as I said, I like the step to step instruction on what to do.

It's easy to follow. I like that it's one line each for each step. It's not messy. It's kind of short, it's direct and it's very instructive." Other less frequently occurring descriptions include: The improved instructions slightly aiding in getting into a meditation mindset, and despite the improved instructions being more helpful, it still failed to increase engagement.

As for the writing down implementation of the feature, participants described it as helpful and as an amplification of the calmness from the relaxation exercises: "I'm always a fan of writing your thoughts down. It helps for me a lot. I noticed that it's very easy to keep all my thoughts in my head. So writing stuff down is one of the best ways for me to, like, calm down and relax. So I found it. That's what helped me like reflect more on it.". In total, this theme was mentioned 25 times as having a positive influence on engagement, by all six participants. Two participants mentioned this theme as a negative influence on engagement, once each.

## Praise

The implementation of the PSD feature Praise was mentioned relatively little compared to the other features, with an even distribution between positive and neutral influences. Two participants described a feeling of accomplishment from the text congratulating them: "Congratulations is always nice. So if it feels like nice, you accomplished it. You finished it. I would say kind of not overly, but like proud.". One other participant mentioned feeling no connection towards the congratulations or the good luck message: "I guess this part was a bit unnecessary and I didn't really get what this was about. But again, it's completely neutral. It doesn't affect me negatively. I just see something and I don't care about that piece of text, so I just ignore it after reading.". In total, this theme was mentioned twice as a positive influence, and twice as a neutral influence to engagement.

## **Similarity**

The implementation of the Similarity PSD feature had a mixed influence on engagement. One participant reported that despite not feeling a connection to Louise due to her not feeling real, she did improve the participant's mood: "...every time I did see Louise and the other people names, I did get a smile and or chuckle for me. I was like, ah hey Louise from the first slide, like, so like it did help my mood and it did help, even though I know they weren't real. It did help." No other participants reported any positive influences on their engagement due to this PSD feature, however some participants did describe the non-PSD version of Louise to increase their engagement. Moreover, two participants described not feeling anything towards Louise, positive or negative, and several participants reported that the companions felt too artificial to connect with or distracting. This theme was mentioned twice as having a positive influence on engagement by two participants, three times as a neutral influence by two participants, and three times as a negative influence by three participants.

Figure 4 shows that the largest visual focus is on the avatar of Louise, with some focus points on the text. However none of those are located around the student related words.

Alternatively, Figure 5 shows the largest focus on the text, rather than the avatar of Emmy.

**Figure 4**Heatmap similarity version B



**Figure 5**Heatmap similarity version A





# Verifiability

Although this theme was mentioned relatively little, all codes refer to a positive influence on engagement. Two participants mentioned liking the provided option to look at additional information, as well as missing this feature when it was not included in a slide: "I clicked on the action and it gave me access to that. Yeah, I like that because this is what I meant with double clicks that you give more of further information then.". Throughout the think-aloud session, this theme was mentioned six times as a positive influence on engagement, by two participants. Figure 6 shows that most visual focus was directed at reading the text. Little visual attention was directed at the link.

Figure 6

Heatmap verifiability





## Expertise

The implementation of this PSD feature had a mostly negative influence on engagement, due to the artificial impressions participants got from Carlijn's picture: "She doesn't look real. So it was kind of strange to me, I don't know what she was doing there... She was distracting me looking at what she was holding and sitting on curtains.". Some participants reported not paying attention to Carlijn, and two other participants described Carlijn's reference and image as trustworthy. This theme was mentioned three times as having a positive influence on engagement by two participants, two times as a neutral influence by two participants, and seven times as a negative influence by four participants. Figure 7 shows a focus point on the face of Carlijn, and that most visual attention was directed at reading the tip section.

Figure 7

Heatmap expertise version A



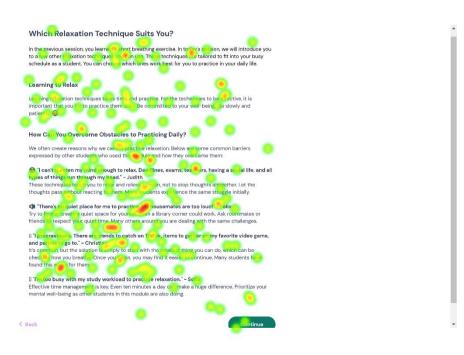


# Normative Influence

Similar to Verifiability, the implementation of the PSD feature Normative Influence was mentioned relatively little, but all codes referred to a positive influence on engagement. The quotes from the students were described as relatable and stimulating for thought processes: "And allowed me to relate a little and see, like, if I had experience with this or if it's that way for me. And I read that like many students do this.". This theme was mentioned seven times as having a positive influence on engagement, by two participants. Figure 8 shows that some of the focus points are located around the names of the students. The rest of the focus points are divided over the text.

Figure 8

Heatmap normative influence





#### Social Facilitation

The implementation of the PSD feature Social Facilitation was perceived as a positive influence to engagement by most participants. The number of other users in the text was generally described as affirming and inducing curiosity: "...it's, it's a nice way of like reaffirming the fact like, hey, you know, meditating shouldn't be seen as something weird and you shouldn't undervalue its usefulness." Alternatively, a couple participants expressed a distrust towards the other users number. Lastly, two participants were interested by the percentage of other people choosing the same favourite exercise. This theme was mentioned seven times as having a positive influence on engagement by four participants, once as a neutral influence, and once as a negative influence.

# Thematic analysis interview

This thematic analysis will list the findings from the participants' descriptions about how design features without PSD influenced their engagement. Three themes, consisting of the mentioned design features, were created from the 61 coded quotes. Furthermore, five subthemes were created, grouping in what way the participants' engagement was influenced. Each theme will be elaborated upon with the participants' descriptions and quotes from the interview, and how the implemented design feature influenced the participants' engagement. Withing each theme, these descriptions are grouped under each sub-theme applicable to the theme.

## Relaxation Exercise

Interaction. The relaxation exercises were perceived as engaging by all participants. Most of the described reasons were because interacting with the module made it more engaging than reading: "...And when I was doing the exercise and the technique with the breathing, I was engaged. Having to do something without just, reading and processing and

actually having to do the technique while I'm in the session, makes me sort of, forces me to react to the technique. So it's asking me to breathe, and I'm going to breathe, and then I've invested into it more because I'm doing something...".

**Novelty.** If a specific exercise was new to a participant, they reported that learning this new exercise was also engaging, and could add a feeling of curiosity for an upcoming exercise: "I mean, and I did learn something new, I forgot the name, but the breathing technique where you're supposed to say one word. I never heard about that before. That was quite interesting.".

# **Text Content**

Novelty. Generally, when content was new to participants, they felt more engaged: "...Well, the only learning was the categorization of those three aspects of how you can classify stress symptoms. That's interesting. That's new...". Alternatively, when participants already knew the content of the text beforehand and learned nothing new from it, it had a disinteresting effect: "Yeah, I skipped that, basically, because that was particularly boring. Why? I mean, it had headings and it had smileys, but it wasn't telling me anything new and it wasn't interactive".

Relevance. When the content of the text felt relevant or relatable to the participant in some way, it had an engaging effect. One participant described that if there was at least something relatable in the content, it was engaging, even if the rest of the content was not relevant: "...like all the stuff I said about the parts of how it's set up that I don't like, does disengaging me a bit, but not to the extent of where I feel like I'm completely out of it. I expect me to be disengaged with stuff that doesn't relate to me anyway, as long as there's something that does relate to me, I'll still be engaged. Like in the screen with the four quotes, one of the quotes related to me. So I'm engaged even if the other three didn't do anything for me.".

Alternatively, if the text content felt irrelevant, it had a disengaging effect. This was described

as the content not having enough depth or being unnecessary to the topic: "Once I kind of understood there wasn't a lot of depth in the text itself. And then I guess especially at the end of the module, I was less invested in it because of that.".

Refreshing Interest. Three participants also mentioned that some switches in the topic or subject was refreshing and kept them engaged: "I think it's the part with the different things like the, you know, this. So the yoga, hot bath, music, massage, steam rooms, this stood out to me because it wasn't a technique. So it was something different, which is why it stood out to me. Well, honestly, refreshed the way I was thinking about this, because now, instead of learning about a technique and doing it and reflecting on it, now I need to read through these clauses and automatically I see which ones can relate to me, like a music, you know, was there, I was doing it.".

#### Text Structure

Ease of Reading. The structure of the text was reported to be influential to engagement by five participants. When text was presented in bullet points and when there was space between the paragraphs to visually separate topics in the content, participants found it more engaging to read the text: "...But if I wanted to read through everything, the second one(session) was nicer to read through than the first one. It did not include the huge concluding text. And to some of the points, some of the stuff was actually written in bullet points. I guess in terms of joy, enjoyment of taking in the information was nicer in the second one.". Alternatively, when there was either relatively much text to read on one slide, or when the paragraph was less structured with white lines, participants mentioned the structure to be disengaging: "...feel unmotivated? The long text without particular headings and not very structured.".

#### **Discussion**

## **Summary of the results**

The aim of this study was to examine the relationships between PSD features and engagement in a DMHI setting, through examining if PSD features have an influence on engagement, which PSD features have the most influence on engagement, and for comparison how design features without PSD influence engagement. To answer the first research question, the quantitative analysis of the TWEETS showed no significant difference in engagement scores between the inclusion of PSD features and exclusion of those. To answer the second research question, the PSD features of Rehearsal and Tailoring were found to influence engagement the most, both with more mentions from the think-aloud session than the other PSD features. Rehearsal was found to have the most influence on engagement, through the implementations in the instructions and the writing boxes increasing behavioural engagement. Tailoring influenced all three elements of engagement, which was not achieved by any other PSD feature. To answer the third research question, the relaxation exercises increased cognitive and affective engagement through being interactive in nature and occasionally new to the participants. If the content of the text was new or relatable, it increased cognitive or behavioural engagement. If this was the opposite, it decreased the engagement. Furthermore, the structure of how the text was written could influence any element of engagement, depending on if it aided or inhibited the participants in reading the text.

## **Main findings**

The primary finding of this study is that there was no significant difference found in engagement scores when including PSD features and when not including those, despite participants describing to feel engaged due to several PSD features. When looking at the TWEETS scores, both groups found the second session to be more engaging. For group A, this was the session with PSD features, but for group B this session did not have those. This

could partially be explained by looking at the findings from the second and third research questions.

One finding that might contribute to this, is that all participants found the exercises to be engaging due to their interactive nature. Since the second session included two exercises, whereas the first session only included one exercise, this might have influenced the engagement scores for the sessions, making the session with more exercises more engaging. This is in line with the findings from the study of Guo et al. (2023), who explored the effect of interaction levels on cognitive engagement. They found that when students interacted with an online learning environment in a deeper and more meaningful manner, their cognitive engagement levels became higher. Moreover, in group B, two participants reported to have vast prior experience with relaxation exercises and as a results felt less engaged with the module's familiar content, which might explain the overall lower engagement scores of group B.

Another finding that might explain the primary finding is that tailoring was one of the two features that increased engagement the most. Since for this feature almost all influences revolved around emojis, and version A included more emojis than version B, this might also have influenced the difference in engagement scores, as the most engaging PSD features were more prevalent in version A than in version B. When comparing the found effects of tailoring to other studies, Hallifax et al. (2020) show that tailoring a gamified learning environment to its users, it increases the positive affect and motivation of the users. This is in line with the findings of this study, which underlines the finding that version A included more of the engaging PSD features than version B.

Despite the fact that these findings are in line with those of other studies, it is not sufficient argumentation to state that these findings fully explain the primary finding, as there are other factors that need to be researched before this can be fully explained. For example

how much a design feature influences a participant's engagement per instance. This study utilised quantities of mentions and descriptions to measure salience, however it is difficult to quantify the amount of influence of a design feature per description with this approach. In order to quantify this, one would have to design a scale or an interview scheme that captures how much a design feature contributed to a participant's engagement. This could be done using Likert scales, asking the participant to fill in how much a certain feature influenced different aspects of engagement after experiencing a page of the DMHI. These findings and shortcomings lead to the primary finding of this study to be that PSD features did not have a significant influence on engagement within this DMHI, however the qualitative data suggests that PSD features might have an influence on engagement under certain circumstances.

## Strengths and limitations

The most impactful strength of this study lies in its mixed methods design. The use of both quantitative and qualitative data collection increased the chance of acquiring significant findings. Despite the quantitative analysis failing to yield any significant results, the qualitative analysis was able to provide several insights into the relationships between PSD features and engagement, and was able to provide additional details to explain the quantitative analysis with. Another strength of this study lies in the crossover design of the DMHI. Utilising a combination of different versions and sessions with and without implemented PSD features made it possible to measure multiple different scenario's per participant, requiring fewer participants for this study to function.

One limitation of this study however, is that there is some overlap between the PSD features and their implementations. Specifically, between tailoring, similarity and normative influence. In order to tailor the text toward students, the content was made to be applicable to a student's life. This implementation also contains elements of similarity, as it is both providing tailored information, as well as creating a feeling of similarity. The same can be

applied to normative influence, as the implementation of this feature includes creating personas that resemble a student and share their experiences, which also provides tailored information and creates a feeling of similarity. Despite attributing the findings to the originally intended PSD feature from these implementations, it is difficult to make inferences about which PSD feature contributed to an increase in engagement. Another limitation of this study is that it only measures short term engagement from initial interaction with a DMHI. It is therefore impossible to measure the participants' engagement over a longer period. Since DMHIs are generally used for longer than one day, this study does not resemble a real life scenario of a DMHI. Moreover, the TWEETS was created with such a longer period of time in mind, making it not ideal for this timeframe.

However, due to the mixed methods nature of this study, the experiences from the participants were able to provide enough data to give insights into what affected their engagement, which suggests that despite the described limitations, it can be assumed that the engagement of the participants was measured sufficiently. Furthermore, when combining this mixed methods approach with the short term data collection, the experiences gathered from the participants were therefore more micro engagement oriented and provided less information regarding macro engagement.

## **Future research**

Future research should focus on further examining the potential influence of PSD features on engagement. It is recommended to focus on examining under which circumstances certain PSD features differ in their influence, as Idrees et al. (2024) describe this to be a current research gap, and this study highlights the importance of this aspect, despite failing to sufficiently incorporate it. A study addressing this gap should design a scale or an interview scheme that captures how much a specific design feature contributed to a participant's engagement. Since the mixed methods approach was fruitful for this study, it is recommended

for future research to adopt this approach as well. To replicate a more realistic DMHI setting, future research should adopt a longer term format, rather than short term. Lastly, since it did not fit within this studies research questions, the crossover design that was utilised was not tested for any recency effect. If a future study would incorporate a similar crossover design, it should compare both sessions with PSD features to each other, and both sessions without PSD features, and investigate any potential recency effects, because that might provide additional insights and explanations next to the main findings.

## Conclusion

To conclude, this study provided insights into the relationships between PSD features and engagement. Despite the fact that the quantitative findings yielded no significant influence from PSD features on engagement, the qualitative findings suggest that there is likely some influence to a certain extend. The two PSD features with the most influence on engagement within this study were rehearsal and tailoring. Furthermore, exercises and text content influenced the participants' engagement as well. Further research should focus on gaining insight into when and under which circumstances certain PSD features have an influences on engagement and when not.

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# Appendix A

## Informed Consent

The purpose of this research is to find out more about the relation between PSD and engagement. The study gained ethical approval by the BMS Ethics Committee. There are no risks by participating in this study. Participating in this study is completely voluntary and you can withdraw your participation at any time. Your personal data will be pseudoanonymised, so it is not possible to distinguish and identify you from other participants. As this study is part of a broader PhD study, the data collected (the audio recording from the interview and the eye-tracking recording) will be shared with the PhD students for further research. After the study is completed the data we collected from you will be deleted. The data will be treated with confidentiality and will not be handed to third parties. You have the right to request access to and rectification or erasure of your personal data and the data we collected from you.

If you have any questions, feel free to ask at them any time. You can contact the researchers by emailing d.e.j.nijhuis@student.utwente.nl or Lflemming@student.utwente.nl.

1 have read and understood the study information, or it has been read to me. I was able to ask questions and these have been answered to my satisfaction.
onsent voluntarily to participate in this study and understand that I can withdraw from the study at any time, without having to give a reason.
I understand that personal information will only be shared within the research team, and will be treated with care. I understand that my personal information will be anonymised to ensure confidentiality, and that I have the right to request access to and rectification or erasure of my personal data.
I understand that there will be an audio recording for the interview part of this study and an eye-tracking recording. I understand that the data will be further used for a PhD study, and I give permission to do so.
I understand that the data will be used only for research purposes, and the recordings will be deleted after the study has been completed.

# Appendix B

After completing the module and administering the last questionnaires, start the interview phase. This phase consists of two parts.

In the first part, play the participants' eye-tracking recordings to them and try to gather information about what they were thinking or feeling when they were looking. Before starting this, make sure to tell participants that they are going to watch their eye-tracking recording and ask them to talk about what were they doing/thinking/feeling. If participants are silent during this part, prob them to think out loud while they are watching the eye-tracking recording with probes such as:

- Do you remember what were you thinking or feeling when you were at this page?
- Can you tell me what you were doing?
- Can you walk me through your thoughts when you were looking at this screen?
- What were you thinking or feeling at that moment?
- How was your reaction to this page?
- Etc.

The second part is the short semi-structured interview. The questions for this part are:

# **General Questions**

- 1. How was your experience with the relaxation module?
- a. Can you tell us/me about your behavior?
- b. Can you tell us/me about your thoughts?

- c. Can you tell us/me about your feelings?
- 2. Have you ever thought about learning relaxation techniques or techniques to use to deal with stress before this study?
- a. Do you think this module helped you learn more about these techniques?
- b. Would you use the tools you learned in this module in your daily life?
- 3. Which session would you go back to if you could? Why?

Questions for the First Session (Keep in mind that participants will see different first and second versions because of randomization)

- 4. What stood out to you the most from the first session? Can you give us/me some examples?
- 5. Was there anything that made you interested in this session? Why?
- a. Were there any points where you lost interest? Why?
- 6. Were there any features or interactions that motivated you?
- a. Was there anything that made you feel unmotivated? Why?
- 7. What were your feelings going through this session? Why?
- 8. Is there anything about this session that you found useful? This can be about design features or any interactions, etc.
- 9. Did you feel engaged with this session? Why?
- a. (Yes) What made it engaging for you?
- b. What would make this session more engaging for you? Why?

# Questions for the Second Session

10.	What stood out to you the most from the first session? Can you give us/me so	me
examp	bles?	

- 11. Was there anything that made you interested in this session? Why?
- a. Were there any points where you lost interest? Why?
- 12. Were there any features or interactions that motivated you?
- b. Was there anything that made you feel unmotivated? Why?
- 13. What were your feelings going through this session? Why?
- 14. Is there anything about this session that you found useful? This can be about design features or any interactions, etc.
- 15. Did you feel engaged with this session? Why?
- a. (Yes) What made it engaging for you?
- b. What would make this session more engaging for you? Why?
- 16. How would you describe your personality?
- 17. Do you think your personality impacted the way you interacted/perceived the system. If so, how?

# **Exit Questions**

- 18. Is there anything you would like to discuss or share about the module that we did not talk about today?
- 19. Is there anything you want to share about your experience with the study?
- 20. Do you have any questions for us/me?

# Appendix C

# The end Thank you for finishing this module on relaxation. See you in future modules. Complete Session



# A bit more about relaxation response

Tip: Use the relaxation response technique (focusing on a word or phrase) to manage procrastination. Practicing this helps people stay present and avoid feeling overwhelmed by everyday stress.

Trick: Pair the relaxation response with a calming word like "focus" or "peace" that resonates with your goals, and practice it before starting a big task to clear your mind.

Fact: The relaxation response, when practiced consistently, can lead to lower blood pressure and heart rate, making it an affective technique for managing physical stress.

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# A bit more about progressive muscle relaxation

Tip: Try progressive muscle relaxation (PMR) before bed to release tension. It helps to improve sleep quality.

 $\label{thm:continuous} \emph{Trick:} \ \ if you're short on time, do PMR while seated by focusing on specific muscle groups (e.g., shoulders and neck) that tend to carry the most tension.$ 

Fact: PMR has been proven to reduce symptoms of anxiety and improve concentration, making it an excellent tool for relaxation.

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# A bit more about breathing exercise

 $\textbf{Tip:} \ \textbf{Use breathing exercises during study breaks to reduce stress and improve focus. Set a timer for 5 minutes to practice deep breathing.}$ 

Trick: Try "box breathing" (inhale for 4 seconds, hold for 4, exhale for 4, hold for 4) during exams to reduce arxiety.

Fact: Research shows that breathing exercises can lower cortisol levels which is the stress hormone.

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# A quick question Hi there! This is Emmy, I am a Human Resources Manager and I use these techniques several times during a week. Which of the below has been your favorite way to relax in this module so far? Breathing exercise Progressive muscle relaxation Relaxation response < Back Settings There are other ways to relax There are alternative ways to relax besides structured techniques: Yoga Yoga postures not only promote physical exercise but also help create a meditative state, perfect for balancing your mind and body. If you haven't tried yoga before, don't worry! It's all about practice, and even small steps will make a difference over time. Hot Baths Consider ending your day with a hot bath. This is a great way to unwind after a long day. You deserve this self-care ritual—make time for it when you need a break. Listening to calm, soothing, and quiet music is an easy way to promote tranquillity. Soft background music while unwinding at the end of the day can help ease stress. Create a playlist that resonates with your mood, and let it guide you into relaxation. Massage Massage is an effective way to relax your muscles and relieve tension. Whether you get a professional massage or ask a friend, it's a simple way to reduce stress. Give yourself this opportunity for relaxation and recovery—it's an investment in your well-being. Steam Room and Saunas Visiting a steam room or sauna is another way to relax. These environments promote full-body relaxation, helping you release physical and mental tension.

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# Relaxation response is a meditation technique that helps restore balance. By focusing on a word, you can step away from daily stressors and quiet your mind. To practice this relaxation technique, start by choosing a word to focus on, like "one." As you exhale, repeat the word in your mind, continuing to do so with each breath. Allow any thoughts to pass by without resisting or judging; them, simply letting them go, to repeat this process about 11 times, focusing on the word and your breath to help calm your mind. Sack Continue



Let's take some time to reflect on how your muscles feel after the progressive muscle relaxation exercise. Do you feel calmer or are there other feelings?

Let's reflect on progressive muscle relaxation

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Continue



# Let's practice progressive muscle relaxation

Progressive muscle relaxation involves focusing on your breath while tensing and releasing your muscles. Begin by paying attention to your breathing, noticing the expansion and contraction of your langs. Shift your focus to your hands and arms, checking for any existing tension. If you find any, relax the muscles completely. Then, tense all the muscles or month administration of relaxation. Repeat this process a few times to enhance the feeling of muscle relaxation.

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# Walking the path to relaxation

In the previous session, you learned a short breathing exercise. In this session, we will introduce you to a few other relaxation techniques you can use. These techniques are designed as generally applicable techniques. You can choose which ones work best for you to practice in your daily life.

### Learning to Relax

Learning relaxation techniques takes time and practice. For the techniques to be effective, it is important that you try to practice them daily. Be committed to your well-being.

# How Can You Overcome Obstacles to Practicing Daily?

We often create reasons why we cannot practice relaxation. Below are some common barriers and how you can overcome them:

"I can't quieten my mind enough to relax."

These techniques teach you to relax and relieve tension, not to stop thoughts altogether. Let the thoughts pass without reacting to them.

"There's no quiet place for me to practice."

Try to find or create a quiet space for yourself and try some relaxation techniques.

"I procrastinate and I have no motivation."
It's common, but the solution is simply to start with the smallest thing you can do, which can be checking how you breathe. Once you begin, you may find it easier to continue.

"I'm too busy to practice relaxation."

Effective time management is key. Even ten minutes a day can make a huge difference. Prioritize your mental well-being.

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# Congratulations! Congrats! You are one of 247 students who have completed the first session on Relaxation!

Complete Session

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# What steps should you take to ensure daily practice?

Daily practice is crucial for relaxation techniques to become a habit. Here's how to make it works

Step I: Take responsibility
Taking responsibility means owning your role in making relaxation a priority. You are ultimately responsible for whether or not you practice daily. But don't worry, you don't have to do it alone. Most students find it helpful to share their goals with friends or family, asking for their support to stay Let's reflect:

- Are you willing to take responsibility for your practice?
   What concerns do you have about taking responsibility?

Step 2: Make a commitment
It's easy to start something new with a burst of enthusiasm, but the real challenge is keeping that
momentum. Think about what keeps you committed. For example, choosing a specific time and place
to practice delily, setting reminders, or even rewarding yourself with a small treat can help maintain that
commitment. Let's reflect:

- Reflect on how committed you are and why it's important to you.
   What strategies can you use to ensure you practice daily?

Step 3: Be willing to take a risk incorporating new habits often requires us to sacrifice something else. To practice relaxation techniques daily, you might have to give up the time you'd usually spend on other activities. The good news is, the benefits—such as feeling calmer and less stressed—are well worth the effort. Let's reflect:

- What are the risks you'll face by committing to this practice?
   Are you willing to take the risk for the benefits of relaxation?

Sometimes we fatter...
Just like in studying, after a period of success, it's easy to slip back into old habits. You might find yourself skipping practice some days, and that's okay. Remember, many students have experience this, too. The key is to get back on track. Don't beat yourself up. Resume your practice, and soon enough, you'll feel the benefits again.



What steps should you take to ensure daily practice?

\*\*Daily practice is could for releasing nearthly seen a heart least hours make it sold:

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Arc yet writing to take responsibility for your practice?
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Top 9 Make a committee:

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Just like in studying, after a period of success, it's easy to slip back into old habits. You might find yourself skipping practice some days, and that's okay, Remember, many students have experienced this, too. The key is to get back on track. Don't beat yourself up. Resume your practice, and soon enough, you'll feel the benefits again.

Focus on the future

Congratulations on completing this modulel By now, you've learned techniques that you can use for the rest of your life. Keep practicing regularly, and you'll notice how much calmer and more in control you feel. Your commitment today will lead to a more relaxed state of being, both now and in the future.

Good luck! - Dr. Carlijn



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Continue



# Making relaxation part of your daily life-

The previous pages introduced you to breathing exercise for relaxation that you can use at home. It is great that you have learned how to do this relaxation technique! However, If you want to see the desired results, you will have to practise this exercise daily. In this sessions, we will explore a few important aspects to take into consideration in order to stay relaxed.

Good luck

It's similar to studying for an exam...

If we follow a strict study plan, we'll achieve the grade we want. Practicing relexation techniques works exactly the same way. Consistency is key; if you practice daily, you will notice positive results. If you don't, you won't see any change. This is something a lot of students discover as they learn these techniques.

# The importance of setting goals

Just like when you're following a study plan, setting clear goals is essential for staying on track. It helps to know what you are aiming for when you practise relaxation techniques. What is your reason for practising? Do you want to feel less stressed before exams, or maybe more focused during study sessions? Whatever it is, having a goal will motivate you to keep practising. Please write down your goal(s) in the box below.

Enter your response here
Remaining characters: 250

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Continue



# Reflecting on the breathing exercise

Good job on the breathing exercisel  $\center{3}$  Alongside you and Louise, 76 students so far have performed the same exercise todayl

Let's take a moment to reflect on how you felt before and after the breathing exercise. It's normal to struggle at first, but with continued practice, you'll get better at it.

Were you able to focus on your breathing, or did you find your mind wandering?

Enter your response here

Remaining characters: 250

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Continue



# Let's try a breathing exercise!

Louise often uses a short breathing exercise, which is doable anywhere – even before a big exam or in a crowded cafe. §

Start by sitting comfortably and taking slow, deep breaths. As you practice, focus on how your body responds, and try to relax your muscles with each exhale. Try this several times until you feel relaxed and ready to continue this session.

< Back

Continue



# Meet Louise!

Louise, like many of you, is a university student. She balances her coursework, part-time job, and social life, but lately, she's felt overwhelmed. Follow her journey through the module to see how she reduces her stress and starts to feel more in control of her life.

√ Back





In this session, we will explore what stress is and how it impacts you, with a focus on common stressors among students, such as academic deadlines or social obligations. You will also meet Louise in the next screen, a student who faces similar challenges in her life, and see how she integrates relaxation techniques into her daily routine.

What is stress?

Stress is a normal emotional and physical response to challenging situations, like exams or deadlines. However, when stress becomes chronic, it can negatively affect your mental and physical well-being identifying which stress symptoms you experience—whether they are physical, emotional, or behavioral —will help you focus on the right relaxation techniques for you.

What are the symptoms of stress?

The symptoms of stress can be categorized as physical, emotional, and behavioral. As you read through the list of symptoms, think about which ones resonate with your experience. Take a moment to reflect on how stress shows up in your life.

Physical: Increased heart rate, muscle tension, and headaches.
Emotional: Anxiety, irritability, difficulty concentrating,
Behavioral: Avoiding social situations, and neglecting self-care.

Informed by Clinical Psychologist Carlijn Saida (PhD).





# Understanding Your Stress

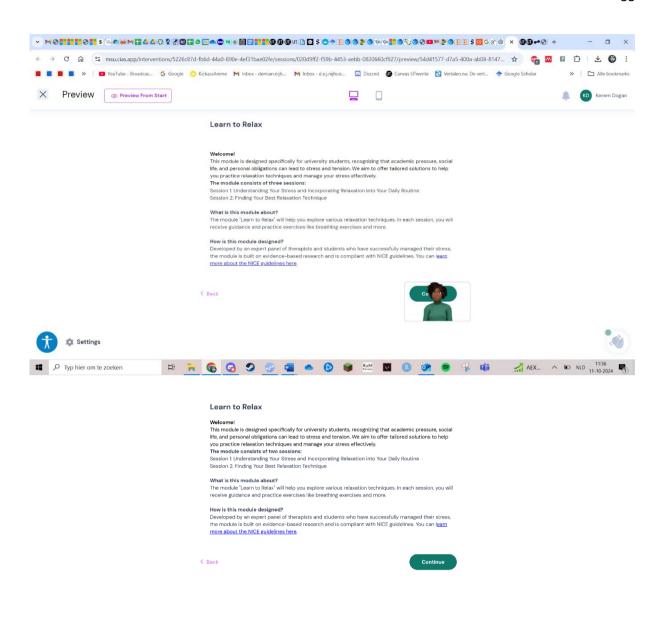
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on how stress shoets up in your life.











# Congratulations!

₹ Congrats! You are one of 247 students who have completed the entire Relaxation module!

Complete Session

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# A bit more about relaxation response

You are one of the 64% of students who chose relaxation response as their favorite way to relax!

Tip: Use the relaxation response technique (focusing on a word or phrase) to manage procrastination. Practicing this helps students stay present and avoid feeling overwhelmed by assignments.

Trick: Pair the relaxation response with a calming word like "focus" or "peace" that resonates with your study goals, and practice it before starting a big task to clear your mind.

Fact: The relaxation response, when practiced consistently, can lead to lower blood pressure and heart rate, making it an effective technique for managing physical stress caused by academic workload.

Thank you Dr. Carlijn for tips, tricks and facts!





# A bit more about progressive muscle relaxation

You are one of the 64% of students who chose progressive muscle relaxation (PMR) as their favorite way to relax!

 ${
m Tip}$ :  ${
m Try}$  PMR before bed to release tension accumulated from long hours of study or screen time. It helps to improve sleep quality.

Trick: If you're short on time, do PMR while seated by focusing on specific muscle groups (e.g., shoulders and neck) that tend to carry the most tension during studying.

Fact: PMR has been proven to reduce symptoms of anxiety and improve concentration, making it an excellent tool for students juggling multiple academic and personal life pressures.

Thank you Dr. Carlijn for tips, tricks and facts!





# A bit more about breathing exercise

You are one of the 64% of students who chose breathing exercises as their favorite way to relax!

Tip: Use breathing exercises during study breaks to reduce stress and improve focus. Set a timer for 5 minutes to practice deep breathing between study sessions.

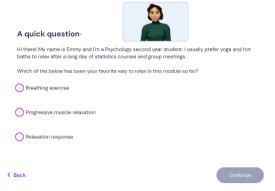
**Trick**: Try "box breathing" (inhale for 4 seconds, hold for 4, exhale for 4, hold for 4) during exams to reduce anxiety.

Fact: Research shows that breathing exercises can lower cortisol levels, the stress hormone, which often spikes near assignment deadlines.

Thank you Dr. Carlijn for tips, tricks and facts!









# There are other ways to relax

There are alternative ways to relax besides structured techniques:



Voga postures not only promote physical exercise but also halp create a meditative state, periect for balancing your mind and book. Many students find that incorporating yegs into their nortion reduces stress after a large by of studying. If you have tried you studying the processing of the processing if you haven't tried yegs before, don't worry! It's all about practice, and even small steps will make a difference over time.

# Hot Baths

Consider ending your day with a hot bath. This is a great way to unwind after intense study sessions or workouts. Many students have shared how it improves both their physical and mental well-being. You deserve this self-care ritual—make time for it when you need a break.

Listening to celm soothing, and quiet music is an easy way to promote tranquillity. Solft background music while studying or unwinding at the ond of the day can help case stress. Many students find that music adis in creating a parceful study or relaxation environment. Create a playlat that resonates with your mood, and let it guide you into releasation (We stan queen Lams the lety in the touce).

# Massage

Massage is an effective way to relax your muscles and relieve tension. Whether you get a professional massage or ask a friend, it's a simple very to reduce stress. Many students find that massages help them recharge after hetenes studying or reservices. Give yourself this opportunity for relaxation and recovery—it's an investment in your well—being.

Vilisting a steem room or sauns is another way to relex. These environments promote full-body relexation, helping you release physical and mental tension. It's a popular method among students for winding down after long study sessions or physical workouts.

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## Music

Listening to calm, soothing, and quiet music is an easy way to promote tranquillity. Soft background music while studying or unwinding at the end of the day can help ease stress. Many students find that music aids in creating a peaceful study or relaxation environment.

Create a playlist that resonates with your mood, and let it guide you into relaxation (We stan queen Lana Del Rey in this house).

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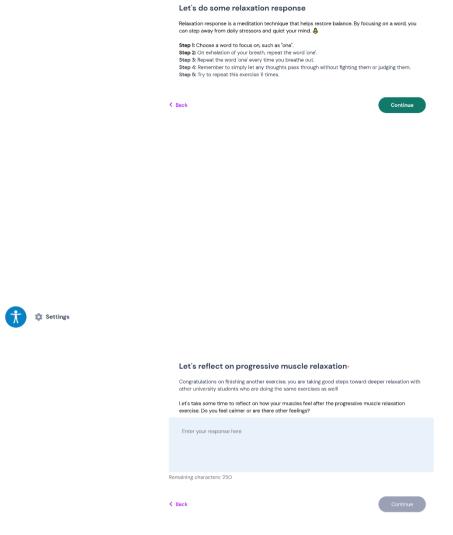
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# Steam Room and Saunas

Visiting a steam room or sauna is another way to relax. These environments promote full-body







# Let's practice progressive muscle relaxation

Progressive muscle relaxation helps you unwind by tensing and releasing your muscles. Follow the steps below to try it yourself:

Step 1: Focus on your breath while calmly inhaling and exhaling. Feel how your lungs expand and shrink back with every breath you take.

Step 2: Feel into your hands and arms, is there some tension already? Does anything hurt? If so, try to release all your muscles into complete relaxation.

Step 3: Try to clench all the muscles in your hands and arms simultaneously and hold for IO-16 seconds. Afterward, release your muscles again and tune into the feeling of relaxation. How do your muscles feel?

muscles feel?

Step 4: Let's repeat the above steps two more times.

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# Which Relaxation Technique Suits You?

In the previous session, you learned a short breathing exercise. In today's session, we will introduce you to a few other relaxation techniques you can use. These techniques are tailored to fit into your busy schedule as a student. You can choose which ones work best for you to practice in your daily life.

Learning relaxation techniques takes time and practice. For the techniques to be effective, it is important that you try to practice them daily. Be committed to your well-being. Go slowly and patiently.

# How Can You Overcome Obstacles to Practicing Daily?

We often create reasons why we cannot practice relaxation. Below are some common barriers expressed by other students who used this module and how they overcame them:

T can't quieten my mind enough to relax. Deadlines, exams, teachers, having a social life, and all types of things run through my head." – Judith
These techniques teach you to relax and relieve tension, not to stop thoughts altogether. Let the thoughts pass without reacting to them. Many students experience the same struggle initially.

(b) "There's no quiet place for me to practice. My housemates are too loud!" - Felix
Try to find or create a quiet space for yourself. Even a library corner could work. Ask roommates or
friends to respect your quiet time. Many others around you are dealing with the same challenges.

Il 7 procrastinate. There are trends to catch on TikTok, items to gather on my favorite video game, and parties to go to.\* – Christian Its common. but the solution is simply to start with the smallest thing you can do, which can be checking how you breathe. Once you begin, you may find it easier to continue. Many students have found this works for them.

[] "I'm too busy with my study workload to practice relaxation." – Sofia Effective time management is key, Even ten minutes a day can make a huge difference. Prioritize your mental well-being as other students in this module are also doing.

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# The End

You have finished this session. Please continue with the other session.

Complete Session

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# What steps should you take to ensure daily practice?

Daily practice is crucial for relaxation techniques to become a habit. Here's how to make it work:

Step I: Take responsibility

Taking responsibility means owning your role in making relaxation a priority. You are ultimately responsible for whether or not you practice dially. But don't worry, you don't have to do it alone. Let's reflect:

- Are you willing to take responsibility for your practice?
   What concerns do you have about taking responsibility?

Step 2: Make a commitment.

It's easy to start something now with a burst of enthusiason, but the red challenge is keeping that momentum. This is door what keeps you committed for example, choosing a specific time and place to practice delay setting reminders, or even rewarding yourself with a small treat can help maintain that commitment.

Let's refloct:

- Reflect on how committed you are and why it's important to you.
   What strategies can you use to ensure you practice daily?

Step 2: Be willing to take a risk incorporating new habits often requires us to sacrifico semething else. To practice releasation techniques daily, younght new to give up the time you'd usuely spend on other activities. The good news it, the benefits—such as feeling calmer and less stressed—are well worth the effort. Left in reflect:

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   Are you willing to take the risk for the benefits of relaxation?

Sometimes we faiter...
After a period of success, it's easy to slip back into old habits. You might find yourself skipping practice some days, and their slow, he key is to get back on track. Don't beet yourself up. Resume your practice, and soon enough, you'll feel the benefits again.

Focus on the future

By now, you've learned techniques that you can use for the rest of your life. Keep practicing regularly, and you'll notice how much calmer and more in control you feet.

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# Louise's story Let's listen to Louise's story. Back





# Making relaxation part of your daily life-

The previous screens introduced you to a breathing exercise that you can use at home. However, if you want to see the desired results, you will have to practise it daily. In this session, we will explore a few important aspects to take into consideration in order to stay relaxed.

Practicing relaxation techniques works exactly the same way. Consistency is key, if you practice daily, you will notice positive results. If you don't, you won't see any change. This is something a lot of students discover as they learn these techniques.

# The importance of setting goals

Setting clear goals is essential for staying on track. It helps to know what you are aiming for when you practise relaxation techniques. What is your reason for practising? Do you want to feel less stressed, or maybe more focused? Whatever it is, having a goal will motivate you to keep practising. Please write down your goal(s) in the box below.

Enter your response here

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Continue



# Reflecting on the breathing exercise. Vou finished an exercise. Let's size a moment to reflect on how you felt before and after the breathing exercise. It's normal to strangle a first, but with continued practice, you'll get better at it. Were you able to focus on your breathing, or did you find your mind wandering? \*\*Sections\*\* \*\*Sections\*\* \*\*Description\*\* \*\*Sections\*\* \*\*Let's try a breathing exercise! Louise often uses a short breathing exercise, which is doable encyshere, in the office or in the kitchen of your house. \*\*Start by sitting comfortably and taking slow, deep breaths. As you practice, focus on how your body responds, and try to releave your muscles with each exhaule. \*\*Sections\*\* \*\*Continue\*\* \*\*Continue\*\*



# Meet Louise!

Louise is a Human Resources Manager. She balances her job, social and family life, but lately, she's felt overwhelmed. Follow her journey through the module to see how she reduces her stress and starts to feel more in control of her life.

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# **Understanding Your Stress**

In this session, we will explore what stress is and how it impacts you. You will also meet Louise in the next screen and see how she integrates relaxation techniques into her daily routine.

What is stress?

Stress is a normal emotional and physical response to challenging situations, like exams or deadlines. However, when stress becomes chronic, it can negatively affect your mental and physical well-being identifying which stress symptoms you experience—whether they are physical, emotional, or behavioral—will help you focus on the right relexation techniques for you.

What are the symptoms of stress?

The symptoms of stress can be categorized as physical emotional, and behavioral. As you read through the list of symptoms, think about which ones resonate with your experience. Take a moment to reflect on how stress shows up in your life.

Physical: Increased heart rate, muscle tension, and headaches.

Emotional: Anxiety, irritability, difficulty concentrating.

Behavioral: Avoiding social situations, and neglecting self-care.



# Learn to Relax

Welcome!
This module is designed for to offer tailored solutions to help you practice relaxation techniques and manage your stress effectively.
The module constate of two sessions:
Session 1: Understanding Your Stress and incorporating Relaxation into Your Daily Routine
Session 2: Finding Your Best Relaxation Technique

What is this module about?

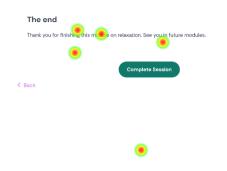
The module 'Learn to Relax' will help you explore various relaxation techniques, in each session, you will receive guidance and practice exercises like breathing exercises and more.

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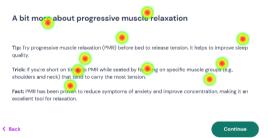
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# Appendix D









# A bit more about breathing exercise ip: Use breathing arcises during study breaks to reduce stress and improve focus. Set a timer for 5 minutes to practice deep breathing. Trick: Try 'box breathing' (inhale for 4 seconds, hold for 4, exhale for 4, hold for 4) during exams to reduce anxiety. Fact: Research show that breathing exercises can lower cortisol levels which is the stress hormone.







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# Let's do some relaxation response

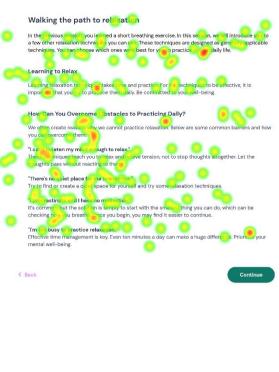
Relaxation response is a meditation technique that helps ustore balance. By focusing on a word, you can step away from d. 1 atressors and quiet your mind.

To practice the refusation for induce start by choosing a word to focus on like "one." As you exhale, reper the word in your mind configuring to do so with each breath. Allow any thoughts to pass by within a start to be judging them, simply letting them go. By to repeat this process about It times, recussing on the word and your breath to help calm your mind. 0 0 0

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# Making relaxation part of your daily life-

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Good luck!

It's similar to studying for an exam...

If we follow a strict study plan, we'll achieve the grade we want. Practicing relaxation techniques works exactly the same way. Consistency is key; if you practice daily, you will notice positive results. If you don't, you won't see any change. This is something a lot of students discover as they learn these techniques.

# The importance of setting goals

Just like when you're following a study plan, setting clear goals is essential for staying on track. It helps to know what you are siming for when you practise relaxation techniques. What is your reason for practising? Do you want to feel less stressed before exams, or maybe more focused during study sessions? Whatever it is, having a goal will motivate you to keep practising. Please write down your goal(s) in the box below.

Enter your response here Remaining characters: 250

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# Welcome: This modifies designed specifically for university students, recombing that academic mesure, socialitie, and personal obtigations can lead to stress and tension. We aim to affer thiored solutions to help you practice relaxation techniques and menue, your stress effectively. The module cause is of two sessions. Season's Underline the view your Stress are incorporating following into Yes. Daily Routine Season 2: Finding Yes Joseph Bloom of the Proporating Plans from Into Yes. Daily Routine Season 2: Finding Yes Joseph Bloom of Yes and Proporating Plans from Into Yes. Daily Routine Season 2: Finding Yes Joseph Bloom of Yes and Yes



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# Steam Room and Saunas

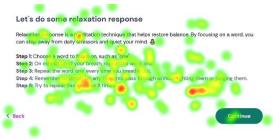
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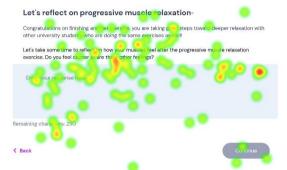
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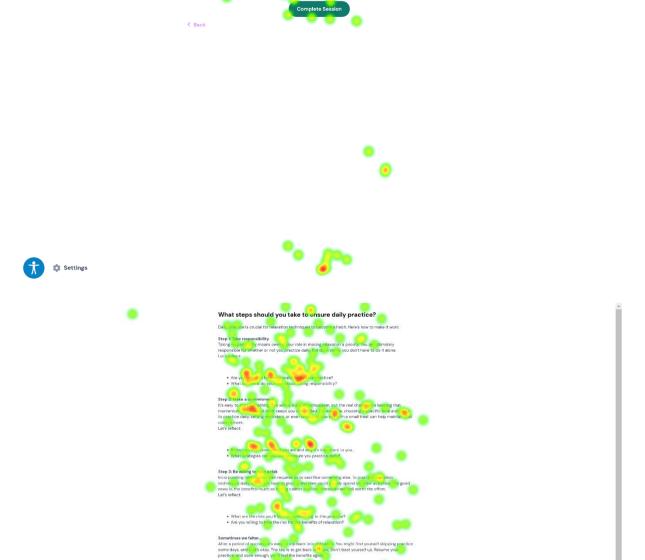
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The End





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Understanding You: Stress
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