



UNIVERSITY OF TWENTE.

BACHELOR THESIS

The Relation between the Perceived Acceptability of different Instruction Styles in Mobile Applications and Gender

In the context of increasing stress management in university students

Author: Sophia Tegethoff



EXAMINATION COMMITTEE

1st Supervisor: Dr. L.M.A. Braakman-Jansen

2nd Supervisor: C. Wrede, MSc.

Abstract

Background: The prevalence of stress within students of higher education is dramatically high with over 45%. Several short- and long-term consequences of stress impose a burden on health care systems and as there is only a student-to-counselling-staff ration of 1:1737 the need for other solutions is urgent. eHealth interventions might be a solution as they have several benefits but need to be tailored to different user characteristics to be more acceptable and effective. It is known that women tend to prefer non-authoritative speech, whereas, men prefer authoritative instructions. Thus, this study aims to investigate whether the perceived acceptability of authoritative and non-authoritative instruction style significantly varies between genders in the context of stress management mobile applications and university students. Moreover, it aims to explore the reasons for user acceptance for the different instruction styles.

Methods: A cross-sectional online survey design was used. Through non-probability sampling, a heterogeneous-convenient sample was gathered. Storyboards were created to imitate an interaction with a mobile application displaying different instruction styles. The 7 items Perceived Acceptability Scale as well as the 10 items Perceived Stress Scale were used. The software SPSS was used for the analysis. Through a Wilcoxon signed rank test the perceived acceptability scores of both instructions styles were compared for the full sample. A Mann-Whitney U test was run for the comparison of the perceived acceptability scores and gender as well as an independent sample t-test for the comparison of the stress scores and gender. By categorizing, comments and reactions of the participants with the same theme were clustered into codes.

Results: The sample consisted of $N=114$ participants, with a mean (*sd*) age of 23 (4.3) and 63% female gender. The whole sample was moderately stressed with a mean (*sd*) stress score of 2.8 (0.6). Women were higher stressed than men ($p=.047$). The perceived acceptability of the authoritative instruction style, as well as the non-authoritative instruction style, did not significantly vary between genders ($p=.72$, $p=.35$, respectively). However, for the full sample, the perceived acceptability of the non-authoritative instruction style was significantly higher compared to the authoritative instruction style ($Z=-4.125$, $p=.00$). Four conditions which either negatively or positively influenced user acceptance were identified: Ambiguity of Content, Tone/Wording Preferences, Positive Reinforcements, and Disapproving Content.

Conclusion: When creating mobile applications to increase the stress management of moderately stressed students a non-authoritative instruction style is recommended for both genders. Furthermore, it is important to keep the four conditions of user acceptance in mind when creating storyboards and stress management mobile applications. Future research using a decent mixed methods approach is needed as gender was not found to be a relevant factor in this study.

Keywords: eHealth, stress-management, mobile applications, instruction styles, persuasive features, students, gender differences

Table of Contents

Abstract	2
1. Introduction	4
2. Methods.....	8
2.1 Design.....	8
2.2 Participants	8
2.3 Materials.....	9
2.4 Procedure.....	10
2.5 Analysis	11
3. Results.....	12
3.1 Comparison between Genders.....	13
3.2 Perceived Acceptability Conditions	14
4. Discussion.....	15
4.1 Strengths and Limitations	16
4.2 Practical Implications and Future Research	17
References	19
Appendix A – Full Questionnaire	22

1. Introduction

In today's society, stress and its related diseases are increasing and by that imposing a burden on the health care system and a threat to public health. According to the American Psychological Association (2017), 45% of university students who seek counselling do so because of stress. There is also a rise of over 30% of university students seeking appointments for counselling. Furthermore, a study of 1617 Turkish university students found that 27% are stressed, and a study of 506 students from four universities in Malaysia found the prevalence of anxiety, depression and stress to be 34%, 28% and 19%, respectively (Hakami, 2018). Long-term consequences are among others cardiovascular, and gastrointestinal diseases, depression and anxiety (Michie, 2002). Additionally, long-term exposure to stress can lead to drug addiction, concentration problems as well as sleeping problems (Michie, 2002). Previous research found stress also to be a biologically significant factor by altering brain cells which disturb cognitive processes like memory or learning (Kim & Diamond, 2002). Therefore, stress limits human life quality and the wellbeing of an individual.

Over the years many different definitions of stress occurred, however, the generally accepted one today is that of an interaction between the situation and the individual (Michie, 2002). According to Michie (2002), stress is the psychological and physical state when an individual has not sufficient resources to cope with the demands of a situation. The causes for stress in university students vary from personal ones like family problems or living alone for the first time, to academic ones like time pressure, work-overload or pressure to meet the requirements of academia (Bayram & Bilgel, 2008). Looking at the psychological component of stress, the transactional model of stress by Lazarus (1993) states that the appraisal, or perception, of a situation, determines whether it leads to stress or not. How much of a threat an individual interprets a stressor to be is classified as the primary appraisal whereas the perceived available resources to cope with this stressor is the secondary appraisal (Lazarus, 1993). When an individual perceives a possible stressor as threatening or harmful together with low perceived coping abilities, stress is experienced (Morrison & Bennett, 2012). The other way around, when an individual appraises a stressor as threatening but feels capable of coping with the stressor, no or low stress is experienced. This is due to the resources the individual possesses to deal with the demands of the situation (Morrison & Bennett, 2012). Furthermore, there are two types of stress. When stress is only present for a short time, for example before an exam, it is classified as acute stress and can, in fact, be helpful to perform better (Morrison & Bennett, 2012). However, when stress remains present for a longer period, it becomes chronic and can lead to the earlier mentioned health problems. In addition to the

emotional component of stress, there is also a physical explanation. For instance, when the safety of an individual is threatened the first response is physical arousal in the form of increased heart and breathing rate as well as muscle tense (Michie, 2002). By that, the fight-or-flight modus of the body is activated and acute stress is experienced (Selye, 1974). After this alarm reaction the body transitions into a state where it tries to adapt to the stressor (Selye, 1974). If this lasts too long it will lead to an exhaustion of mental and physical resources which is then chronic stress. How a person interprets and reacts to a stressor also depends on past experiences and the set of resources he/she has (Selye, 1974). Therefore, the amount of experienced stress varies between situations and individuals.

As the problem of stressed students is present for decades now, several interventions aiming to reduce the stress in university students have been developed, tested and implemented. Most of these interventions are cognitive, behavioural and mindfulness-based and consist of single or group sessions over a specific given period. For example, the Mind/Body intervention done by Deckro et al 2002, consisted of 6 weekly 90 minutes sessions which included lectures, discussions and exercising of mind/body skills. These mind/body skills are for example the relaxation response (RR), which is the opposite of the flight-or-fight response and can be consciously elicited by repeating a word, phrase etc while ignoring distracting thoughts. The results of this intervention showed that the psychological distress and anxiety in students that participated in the 6-week programme significantly decreased compared to a control group (Deckro et al., 2002). Several other interventions like the Transcendental Meditation Intervention by Burns, Lee, & Brown (2011) or the Cognitive-Behavioral Stress Management (CBSM) intervention by Gaab et al. (2006) used similar methods and found similar results. So, it is proven that educating about how stress arises, what are common stressors as well as teaching different relaxation and/or cognitive behavioural techniques is effective in the stress reduction of university students. However, during the last decades, the problem of highly stressed students did not decrease but rather increase, which leads to the question why? One answer might be that these interventions are normally acted out in a face-to-face approach which makes it difficult to be available for everyone as there is only a student-to-counselling-staff ratio of 1,737:1 (APA, 2017). Therefore, the need to find other solutions that are available for everyone to help students in this situation is urgent.

E-Health technologies afford many opportunities to support individuals to engage in healthy behaviours (van Gemert-Pijnen, Kelders, Kip, & Sanderman, 2018). As, nowadays, almost every student possesses a Smartphone which provides access to these eHealth

technologies it could support students to increase their stress management abilities. E-health technologies can be defined as all the technology used to support and enhance healthy behaviour in individuals (Eysenbach, 2001). They provide the opportunity to support the individual at a time and place convenient for the user because they are available 24/7. Furthermore, as they are almost always available it is possible to intervene in the right moment (Consolvo, S. et al., 2006). For instance, when an individual is stressed during studying and he/she notices it, they could use the mobile application to practice a short 5-minute meditation or increase their time management by separating big tasks into smaller ones. Additionally, these eHealth technologies can be used anonymous which provides an opportunity for students who feel stressed but still hesitate to ask for help because they think stress is normal or feel pressure to deal with it alone. With mobile applications, it could be acted out in private without anyone else to know.

To make these technologies more effective designers use persuasive strategies and behaviour change techniques to achieve a change in attitude and behaviour. The PSD model by Oinas-Kukkonen and Harjumaa (2009) gives a detailed insight into all the aspects that should be considered when developing a persuasive system and also how to evaluate it. The framework states three phases to do so. First of all, it is important to understand some issues behind persuasive systems and the model points out seven aspects that need to be addressed (eg.: Information technology is never neutral). The second phase concerns analyzing the context in which the persuasion takes place. For instance, it is important to understand the persuadee, the role of the persuader, the channel of communication and also the user's motivation among others. The PSD model categorises these into the intent, the event and the strategy. The third phase emphasizes the design of system features to increase the persuasive potential of technology. In total, the framework provides 28 design principles, which are, for example, giving rewards, including social comparison or tailoring the system to specific user needs (Oinas-Kukkonen and Harjumaa, 2009).

Despite the access to the PSD Model, most health technologies are designed for a more general audience and mainly use one persuasive strategy (Halko & Kientz, 2010). This one-size-fits-it-all approach can impact the effectiveness negatively because what is motivating for one individual might be demotivating for another one. Therefore, it is important to tailor the technology to the different characteristics of the user. Several studies have shown that personality and/or gender are important factors to consider. For instance, Halko and Kientz (2010) found that the perceived acceptability of different persuasive strategies like the instruction style, the type of motivation, social feedback and the type of reinforcement is

related to the personality of an individual. Perceived acceptability covers, among others, factors like the likelihood that an individual would make use of the technology, that an individual would enjoy using it or if the technology would improve their quality of life. Halko and Kientz (2010) showed storyboards to their participants which imitated an interaction between an individual and a mobile application which aimed at increasing physical activity. Furthermore, a study done by Orji, Mandryk, and Vassileva (2014) which used the same approach as Halko and Kientz found that there are also differences between men and women and the perceived persuasiveness of five persuasive strategies. Women perceived cooperation, customization, personalization, praise, and simulation as being more persuasive than males. Orji, Mandryk and Vassileva (2014) also concluded that women are in general more persuadable than man in the context of the influence of persuasive strategies on their behaviour. Additionally, Oyibo, Orji and Vassileva (2017) found that males are more responsive to reward and competition strategies than females. Another study done by Chittaro (2016) investigated if the perceived persuasiveness of two different types of message framing is influenced by gender. The results showed that women were more persuaded by gain-framed messages whereas men were more persuaded by loss-framed messages.

So, the above-mentioned studies have shown that gender has an effect on the perceived persuasiveness of different persuasive strategies and is a reasonable factor for consideration to make persuasive technology more effective. However, to date, no study has researched about the relationship between gender and the perceived acceptability of the persuasive strategy of different instruction styles although it is known that, on a general level, females prefer non-authoritative speech and are also more responsive to it compared to men (Carli, 1989; Kuhn, 1992; Kline, 1994). Additionally, men and women also differ in the strategies they tend to use themselves to persuade others. A study done by Harper and Horikawa (2009) found that male managers rely more on punishment-based strategies whereas female managers rely more on altruism-based strategies. This supports the assumption that females favour authoritative strategies less than men and therefore might also be less responsive to them. Additionally, the above-mentioned studies by Orji, Mandryk, and Vassileva (2015) and Oyibo, Orji and Vassileva (2017) suggest that the persuasive power of a strategy and the relation to specific user characteristics may be context-dependent and may differ depending on the domain it focuses on. Therefore, this study aims to investigate whether the perceived acceptability of authoritative and non-authoritative instruction style significantly varies between genders in the context of increasing stress management in university students. Due to its focus on the domain of stress management and also on students

of higher education it contributes to filling the mentioned gap in the literature. Moreover, to get insights into the thoughts and feelings of the participants towards the displayed technology this study also aims to explore possible reasons for user acceptance for the different instructions styles by including a qualitative element. This provides an opportunity to reach a greater breadth of perspectives and by that understand what is important to the user. All in all, taking the current findings into account, that in several studies women are more influenced through friends/peers and in a non-authoritative manner and that on the other hand males are more responsive to authoritative speech it is hypothesized:

H1: Female students show significantly higher perceived acceptability of the non-Authoritative Instruction style compared to male students.

H2: Male students show significantly higher perceived acceptability of the Authoritative instruction style compared to female students.

2. Methods

2.1 Design

A cross-sectional online survey design has been used to examine the relationship between the perceived acceptability of different instruction styles (Authoritative vs. Non-Authoritative) of stress management mobile applications and gender. Storyboards were used to represent the persuasive strategy of different instruction styles and imitated an interaction between the mobile application and the user.

2.2 Participants

The main inclusion criteria were: age equal to or above 18 years and being a student of higher education. G-power analysis for the expected medium effect size resulted in a sample size $N=210$ consisting of $N=105$ males and $N=105$ females with a power of .95, 2-sided tested. Through non-probability sampling, a heterogeneous-convenient sample was recruited from the closer environment of the researcher and cross-sectional data was gathered. Furthermore, the recruitment was done simultaneously via public postings (Facebook, Instagram), private invitations (Whatsapp) and the SONA system of the University of Twente.

2.3 Materials

Demographic Questions

The first three items of the survey are about the demographic characteristics of the participants. The age, the gender and the nationality are asked (eg. “How old are you?”). This is important to get an overview of the representativeness of the sample and to be able to answer the research question which focuses on the differences in gender.

Storyboards

The storyboards were created by the researcher to imitate an interaction between a stress management mobile application and the user. The use of storyboards was chosen as they provide common visual language and by that are understandable for people from different backgrounds. The storyboards show different instruction styles (Authoritative and Non-Authoritative) and are used as an input to measure the perceived acceptability of this persuasive strategy. Furthermore, the storyboards are based on the validated storyboards by Halko & Kientz (2010). The authoritative instruction style is imitated through a drill agent that gives clear instructions on how to decrease the stress level whereas the non-authoritative instruction style uses a neutral agent like a friend to encourage the user to meet their goals.

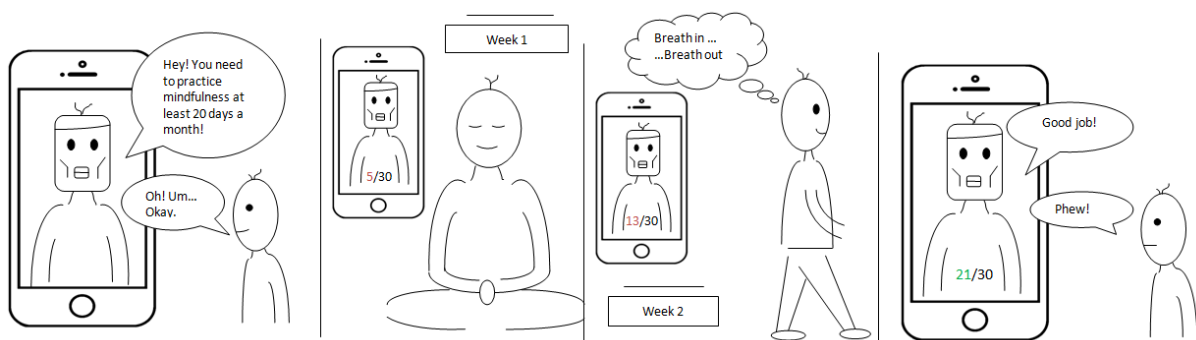


Figure 1 *Authoritative Instruction Style*

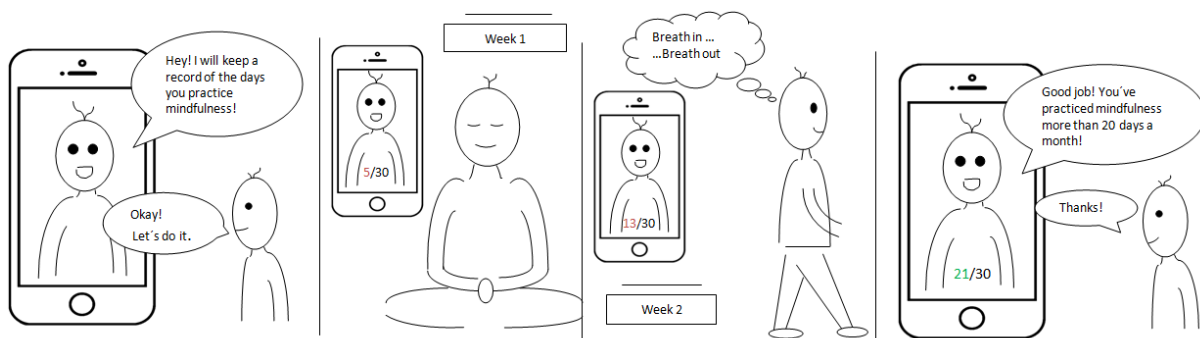


Figure 2 *Non-Authoritative Instruction Style*

Perceived Acceptability Items

To measure how the participants perceived the shown storyboards the approach of Halko and Kientz (2010) was followed using the same seven questions regarding different aspects of acceptability. Six of them covered the perceived enjoyment, likelihood of use, helpfulness, quality of life, ease of use, and time-saving aspects of the technology (eg. “With regards to my own health goals, I consider this technology helpful.”) The items were answered on a 7-point Likert scale (1=Disagree strongly; 2=Disagree moderately; 3=Disagree a little; 4=Neither agree nor disagree; 5=Agree a little; 6=Agree moderately; 7=Agree strongly) with higher scores reflecting higher perceived acceptability. The seventh question asked for any additional comments or reactions to the technology. The scores range from 0 to 42. Furthermore, the internal consistency of the perceived acceptability scale was examined using Cronbach’s alpha. Values $> .5$ show unacceptable internal consistency; values $> .6$ reflect questionable internal consistency and the values $> .7$, $> .8$, $> .9$ reflect acceptable, good and excellent internal consistency, respectively (Nunnally, 1978; George & Mallery, 2003). In this study, the scales for both storyboards showed excellent reliability (.91).

Perceived Stress Scale (PSS)

The stress levels of the participants were obtained using the 10-item Perceived Stress Scale (PSS) by Cohen, Kamarck and Mermelstein (1983). It measures how unpredictable or overloaded the participant perceives his/her life during the last month and also if the participants felt able to cope with different situations. Items are rated on a 5-point Likert scale (0=“Never”; 1=“Almost Never”; 2=“Sometimes”; 3=“Fairly Often”; 4=“Very Often”). The scores of the positively formulated items were reversed and after that, the total scores were calculated. The scores range from 0 to 40, with higher scores showing higher perceived stress. The PSS is not a diagnostic tool and therefore has no cut-off scores. Furthermore, the scale has good reliability with Cronbach’s alpha .86 and also acceptable validity (Lee, 2012).

2.4 Procedure

From the 1st of April until the 8th of May the online survey was available on Qualtrics and SONA, which is a platform from the University of Twente that gives students credits for participating in studies of other students from the UT. The participation was voluntary, so the participants did not receive any rewards, despite the SONA credits for UT students. To ensure that the study is ethical and no one gets harmed an overview was submitted to the Faculty of

Behavioural Sciences Ethics Committee of the University of Twente and they gave ethical approval for conducting the survey.

When someone decided to participate in this study an anonymous link led to the landing page of the survey, which displayed the informed consent (see Appendix). A short overview was given on the topic of the study, its purpose as well as the expected time frame for the questionnaire. Participants were also informed that they could end their participation at any time of the survey without providing a reason. After they declared that they have read and accepted the provided information, the demographic characteristics, for example, age, gender, nationality etc. were asked. If a person fulfilled the inclusion criteria he/she were forwarded to the next page which displayed a storyboard of an interaction between an individual and a stress management mobile application. The participant was instructed to inspect the interaction carefully and after that to answer questions about the perceived acceptability (eg. “This technology is something that I would enjoy using”). In total two storyboards were shown, one illustrating an authoritative instruction style and the other one a non-authoritative instruction style. After each of them, the perceived acceptability items were asked in a standard sequence, so every participant had to answer the items in the same order. Furthermore, the stress level of the participants was measured (eg. “In the last month, how often have you felt nervous and “stressed”?). After that, the end of the survey was reached and participants were thanked for their contribution and reminded that they can always contact the researcher in case of questions or other remarks.

2.5 Analysis

The data of the questionnaires were imported into the SPSS software, version 24. Data of participants that either did not fill out the questionnaire completely or did not meet the inclusion criteria were excluded from the analysis. Due to that, N=54 missings which are 31% of the dataset were not considered. Descriptive statistics were used to summarize the social demographic characteristics of the study sample (age, gender, etc.). Second, a preliminary test for normality (Kolmogorov Smirnov test) was used. The normality assumption of the perceived acceptability scale could not be approved whereas the perceived stress scale (PSS) was found to be normally distributed. After that, the mean scores of the PSS were calculated to get an impression of the stress level of the whole sample as well for each participant. An independent sample t-test was conducted to compared the stress scores of males and females in the sample. Furthermore, the median scores for the perceived acceptability scales were also calculated for each participant to be able to conduct further analysis. For the full sample, a

Wilcoxon signed rank test was executed to compare the perceived acceptability scores of the authoritative and non-authoritative instruction styles. To either reject or accept the null hypothesis that there is no difference in the perceived acceptability in males and females a Mann-Whitney U test was conducted. It was used to compare the results of the perceived acceptability scale for the Authoritative and Non-Authoritative instruction style and being male or female. To explore the reasons for user acceptance for the different instruction styles item 7 of the perceived acceptability scale was analyzed inductively by thematic analyses. By categorizing, fragments with the same theme were clustered into one code. Revision of categories and coding agenda was carried out as a formative check of reliability. Moreover, for each cluster, the median scores and range of the participants which made comments in that cluster were calculated to get insights into their perceived acceptability. The outcomes of the analysis are significant at a p-value <.05.

3. Results

After the exclusion of incomplete data ($N=54$), the final sample consisted of $N=114$ university students with a mean (sd) age of 23 (4.3) years. The majority was female (63%) and most of the participants stated to have German nationality (91%) as displayed in Table 1.

Table 1
Overview of Participant Characteristics

Characteristic	Total Sample	Female	Male
	$N=114$	$N=72$	$N=42$
Gender			
$N(\%)$ Female	72 (63)		
$N(\%)$ Male	42 (37)		
Mean Age in Years (sd)	23 (4.3)	23 (4.7)	23 (3.0)
Nationality			
$N(\%)$ German	104 (91)	70	34
$N(\%)$ Dutch	3 (3)	2	1
$N(\%)$ Other	7 (6)	0	7

3.2 Comparison between Genders

It was found that females and males do significantly differ in their perceived stress during the last month ($p = .047$). Female students in this study were higher stressed than males. However, males and females do not significantly differ in their perceived acceptability of the different instruction styles, as shown in Table 2. So, in the current study the authoritative instruction style was perceived as almost equally acceptable by males and females ($p = .724$) and also the non-authoritative instruction style was perceived as almost equally acceptable by males and females ($p = .349$). Therefore, the first hypothesis (H1) “Female students show significantly higher perceived acceptability of the non-Authoritative Instruction style compared to male students.” can be rejected. Additionally, the second hypothesis (H2) “Male students show significantly higher perceived acceptability of the authoritative instruction style compared to female students.” can also be rejected. Nevertheless, in the whole sample, the non-authoritative instruction style reached significantly higher perceived acceptability scores than the authoritative instruction style ($Z = -4.125, p = .00$).

Table 2

Comparison between Males and Females and their Perceived Stress Scores (independent sample t-test) as well as Perceived Acceptability Scores (Mann Whitney U test)

	Total Sample N=114	Female N=72	Male N=42	<i>p</i>
Mean Stress Score (sd)	2.8 (0.6)	3.0 (0.7)	2.7 (0.6)	.047
Median Authoritative Instruction Style (range)	3.5 (6.0)	3.5 (6.0)	3.5 (5.0)	.724
Median Non-Authoritative Instruction Style (range)	5.0 (6.0)	5.0 (6.0)	4.5 (5.5)	.349

3.3 Perceived Acceptability Conditions

Regarding the second research question, the seventh item of the Perceived Acceptability Scale asked for general comments and reactions on the displayed storyboards. The different categories in which the comments were clustered are shown in Table 3. Regarding both storyboards, some participants had problems understanding the content of the storyboards and were unsure of what is meant with mindfulness. Participants which made comments from this

category scored a median (range) of 3.0 (4.0) out of possible 7.0. Furthermore, the commanding phrases in the authoritative storyboard were disapproved by participants which were also visible in the perceived acceptability scores of these participants ($Mdn=2.75$, $r=4.0$) Additionally, it was also criticized that the authoritative instruction style does not fit the context of stress management as participants did not see any sense in forcing someone to practice mindfulness. This was also displayed in the perceived acceptability scores with a median (range) of 2.0 (4.0). Regarding the non-authoritative instruction style, the comments were almost all positive and especially the “reward” of getting positive feedback after they executed the desired behaviour were appreciated ($Mdn=5.0$, $r=6.0$).

Table 3

Overview of Perceived Acceptability Conditions for Instruction Styles

Perceived Acceptability Condition	Authoritative Instructions/Non-Authoritative Instructions	No. of quotes	Example quote	Median (range)
Ambiguity of content	Both	5	“No instruction what counts as being mindful which makes it hard to understand”	3.0 (4.0)
Tone and wording preferences	Authoritative	8	“the instruction would prevent me of using this technology because the word “need” is used (it seems like a command)”	2.75 (4.0)
Positive Reinforcement	Non-Authoritative	12	“It track's goals that you achieved so you feel productive and positive about the achievement”	5.0 (6.0)
Disapproving Context	Authoritative	7	“There is no point in forcing somebody to relax”	2.0 (4.0)

4. Discussion

The main purpose of this study was to find out whether females and males prefer different instruction styles in stress management mobile applications and what are possible reasons for their perceived acceptability. Taking the whole sample into account the non-authoritative instruction style was favoured over the authoritative instruction style. Surprisingly, no difference between males and females and their preferences of instruction styles were detected. Due to these findings, the first hypothesis which claims that women perceive the non-authoritative instruction style as more acceptable than men is rejected. The second hypothesis which states that men perceive the authoritative instruction style as more acceptable than women is also rejected. Additional comments and reactions of the participants revealed four conditions for user acceptance: unambiguous content, tone/wording preferences, positive reinforcements and a fitting context.

The results of the current study are contradictory to the findings of previous studies, which found differences between the perceived acceptability of persuasive features like rewards and the gender of an individual (Halko & Kientz, 2011, Orji, Mandryk and Vassileva, 2014, Oyibo, Orji and Vassileva, 2017). However, these studies were done in the context of increasing physical activity in individuals. When trying to persuade an individual to increase physical activity an authoritative instruction style might have reached higher perceived acceptability as clear and demanding instructions might be preferred when it comes to motivating someone in this domain. Also, the studies done by Carli (1989), Kuhn (1992), Kline (1994), and Harper and Horikawa (2009) led to expecting differences between males and females and authoritative and non-authoritative instructions but could not be underpinned by the findings in this study. This could be due to the context of the above-mentioned studies as they focused on differences between genders but did not include any specific health threat like the factor stress. So, previous studies focused rather on a more general audience. Furthermore, the studies which found women to prefer non-authoritative instructions and men favour authoritative instructions were all acted out face to face and not like in this study through an illustration. By that, the instructions also included, additionally to vision, other senses like hearing or smell. This might be a reason why the findings of this study are different compared to the findings of previous studies as the tone of a message is also very important and can change the perception of it drastically. The current study used plain mock-ups which focussed solely on the instruction style based on the text itself and left out other elements like colours, tones or even different genders of the instructor. Several studies found that female instructors are perceived as compassionate, understanding and supportive, while

male instructors are seen as assertive, challenging or self-assured which might influence persuasiveness as different participants prefer different characteristics in their instructors (Clune, 2009). So, displaying both female and male instructors, using colours in the storyboards and/or using voice-based coaching might have led to other results. Another factor to consider is that of publication bias as sometimes studies which found nonsignificant results were not published (Kühberger, Fritz & Scherndl, 2014). This is a widespread phenomenon in psychology and might have led to the impression that differences can be expected when in reality other studies have found no significant differences as well. Additionally to that, inflation bias, also called “p-hacking”, is another strategy used by researchers to get statistically significant results. This is done by trying out several data eligibility specifications and/or data analyses until nonsignificant results become significant (Simmons, Nelson, & Simonsohn, 2013, Head, Holman, Lanfear, Kahn, & Jennions, 2015). Therefore, it is unclear if the available studies which found differences between males and females and their preferences of instruction styles represent reality.

4.1 Strengths and Limitations

Positive aspects of the study are among others the solid amount of related studies which made the expected difference reasonable. No other study before combined the context of stressed university students, the persuasive feature of instruction style and the gender of an individual and by that filled this gap in the literature. Furthermore, this study combined a quantitative approach with a qualitative element to get insights into the reasons for user acceptance. This mixed-methods approach provides many benefits and is a well-recognised approach (Bulsara, 2015, Molina-Azorin, 2016). Another strength of the current study is that of a moderately stressed sample as the focus lied in the field of increasing stress management. On a more detailed level this study used measurements that showed excellent psychometric properties and by that were wisely chosen. However, there are also some limitations to the current study. First of all, the sample size was under-powered for the expected medium effect size. Although 210 participants were planned it was only possible to recruit 114 participants. Especially men were underrepresented and only made up one-third of the whole sample. This might have impacted the results of the study as it is recommended to have an equal number of participants in each of the compared groups. The smaller the sample size the harder it gets to detect significant differences between two groups. So, the results might be different if as many men as women participated. Furthermore, the created storyboards were not pre-tested before used in this study. In the comments, it was pointed out that it was hard to understand what was

meant by mindfulness and also that despite the imitated interaction it was “hard to imagine how helpful it really is”. Due to that some participants might be too confused or unsure about the content to evaluate the storyboards. Also, the context of moderately stressed individuals may not fit the authoritative instruction style as a lot of comments stated that it makes no sense to them to force an individual to practice stress releasing exercises.

4.2 Practical Implications and Future Research

Despite the limitations of the current study, some practical implications can be made. For instance, this study showed that mobile applications aiming at increasing stress management should use positive reinforcement as most participants stated that they liked the encouraging positive feedback used in the non-authoritative instruction style. Also avoid the use of words like “need to” in the instructions is recommended as some participants felt forced to perform the desired behaviour, which demotivated them. So, the information gathered in this study, for example, wording preferences can help to create storyboards that are unambiguous and understandable for every individual. Additionally, as the sample of this study were moderately stressed and favoured the non-authoritative instruction style over the authoritative one it is recommended to use non-authoritative speech when working with individuals from this population.

Additionally, this marks a good starting point for future research. It was found that for moderately stressed students the non-authoritative instruction style is preferred but it is questionable if highly stressed students prefer the same or if they need a stricter instructor to be able to follow it. Moreover, it would be interesting to find out how persuasive instructions can be when other factors like the gender or age of the instructor and other elements were adapted to user preferences. Furthermore, the holistic framework created by van Gemert-Pijnen, Nijland, van Limburg, Ossebaard, Kelders, Eysenbach and Seydel (2011) showed that for future studies a mixed-methods approach would be advisable including pre-tests and interviews with the end-user as well as other stakeholders to get insights into their needs and preferences. This bottom-up approach makes clear what is important to consider by formatively testing it. Testing a pre-design will detect shortcomings which could then be fixed and will, therefore, lead to wisely chosen persuasive features and more. Van Gemert-Pijnen, Nijland, van Limburg, Ossebaard, Kelders, Eysenbach and Seydel (2011) also showed that a participatory development process which includes points of all stakeholders, for example, that of technicians, designers or payers will lead to an even more coherence intervention and by that increase the uptake. Moreover, this study marks a starting point for the creation of new

storyboards. To avoid ambiguity regarding the displayed content of the storyboards, they should be pre-tested and adapted when needed. Pretested storyboards with a wide range of persuasive features used in different contexts are needed. Especially, to be able to make mobile applications more user-centred and fitted to the specific needs of the user.

In conclusion, the expected difference between male and female students and their perceived acceptability of authoritative and non-authoritative instruction styles was not found but through the results, it was shown that in general the non-authoritative instruction style was favoured by both males and females over the authoritative one. Therefore, the current study gained knowledge about the preferences of moderately stressed students regarding instructions. It also gave insights into the different conditions for user acceptability of the created storyboards and by that provides practical suggestions for future storyboards and research. All in all, this study highlights the need to further explore and find the optimal persuasive features to increase the adherence and effectiveness of eHealth and, especially, stress management mobile applications to tackle the increasing problem of stress and its related diseases in students.

References

- Abouserie, R. (1994). Sources and levels of stress in relation to locus of control and self esteem in university students. *Educational psychology, 14*(3), 323-330.
doi:10.1080/0144341940140306
- Andersen, K., & Miller, E. D. (1997). Gender and student evaluations of teaching. *PS: Political Science and Politics, 30*, 216-219 doi: 10.2307/420499
- Baker, M. A. (1991). Gender and verbal communication in professional settings. *Management Communication Quarterly, 5*, 36-63 doi:10.1177/0893318991005001003
- Bayram, N., & Bilgel, N. (2008). The prevalence and socio-demographic correlations of depression, anxiety and stress among a group of university students. *Social psychiatry and psychiatric epidemiology, 43*(8), 667-672. doi:10.1007/s00127-008-0345-x
- Bulsara, C. (2015). Using a mixed methods approach to enhance and validate your research. *Brightwater Group Research Centre, 1-82*.
- Carli, L. L. (1989). Gender differences in interaction style and influence. *Journal of Personality and Social Psychology, 56*(4), 565–576. doi:10.1037/0022-3514.56.4.565
- Chittaro, L. (2016, April). Tailoring web pages for persuasion on prevention topics: message framing, color priming, and gender. In *International Conference on Persuasive Technology* (pp. 3-14). Springer, Cham. doi:10.1007/978-3-319-31510-2_1
- Clune, K. F. (2009). *Students' perceptions of instructor credibility: Effects of instructor sex, gender role, and communication style* (Doctoral dissertation, University of Kansas). ISBN: 978-1-1096-4021-2
- Consolvo, S. et al. (2006). “Design Requirements for Technologies that Encourage Physical Activity” in Proceedings of ACM CHI 2006 Conference on Human Factors in Computing Systems, New York: ACM Press, pp. 457-466
doi: 10.1145/1124772.1124840
- Coulon, S. M., Monroe, C. M., & West, D. S. (2016). A systematic, multi-domain review of mobile smartphone apps for evidence-based stress management. *American journal of preventive medicine, 51*(1), 95-105. Doi:10.1016/j.amepre.2016.01.026
- Cox, T. (1987). Stress, coping and problem solving. *Work & Stress, 1*(1), 5-14.
doi:10.1080/02678378708258476
- Dantzer, R., & Kelley, K. W. (1989). Stress and immunity: an integrated view of relationships between the brain and the immune system. *Life sciences, 44*(26), 1995-2008.
doi:10.1016/0024-3205(89)90345-7
- Deckro, G. R., et al (2002). The evaluation of a mind/body intervention to reduce

- psychological distress and perceived stress in college students. *Journal of American College Health*, 50(6), 281-287. doi: 10.1080/07448480209603446
- Downs, M. F., & Eisenberg, D. (2012). Help seeking and treatment use among suicidal college students. *Journal of American College Health*, 60(2), 104-114. doi:10.1080/07448481.2011.619611
- Drozd, F., Lehto, T., & Oinas-Kukkonen, H. (2012, June). Exploring perceived persuasiveness of a behavior change support system: a structural model. In *International Conference on Persuasive Technology* (pp. 157-168). Springer, Berlin, Heidelberg. doi: 10.1007/978-3-642-31037-9_14
- Eysenbach, G. (2001). What is e-health? *J Med Internet Res*, 3(2), e20. doi:10.2196/jmir.3.2.e20
- Hakami, R. M. (2018). Prevalence of psychological distress among undergraduate students at Jazan University: A cross-sectional study. *Saudi journal of medicine & medical sciences*, 6(2), 82. doi: 10.4103/sjmms.sjmms_73_17
- Harper, N. L., & Hirokawa, R. Y. (2009). A comparison of persuasive strategies used by female and male managers I: An examination of downward influence. *Communication Quarterly*, 36(2), 157-168. doi: 10.1080/01463378809369716
- Head, M. L., Holman, L., Lanfear, R., Kahn, A. T., & Jennions, M. D. (2015). The extent and consequences of p-hacking in science. *PLoS Biol*, 13(3), e1002106. doi:10.1371/journal.pbio.1002106
- Hoffmann, A., Christmann, C. A., & Bleser, G. (2017). Gamification in stress management apps: a critical app review. *JMIR Serious Games*, 5(2), e13. doi:10.2196/games.7216
- Kaptein, M., Lacroix, J., & Saini, P. (2010, June). Individual differences in persuadability in the health promotion domain. In *International Conference on Persuasive Technology* (pp.94-105). Springer, Berlin, Heidelberg. doi: 10.1007/978-3-642-13226-1_11
- Kim, J., Diamond, D. (2002). The stressed hippocampus, synaptic plasticity and lost memories. *Nat Rev Neurosci* 3, 453–462. doi:10.1038/nrn849
- Kline, S. L. (1994). Gender differences in persuasive message practices. *Women's Studies in Communication*, 17(2), 68-88. doi: 10.1080/07491409.1994.11089783
- Kuhn, E. D. (1992). *Gender and Authority: Classroom Diplomacy in German and American Universities* (Vol. 373).
- Kühberger, A., Fritz, A., & Scherndl, T. (2014). Publication bias in psychology: A diagnosis based on the correlation between effect size and sample size. *PloS one*, 9(9), e105825. doi:10.1371/journal.pone.0105825

- Lazarus, R. S. (1993). From psychological stress to the emotions: A history of changing
Annual review of psychology, 44(1), 1-22. doi: 10.1146/annurev.ps.44.020193.000245
- Lee, E. H. (2012). Review of the psychometric evidence of the perceived stress scale. *Asian nursing research*, 6(4), 121-127. doi: 10.1016/j.anr.2012.08.004
- Michie, S. (2002). Causes and management of stress at work. *Occupational and environmental medicine*, 59(1), 67-72. Doi: 10.1136/oem.59.1.67
- Molina-Azorin, J. F. (2016). Mixed methods research: An opportunity to improve our studies and our research skills. doi:10.1016/j.redeen.2016.05.001
- Morrison, V., & Bennett, P. (2012). *An Introduction to Health Psychology*: Pearson Education Limited.
- Oinas-Kukkonen, Harri and Harjumaa, Marja (2009) "Persuasive Systems Design: Key Issues, Process Model, and System Features," *Communications of the Association for Information Systems*: Vol. 24 , Article 28. doi:10.17705/1CAIS.02428
- Orji, R., Mandryk, R. L., & Vassileva, J. (2015). Gender, age, and responsiveness to Cialdini's persuasion strategies. In *International Conference on Persuasive Technology* (pp. 147-159). Springer, Cham. doi: 10.1007/978-3-319-20306-5_14
- Orji, R., Mandryk, R. L., & Vassileva, J. (2014). Gender and persuasive technology: Examining the persuasiveness of persuasive strategies by gender groups. *Persuasive Technology*, 48-52.
- Oyibo, K., Orji, R., & Vassileva, J. (2017). Investigation of the Persuasiveness of Social Influence in Persuasive Technology and the Effect of Age and Gender (pp. 32-44).
- Selye, H. (1974). *Stress without distress*. New York: The New American Library. *Inc, A Signet Book*, 1-51.
- Simmons, J. P., Nelson, L. D., & Simonsohn, U. (2013, January). Life after p-hacking. In *Meeting of the society for personality and social psychology, New Orleans, LA* (pp. 17-19). doi: 10.2139/ssrn.2205186
- van Gemert-Pijnen, J. E. W. C., Kelders, S. M., Kip, H., & Sanderman, R. (2018). *eHealth Research, Theory and Development: A Multi-Disciplinary Approach*: Routledge. ISBN: 9781138230422
- van Gemert-Pijnen, J. E., Nijland, N., van Limburg, M., Ossebaard, H. C., Kelders, S. M., Eysenbach, G., & Seydel, E. R. (2011). A holistic framework to improve the uptake and impact of eHealth technologies. *Journal of medical Internet research*, 13(4), e111. doi 10.2196/jmir.1672

Appendix A – Full Questionnaire

Dear respondent,

Thank you for participating in this study which is part of our bachelor thesis at the University of Twente. This study focuses on the persuasion of stress management mobile applications and how this is connected to sample features like personality traits, coping strategies or gender. It will take you about 10 minutes to complete this survey. Please answer the questions honestly; there are no right or wrong answers.

You are free to stop the survey at any point of time. Only completed surveys can be used for this research. Your data will be used anonymously and only for the purpose of this study.

If you have any questions, feel free to contact us.

Thank you in advance!

Sophia, Judith and Kristina

contact address: j.senger@student.utwente.nl

I read and understood all the above mentioned and agreed to participate in the study. I partake out of my own free will and I am informed that I can withdraw from this study at any time without providing a reason.

Yes

No

The following questions ask about your demographic characteristics.

What is your age?

What is your gender?

- Male
- Female
- Other

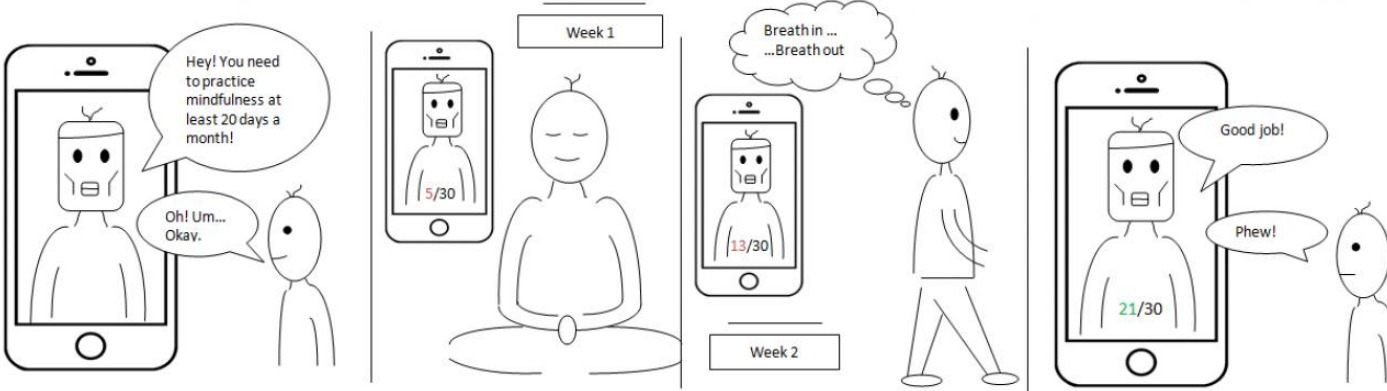
What is your nationality?

- German
- Dutch
- Other

I am a ...

- University student at the UT
- student at another University
- no student

Please read and inspect the storyboards clearly, before you rate the statements. Keep in mind that there are no right or wrong answers as we are interested in your personal opinion.



You just saw an interaction with a stress management application. Now, we want you to answer the following questions about your opinion regarding the system as honest as possible.

	Disagree strongly	Disagree moderately	Disagree a little	Neither agree nor disagree	Agree a little	Agree moderately	Agree strongly
This technology is something that I would enjoy using.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In the future, this technology is something I would consider using.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
With regards to my own health goals, I consider this technology helpful.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

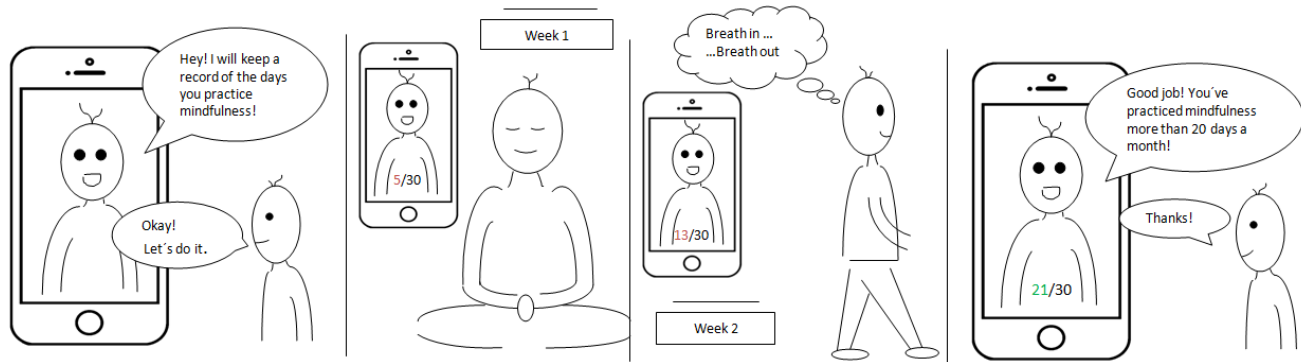
With regards to the quality of my life, I think this technology would improve the quality of my life.

I think this technology seems easy to use.

I think this technology would help me save time in reaching my health goals.



Please describe any other comment or reaction to the technology depicted in the storyboard



You just saw an interaction with a stress management application. Now, we want you to answer the following questions about your opinion regarding the system as honest as possible.

	Disagree strongly	Disagree moderately	Disagree a little	Neither agree nor disagree	Agree a little	Agree moderately	Agree strongly
This technology is something that I would enjoy using.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In the future, this technology is something I would consider using.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
With regards to my own health goals, I consider this technology helpful.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
With regards to the quality of my life, I think this technology would improve	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

the quality
of my life.

I think this
technology
seems easy
to use.

I think this
technology
would help
me save
time in
reaching
my health
goals.



Please describe any other comment or reaction to the technology depicted in the storyboard

The questions in this scale ask you about your feelings and thoughts during the last month. In each case, you will be asked to indicate by clicking on how often you felt or thought a certain way.

	Never	Almost Never	Sometimes	Fairly Often	Very Often
In the last month, how often have you been upset because of something that happened unexpectedly?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In the last month, how often have you felt that you were unable to control the important things in your life?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In the last month, how often have you felt nervous and "stressed"?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In the last month, how often have you felt confident about your ability to handle your personal problems?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In the last month, how often have you felt that things were going your way?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In the last month, how often have you found that you could not cope with all the things that you had to do?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In the last month, how often have you been able to	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

control
irritations in
your life?

In the last
month, how
often have you
felt that you
were on top of
things?

In the last
month, how
often have you
been angered
because of
things that were
outside of your
control?

In the last
month, how
often have you
felt difficulties
were piling up
so high that you
could not
overcome
them?