



# UNIVERSITY OF TWENTE.

**Faculty of Behavioural and Management  
Sciences**

## **Achieving behaviour change:** **Evaluating the differences in content and motivational value of peer- and expert-written messages in the context of physical activity**

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## Abstract

Due to the increasing use of technology in a wide variety of fields in the last years, current developments in HCI research have put emphasis on designing motivational technology that intends to assist or encourage people to change their behaviour. In particular mobile applications and sending tailored text messages have been found to have promising effects in the context of behaviour change. Because of the urgent need to fight the prevalence of being overweight and suffering from obesity in our society, De Vries et al. (2016b) have been focussing on designing a mobile application that helps to motivate its users to increase their current level of physical activity. The design of their application relies on the theory of the Transtheoretical Model of Behaviour Change (Prochaska & Di Clemente, 1982), which states that an individual goes through five progressive stages of change along which behaviour change occurs. The current study aimed to improve their design by examining in depth the differences that may occur in the content and the motivational value of peer- and expert-written messages. For our first survey we recruited health professionals and asked them to come up with several motivational messages for different scenarios, which were all adjusted to the five stages of change. After coding the generated messages according to the ten processes of change, a comparison with the messages previously generated by peers revealed that experts generated proportionally more experiential messages and proportionally less behavioural messages than peers did. In a second study we asked participants to rate the motivational value of the messages previously written by both peers and experts. The findings suggest that there is indeed a difference in the motivational value of the messages, and the results indicate that messages generated by peers are perceived to be more motivating in most of the phases of behaviour change. Concluding, the idea of implementing a mobile application that sends motivating text messages is very promising in achieving behaviour change in the context of engaging somebody in physical exercise, as long as it pays attention to the cultural and individual differences that come along with it.

## 1. Introduction

As the American comedian Joey Adams (1911-1999) already framed it, “if it weren't for the fact that the TV set and the refrigerator are so far apart, some of us wouldn't get any exercise at all.” This leads us to the problem of being overweight, which is currently the fourth leading risk factor for global mortality and an issue that concerns the population worldwide (World Health Organization [WHO], 2010). Being overweight can lead to drastic physical and psychosocial consequences, such as chronic diseases like type 2 diabetes and high blood pressure. Examples of psychosocial consequences are decreases in self-esteem, a lower quality of life, and sometimes even depression (WHO, 2010). Among other influential factors, such as eating behaviour or sedentary behaviour, “physical inactivity is one of the key contributors to the 50% increase in obesity prevalence among US adults during the past decade” (Mokdad et al., 1999, p. 1520). Still, only about 1 in 5 adults meet the guidelines for physical activity, and less than 3 in 10 high school students get the recommended amount of physical activity every day (WHO, 2010). These statistics make it obvious that the low occurrence of physical activity is a public health concern and that the behaviour of the global population has to change.

Internal motivation has been found to be one of the most important prerequisites for successfully changing behaviour (Skutella, Suessenbach, Pitsch, & Wagner, 2014). But how do you get motivation? As Skutella et al. (2014) stated, motivation does not only embody the internal state of one individual, but is also perceived “as a collaborative achievement of two or more persons interacting with each other” (p.288). This implies that our motivation does not only depend on ourselves, but that we can also be motivated by others. Recent studies confirm that people tend to be more motivated and perform better if they are accompanied by or work together with a personal coach (Schnabel, Harre, & Krug, 2008). However, due to a variety of reasons such as money or time constraints, working together with a personal coach is not always possible (Schnabel et al., 2008). This has led researchers to increasingly explore the domain of human-computer interaction and its' potential effects on behaviour change (Hekler, Klasnja, Froehlich, & Buman, 2013). Current developments in HCI research, in particular persuasive technology, have focused on designing motivational technology that intends to assist or encourage people to change their behaviour (Hekler et al., 2013). Especially smartphone applications that aim to change behaviour can have enormous effects, because they can reach a tremendous amount of people through mobile technology (De Vries,

Truong and Evers, 2016a). Furthermore, when compared to printed health materials, smartphone applications can have the advantage of “providing support in an individual’s natural environment, tailoring material to individual characteristics, and adapting to individual feedback over time” (Kristan, & Suffoletto, 2015, p.46).

### **Behavioural change theories in the context of persuasive technology**

The persuasive technologies derived from HCI research have one important aspect in common: The design of those technologies always draws on theories from behavioural sciences (Hekler et al., 2013). One popular theory that is often used in persuasive technology and health intervention research is the *Transtheoretical Model of Behaviour Change* (TTM) proposed by Prochaska and Di Clemente in 1982 (Consolvo, McDonald, & Landay, 2009). There are two aspects that make this framework so appealing in the context of persuasive technologies: First, the TTM helps to categorize individuals according to their readiness to change their behaviour, and second it provides developers of (smartphone) interventions with concrete strategies on how to tailor the strategies to a specific individual according to different processes of change (Nigg et al., 2011). Those assumptions are going to be illustrated in the following.

According to the TTM, an individual goes through five progressive *stages of change* along which behaviour change occurs: In the *precontemplation stage*, there is no intention to change behaviour. An individual in the *contemplation stage* already thinks about changing his or her behaviour in the next 6 months. This is followed by the *preparation stage*, in which individuals have immediate intentions and commitment to behaviour change. Individuals who have actually succeeded in changing behaviour have advanced to the *action stage*. Finally, an individual is said to have reached the *maintenance stage* if he or she has persisted in the new behaviour for more than six months (Prochaska & DiClemente, 1982). As can be seen in Table 1, the model does not only claim that there are several *stages of change*, but also proposes ten *processes of change*. These processes can be used to tailor any behaviour change methods to the stage of change of the individual (Prochaska & DiClemente, 1982), and they are either labelled as experiential or as behavioural: Experiential processes aim to change people’s ideas and entail the processes *consciousness raising* (get the facts), *dramatic relief* (pay attention to feelings), *environmental re-evaluation* (notice your effect on others), *self-reevaluation* (create a new self-image), and *social liberation* (notice public support) (Prochaska & Di Clemente, 1982). Behavioural processes on the other hand are focused on

changing people's actions and involve *self-liberation* (make a commitment), *counter conditioning* (use substitutes), *helping relationships* (get support), *reinforcement management* (use rewards), and *stimulus control* (manage your environment). The assumption of the TTM is that different processes are most effective at different stages of change, which is described in Table 1. According to Nigg et al. (2011), "this interplay between the stages and processes of change is considerably constructive to physical activity promotion" (p. 3), as it provides information on how to more efficiently tailor unique and individualized interventions for behaviour change.

Next to the stages and processes of change, the TTM proposes two more components that are of particular importance in the context of behaviour change: An individual's *decisional balance* and *self-efficacy*, which both predict how and when an individual is likely to progress to one of the subsequent stages (Prochaska, Harlow, Redding, Snow, Rossi, & Velicer, 1990). In the context of the TTM, decisional balance is defined as "weighing the pros (advantages) and cons (disadvantages) of changing a certain behaviour" (Gullette, Wright, Booth, Feldman, & Stewart, 2009, p.6). As individuals progress through the stages of change, decisional balance is expected to shift in critical ways: In the earlier stages for example (i.e. precontemplation and contemplation), the pros in favour of behaviour change are outweighed by the relative cons for change, while in later stages (i.e. action and maintenance) individuals perceive more pros than cons for changing (Prochaska et al., 1990). The construct self-efficacy reflects "an individual's confidence in his or her ability to maintain the desired behaviour change, despite interpersonal or situational pressure to do otherwise" (Gullette et al., 2009, p.7). Individuals that see themselves as scoring high on self-efficacy expect to successfully perform the desired behaviour even in challenging situations, while those with low perceived self-efficacy expect to fail and return to their problem behaviour (Gullette et al., 2009).

Table 1

*Definition and applicability of the ten processes of change. Adapted from Prochaska & Velicer (1997)*

<b>Process of Change</b>	<b>Definition of process</b>	<b>Stage of change</b>
Consciousness raising	Awareness about causes, consequences, and cures for problem behaviours.	Precontemplation/ Contemplation
Environmental reevaluation	Affective and cognitive assessments of how the presence or absence of a personal habit affects one's social environment.	
Dramatic relief	Increased emotional experiences followed by reduced affect or anticipated relief if appropriate action is taken.	
Social Liberation	Increase in social opportunities.	
Self-reevaluation	Cognitive and affective assessments of one's self-image with and without a particular unhealthy habit.	Contemplation/ Preparation
Self-liberation	Believing in own ability to change & making commitments to act.	Preparation
Helping relationships	Caring, trust and acceptance & support for healthy behaviour change.	Preparation/ Action Maintenance
Counter conditioning	Learning healthy behaviours as substitutes for problem behaviours.	
Reinforcement management	Positive consequences for taking steps in the right direction.	Action/ Maintenance
Stimulus control	Removing cues for unhealthy habits and adding prompts for healthier habits.	

### Usage of tailored text messages

One approach that relies on the underlying assumptions of the TTM and that has been found to have promising effects in helping participants reach behaviour change goals in the context of physical activity is the use of sending tailored text messages by means of technical devices (Coley et al., 2013; Mutsuddi & Connelly, 2012). According to Rimer and Kreuter

(2006), tailoring text messages can enhance motivation to attend to and process health information in at least four ways: “1) match content to an individual’s information needs and interests, 2) frame health information in a context that is meaningful to the person, 3) use design and production elements to capture the individual’s attention, and 4) provide information in the amount and type of delivery preferred by the individual” (p. 187). As a result, recipients of those messages will be more likely to attend to those messages, to process them more carefully and to take them into consideration when making decisions or taking actions to improve health (Rimer & Kreuter, 2006).

When planning to design a health application that is grounded in the TTM, researchers have to face the challenge of finding a way to collect motivational messages that fit to the stages and processes of change that are proposed by this model. Over the last years, a new web-based business model has emerged with the term of crowdsourcing, “which harnesses the creative solutions of a distributed network of individuals through what amounts to an open call for proposals” (Brabham, 2008, p. 76). In short, the method of crowdsourcing is based on a simple, but very powerful concept: “Virtually everyone has a potential to plug in valuable information” (Greengard, 2011, p. 21). Companies such as Threadless, iStockphoto and InnoCentive are only a few of the most successful and profitable examples of crowdsourcing in a variety of industries (Brabham, 2008).

### **Peer- versus expert-written messages**

What makes the method of crowdsourcing so effective is that the web provides a suitable technology capable of aggregating millions of disparate and independent ideas. This leads to that more varied and applicable information can be collected compared to the output of a small group of experts (Brabham, 2008; Coley et al., 2013). To test this assumption, Coley et al. (2013) investigated whether crowdsourced peer-written messages were perceived to be more effective in achieving behaviour change than expert-written messages in a smoking cessation program. They expected peer-written messages to be rated as more motivating than expert-written messages because of the following reasons: First, expert-written messages are thought to be less appropriate because they may not account for culture-dependent concepts that are of intrinsic importance to the targeted population. Also, they may overlook some information that is deemed relevant to the target population engaged in the intervention, and the language used may not really reflect their real-world experiences and how they actually feel or think about it. Finally, when people who went through the same



stages of change share their experiences, it gets easier for similar others to identify with the message content and to acquire the skills and strategies needed for behaviour change (Coley et al., 2013).

Coley et al. (2013) used the method of crowdsourcing to collect peer-written messages, and asked physicians and nurses to conceptualize the expert-written messages. Given the previously mentioned assumptions, it was no surprise that they indeed found that peer-written messages were perceived as more motivating than expert-written messages. A multivariable analysis showed that peer-written messages were significantly more likely to induce a return visit to the study website that offered support on how to quit smoking than messages written by experts. However, it is important to mention that they only asked people who stopped smoking before as well to come up with motivational messages for participants in their smoking cessation program. Hereby only those people who previously had to go through the same experience of quitting to smoke themselves had the opportunity to add something to the message collection. Because of this limitation it is problematic to propose that peer-written messages are always perceived to be more motivating than messages written by experts in the context of changing certain behaviours. Furthermore, besides finding a difference regarding the motivational value of the generated messages, Coley et al. (2013) also discovered a difference regarding the content. While the messages written by peers relied more on social and real-life aspects (e.g. money, quality of life, attitudes and friends), the messages of experts rather focussed on behavioural strategies (e.g. avoidance) and general health.

Kristan and Suffoletto (2015) conducted a similar study in which they evaluated the differences between peer- and expert-written messages for an alcohol consumption intervention. Anybody who was willing to had the opportunity to contribute something to the peer-written messages, but there is no further information on the collection of the expert-written messages. Out of all generated text messages they composed three subtopics based on the content of messages: *Informational messages*, which included “knowledge about a medical condition and its effect on the body” (e.g., *alcohol kills precious brain cells.*) (p.47), *strategy facilitating messages*, which listed specific behavioural tools to manage stress or other barriers (e.g., *see how many days/weeks you can go without getting drunk, and make it a bet or a dare.*), and finally *motivational messages*, which encompassed “personal attitudes towards the behaviour and the patients’ subjective norm” (p.47) (e.g., *be responsible for yourself and be an example to others around you.*). An interesting finding of their study was

that the messages generated by peers and by experts differed in focus: When asked to generate text messages, experts mostly came up with informational (44%) and strategy facilitating (38%) messages, and least with motivational ones (18%). Peers on the other hand generated mostly motivational messages (40%), followed by informational (35%) and strategy facilitating (25%) messages. However, Kristan and Suffoletto (2015) did not evaluate whether expert- and peer-written messages differed in how motivating they are perceived to be. The aspect they measured in the context of effectiveness was which of the above-mentioned subtopics was perceived to be most *helpful* and *interesting*. The results of their study indicate that participants rated informational and strategy facilitating messages as being more helpful and interesting than motivational messages. Nonetheless, these results cannot be generalized for all participants: Hazardous drinkers for example rated informational messages to be less helpful than non-hazardous drinkers, but did not report any differences for being interesting. Furthermore, men rated all messages categories lower on helpfulness than women did. These differences show that when comparing the effectiveness or motivational value of generated text messages, certain characteristics that are either person- or context-dependent have to be kept in mind.

### **Focus of this study**

The focus of this study relies on the current work of De Vries et al. (2016a), who aim to design a smartphone application that motivates users through text messages to become regular sportspersons. The design of their application draws on the strategies of the *Transtheoretical Model of Behaviour Change* of Prochaska and Di Clemente (1982), and their goal is to tailor the text messages to the specific stage of change of the user and the processes of change that are of importance in that stage (De Vries et al., 2016a).

As a first step, De Vries, Truong, Kwint, Drossaert and Evers (2016b) already successfully used the method of crowdsourcing to collect peer-written messages that aim to motivate people to engage more in physical activity. Except for the requirement of having a certain degree of familiarity with AMT, there were no further restrictions on the allowance to participate in the study and anybody who was willing to was able to contribute something to the message collection. Their results showed that crowdsourcing provides a feasible method for designing motivational messages that reflect the processes of change. Another interesting finding was that peers focused much more on generating messages that relate to behavioural processes than to experiential processes. Less than one third of the generated messages have

reference to experiential processes of change, which implies that peers find it easier to think of more ‘action-oriented’ behavioural messages than of ‘thinking-oriented’ experiential messages (De Vries et al., 2016b).

However, until now no research has been done on the question whether those messages are actually effective in achieving behaviour change in the users of this application. Before implementing a study to answer that question, another interesting issue would be to see whether expert-written messages might be of added value to the previously collected peer-written messages in achieving behaviour change in the context of physical activity. Until now there is not enough research to draw definitive conclusions on the question whether expert- or peer-generated messages are perceived to be more motivating. Furthermore, none of those studies (cf. Coley et al., 2013; Kristan & Suffoletto, 2015) have been conducted in the context of starting, increasing or maintaining someone’s level of physical activity, but only in the context of smoking cessation or reducing alcohol consumption. In order to close the knowledge gap on motivational text messages in the context of physical activity, this study aims to deepen the research on differences regarding the motivational value of messages generated by peers or by experts in this field.

### **Research goals and expectations**

Following from the results of recent research on the combination of persuasive technology and behavioural change methods, and with the promising results of sending tailored text messages to motivate users, this study aims to improve the current design of the smartphone application of De Vries et al. (2016a). Before actually implementing their smartphone application it is useful to evaluate in depth the differences between peer- and expert- written text messages. When comparing peer-written messages with expert-written messages, two aspects come to mind that have to be distinguished.

First, one will probably encounter that messages generated by peers and messages generated by experts differ in content. As Kristan and Suffoletto (2015) demonstrated, experts generate more informational messages that focus on the general health of the user and strategy facilitating messages, whereas peers write more messages that emphasize motivational aspects such as personal attitudes or one’s perceived subjective norm. As this study aims to improve the current work of De Vries et al. (2016b), the generated messages need to be evaluated in terms of the processes of change and the distinction made between experiential and behavioural processes. Informational messages for example, which are said to include

knowledge about a medical condition and its effect on the body, would rather fit to categories of experiential processes, such as *consciousness raising* or *environmental reevaluation* than to any of the behavioural processes. As 44% of the expert-generated messages in the study of Kristan and Suffoletto (2015) were categorized as informational, one would expect that experts generate a lot of messages that can be coded as one of the experiential processes. In a previous study, De Vries et al. (2016b) found that peers mainly generate messages that focus on behavioural processes (especially the process Self-liberation) and considerable fewer messages for experiential processes. This leads to the first assumption that we aim to test with this study: When comparing the content of expert- and peer-written messages, we expect experts to generate relatively more messages that belong to any of the experiential processes than peers do.

Second, it needs to be considered that not only the content of the generated messages will differ, but also the perceived motivational value of the messages. Coley et al. (2015) for example found that peer-written messages are rated to be more motivating than expert-written messages. However, it is difficult to generalize their results to all persuasive messages because this study was conducted in the context of a smoking cessation programme, whereas the study at hand of De Vries et al. (2016b) focuses on motivating people to engage more in physical activity. Furthermore, Coley et al. (2013) only consulted physicians and nurses to conceptualize the expert-written messages. This range of medical experts can be broadened to psychological health practitioners, who do not only have profound knowledge of the health behaviour of the population, but also a thorough understanding of the factors that drive people in their behaviour. To contribute to the little amount of research on the motivational value of text messages, we are also going to examine whether there are any differences in the perceived motivational value of expert- or peer-written text messages.

The purpose of this evaluation is to find a way to tailor potential text messages to the individual needs of the users and to find those messages that are most effective in motivating people to change their behaviour with the use of a smartphone application.

## 2. Methods

We conducted two studies to assess these assumptions. In Study 1, we consulted health experts to generate motivational messages and then coded them according to the processes of change the same way as previously done by De Vries et al. (2016b). Afterwards we could compare them with the peer-written messages that were generated in the preceding study of De Vries et al. (2016b). Study 2 was composed of an online survey in which people could rate how motivating they think the expert- and peer-written messages were. That way it could be evaluated whether there were any differences in the motivational value of messages that were generated by experts or by peers.

### 2.1 Study 1 - Designing, coding and comparing motivational messages

#### 2.1.1 Participants and procedure

**Recruitment.** For the collection of expert-written messages, we set up a survey on SurveyMonkey in which experts were asked to generate 18 motivational messages for the means of motivating somebody to start, increase or maintain his or her current level of physical exercise. Only people that were working in the field of health care such as fitness- or behavioural coaches, people working in public health programs, and professionals that were teaching and conducting research in the field of health psychology were eligible to participate in the survey. Experts were both approached by email or in person and asked to fill in the survey. Their email addresses were derived online from several websites of universities and health institutions in the Netherlands and in Germany. Lifestyle- and fitness coaches were asked in person to fill out a printed version of the survey by visiting four local fitness studios in Enschede (NL) and in Essen (GER).

**Participants.** In total, we send the online or the printed version of our survey to 72 people that were eligible to be considered as experts and asked them to participate. Of all experts approached, 37 (51,38%) at least opened the survey, but only 25 (34,72%) of them actually generated motivational messages. Although not all 25 participants generated all 18 messages that were requested (only 16 participants came up with all messages), we still decided to use all of them for further data analysis. This left us with a sample of 25 participants that came up with 380 motivational messages in total.

**Procedure.** In the email we introduced our research team and explained the content of the survey and the estimated time to complete it. If participants agreed to participate in the survey, they had to click on a link that transferred them to the SurveyMonkey website where the survey was hosted. On the first page of our survey participants were welcomed and given a short summary of the purpose of the current study. Although the survey was written in English, participants were also informed of the option to answer in English, Dutch or German. After reading the introduction they could decide whether they agree and consent to participate in the study, or if they want to leave the survey. Informed consent was given by ticking the option ‘Yes I agree and consent to participate’. In the printed version participants were provided with an introduction leaflet that gave information on the research team, the goal of the survey and the option to consent and agree to participate in the survey.

If participants agreed to participate in the survey, they were forwarded to the main part of the survey, which was made up of two sections: 1) Questions about their demographics, and 2) the central part of this study in which participants were asked to come up with motivational messages. At the end of the survey, participants were debriefed about the goals of the survey and asked if they were familiar with the Transtheoretical Model or not. Furthermore, we thanked them for their participation and explained that they can always contact the main researcher if they still had some unanswered questions.

### 2.1.2 The questionnaire

**Demographics.** The first section of the survey included questions about the participants’ personal demographics, including their gender, age, nationality and the highest degree they received so far (for the whole questionnaire see Appendix A). Furthermore they were asked to indicate their main work field by choosing from the options *Working directly with patients with health problems (i.e. behavioural coaches)*, *Working directly with patients that are overweight (i.e. fitness coaches)*, *Working indirectly with patients in public health programs* or *Teaching and conducting research in the field of Health Psychology*. Finally they were asked to indicate how long they have already been working in this field (< 5 years, 5 - 15 years, or > 15 years).

N.B.: To make the upcoming description of the results and the discussion more coherent, the following titles are going to be used for the three main work fields: Participants working with patients that are overweight are referred to as *fitness coaches*, those that indicated to work directly with individual patients with health problems are categorized as *behavioural coaches*,

and participants that are teaching and conducting research in the field of Health Psychology are referred to as *researchers*.

**Eliciting motivational messages.** An instruction page informed participants that they will be presented with three short scenarios, which all describe a person with a certain degree of physical (in)activity. Afterwards they were asked to come up with 6 motivational messages for each scenario that aim to motivate this person to change his or her exercise habits. Each scenario in this survey was adjusted to one of the five stages of change proposed by the TTM, which left us with a total of five possible scenarios. We used the same scenarios that De Vries et al. (2016b) previously used to collect the motivational messages written by peers. Of all possible scenarios, each participant randomly received three scenarios consecutively in a randomized order. After presenting the particular scenario, we asked participants to imagine that they had to motivate this person to change his or her exercise habits by the means of motivational messages. In total, participants were asked to come up with six messages for each scenario: Respectively three for either motivating somebody during a long period of time (e.g. 1 year) or during a short period of time (e.g. 1 month). Examples of scenarios and actual participant responses are shown in Table 2.

Table 2

*Examples of expert-written motivational messages for a physical (in-)active person in a particular stage of change*

Stage of change scenario	Expert designed text message
<i>Contemplation:</i> "Consider a middle-aged person, with a steady personal life and solid friend foundation. This person lacks regular exercise in his/her daily life, but has been thinking about starting to exercise regularly and wonders if he/she will be able to do it. This person is opting to start in the next 6 months."	<p>"How about joining your friends that are already exercising? It will not only improve your health, but also your social relationships."</p> <p><b>Helping relationships</b></p> <p>"Feeling a bit unhappy with yourself currently? You don't have to! You are worth being the self that you imagine yourself to be."</p> <p><b>Self-reevaluation</b></p>
<i>Action:</i> "Consider a middle-aged person, with a steady personal life and solid friend foundation. This person has recently incorporated regular exercise in his/her daily life, but it has not been for an extended period of time. This person has been active for less than 6 months."	<p>"Are you stuck in a lowpoint? Ask friends to join you, because with the two of you it's even more fun." <b>Counter-conditioning</b></p> <p>"You can be proud of yourself. You achieved your first personal goal."</p> <p><b>Reinforcement management</b></p>

*Note.* According coding categories are given in bold.

### 2.1.3 Data analysis

***Coding motivational messages.*** The next step was to evaluate to what degree the content of the 380 expert-written messages actually reflect the processes of change. In order to be able to make adequate comparisons between the peer-written messages generated by De Vries et al. (2016b) and our expert-written messages, we decided to use the same codebook that De Vries et al. (2016b) already constructed for their previous study. When developing the codebook they used the guidelines of Guest and MacQueen (2007), who suggest to structure the codebook with (at least) six parameters: the code, brief definition, full definition, when to use, when not to use, and examples. Furthermore, they added the seventh parameter ‘perspective’, as this is considered to give “an alternative definition of what the processes could look like in terms of a text message” (De Vries et al., 2016b, p.4). They decided to only apply one code to each message, so we applied the same guideline to our coding procedure.

The coding process was done iteratively, independently and without any information about the stage of change by the two main coders. The coders started with two rounds of independently coding up to 20 messages. After each round, they compared their coding and tried to resolve any mismatches by discussing their decisions. They then constantly increased the number of messages for each round, until they ended up with 80 messages in the 6<sup>th</sup> and final round of coding. Furthermore they added the ‘certainty measure’ after the 4<sup>th</sup> round of coding, which was taken over from the setup of the study of De Vries et al. (2016b) as well. De Vries et al. (2016b) explained the logic of the certainty measure as follows: It implies that both coders add a certainty code to their coding of messages “if they are 99% sure that the message belongs to the particular coding category, and that the other coder would select the same process category” (p. 4). After the 6<sup>th</sup> round of independent coding, both coders decided that they had reached a saturation point at which a higher agreement ( $n = 100$ ,  $\kappa = .62$ ,  $p < .005$ ) would not be achievable. For those messages on which both coders were sure about the process category and agreed on the certainty measure ( $n = 45$ ) they reached an even higher agreement with a Cohen’s kappa of  $\kappa = .84$ ,  $p < .005$ . Concerning the codes that were coded as “certain” by coder 1, the Cohen’s kappa was sufficiently high ( $n = 51$ ,  $\kappa = .725$ ,  $p < .005$ ), which led to the decision that this coder should do the final coding on his own. As a result, Coder 1 did a final round of coding all the 380 messages again, without any information about the stage of change or the codes that were given in the previous rounds. Of all 380 messages, 293 (77.1%) were coded with the certainty measure.



**Comparing motivational messages.** In order to be able to evaluate whether the content of the motivational messages differed between those generated by peers and those by experts, we first generated a cross-tabulation that displayed the distribution of messages across the two higher order processes (experiential- and behavioural processes) for both datasets (expert- and peer-generated messages). The dataset for the messages of peers was taken over from the previous study of De Vries et al. (2016b). Calculating the percentages of messages that were either coded as experiential or as behavioural processes of change provided us with a first impression of the focus or intention of either peers or experts when being asked to generate motivational messages. Furthermore we did not only generate cross-tabulations for the higher order processes, but also the distribution of messages across the ten processes of change proposed by the TTM. In order to be able to determine whether the differences in the distribution of messages were significant we applied a Chi-square goodness of fit test to the dataset. Therefore we calculated the expected count for expert-written messages for both higher order processes and each process of change by applying the percentages of the distribution of peer-written messages to the dataset of experts. By determining the standard residual between each expected and observed count we could then conclude whether the differences between messages generated by peers and by experts were significant or if they just occurred by chance.

## **2.2 Study 2 - Evaluating the motivational value of the collected messages**

### **2.2.1 Participants and procedure**

**Recruitment.** For the evaluation of the question whether there is a difference in the motivational value of expert- and peer-generated messages we set up a second survey on SurveyMonkey.

Participants were either approached via the Internet tool Amazon Mechanical Turk (AMT) or via the research tool Sona Systems for students enrolled at the University of Twente. We decided to use those two data collection systems to ensure that we will be able to collect a wide variety of participants. As the previous study of De Vries et al. (2016b) was only conducted by means of AMT, and thus only in an American setting, we added another (European) setting via Sona Systems to examine if the results apply for all environments. In order to be eligible to participate in the survey via Sona Systems, students had to be older

than 18 years and have profound knowledge of the English language. The requirements for AMT were that respondents should have already completed > 1000 tasks on AMT, that > 98% of these tasks were approved successfully and that they were currently located in the United States. By adding those requirements we were able to ensure that our respondents were already familiar with completing online surveys and that they were serious about their answers.

**Participants.** In total, 403 participants started the survey but only 329 of them responded to every question. The data of 17 participants had to be omitted from further analysis because it took them less than 6 minutes to complete the survey, which suggested that they did not take the questionnaires seriously. This left us with a sample of 312 participants (193 (62%) from AMT and 119 (38%) from SONA) who completed the whole survey.

**Procedure.** After being informed of their compensation, the goal of the study and the estimated time to complete the survey, respondents could either decide to accept or decline the survey. If they accepted, they were forwarded to the SurveyMonkey website where the survey was hosted. On the first page of the online survey participants were welcomed and given a short summary of the purpose of the current study. Informed consent was given by ticking the option ‘Yes I agree and consent to participate’. After agreeing on the consent form participants were forwarded to the main part of the questionnaire, which was made up of four sections: 1) Questions about the personal demographics, 2) rating the motivational value of the text messages, 3) three questionnaires that measured the components of the TTM (stage of change, decisional balance and self-efficacy), and 4) one final questionnaire that assessed the participant’s personality. We added the questions about the components of the TTM and the personality characteristics in order to get a better and more detailed overview of the respondents. After completing the survey, participants were debriefed about the detailed goals of the study and thanked for their participation. If participants were filling out the survey via AMT, they were given a completion code to fill in on AMT to receive their compensation of 3 US dollars for their participation. Participants who completed the survey via SONA systems got rewarded with 0.5 credit points at the University of Twente. The whole study was conducted in English.

### 2.2.2 The questionnaire

**Demographics.** In the first part of the survey participants were asked to answer questions about their personal demographics, such as their gender, age, and nationality (*American, Dutch, German, or Other*) (for the whole questionnaire see Appendix B). Furthermore they were asked to indicate the highest degree they have received up to that moment and their current employment status (*Employed, Unemployed, Retired, Student, or Other*).

**Rating motivational messages.** The second section constituted the main part of this study, in which participants had to rate a selection of the previously generated messages on their motivational value. An instruction page informed participants that they will be presented with two short scenarios, in which they are asked to imagine themselves as a person with a certain degree of physical (in)activity. With that scenario in mind they were requested to rate a selection of potential text messages that were designed to motivate people in the circumstances mentioned before. Just like in the first study, each scenario in this survey was adjusted to one of the five stages of change proposed by the TTM. This left us with a total of five possible scenarios, of which each participant randomly received two consecutively in a randomized order.

Each participant had to rate 30 messages (15 expert-written- and 15 peer-written messages) per scenario. Only messages that were previously marked with the certainty code were eligible for this survey. The text messages were randomly chosen from the dataset of messages that were previously generated for the corresponding stage of change by either peers or experts. Concerning the expert-written messages, only the messages written by health professionals were selected. The order of the messages was randomized for each participant. To get an idea of the motivational value of the generated messages, we asked participants to rate each message according to how motivating they thought it was (*Please rate how motivating or demotivating you find the following messages if you imagine yourself as the person described.*). They could respond on a Likert Scale from 1 (*very demotivating*) to 5 (*very motivating*), with 3 serving as a neutral decision (*neither demotivating nor motivating*).

Executing the reliability analysis within the different stages revealed that all motivational messages of either experts or peers were consistently rated: The Cronbach's alpha was almost always higher than 0.80 and at least higher than 0.70, which is a satisfactory reliability for the internal consistency. Only in rare cases could the Cronbach's alpha be increased by deleting one particular item. Because the increase was mostly extremely low, and the Cronbach's

alpha was almost always higher than 0.80 anyway, we decided not to delete any of the messages from the dataset.

In order to get an idea of the motivational value of the generated text messages we calculated an average score of the ratings for each stage for both peer- and expert-written messages. Furthermore we calculated an average score for both types of messages (i.e. peer- or expert-generated) over all the stages combined. A high average score of the ratings (the scale was from 1 to 5) indicated high motivational value of the generated messages within this category.

***Transtheoretical Model (TTM) of Exercise Measures.*** To measure the respondents' current stage of change, perceived self-efficacy and decisional balance we used the assessment inventories developed by Prochaska at the Cancer Prevention Research Center in 1991. First, respondents were presented with the validated 1-item stage of change measure for exercise, which provides participants with a description of regular exercise and the five stages, and then asks them to rate their own stage based on that description (Norman, Benisovich, Nigg, & Rossi, 1998). Decisional balance was assessed by 10 questions on a Likert-scale (from 1 to 5), with 5 items addressing advantages and 5 items addressing disadvantages of exercising (Nigg, Rossi, Norman, & Benisovich, 1998). Participants were asked to indicate how important each statement was with respect to the decision to exercise or not to exercise in their leisure time (1 = *not important* to 5 = *extremely important*). Examples of decisional balance include *I would have more energy for my family and friends if I exercised regularly* (advantage) and *I feel uncomfortable or embarrassed in exercise clothes* (disadvantage). Scores on half of the items that were framed as a disadvantage had to be reverse coded so that a high average score indicated high decisional balance ( $\alpha = .73$ ). Self-efficacy was measured by an 18-items questionnaire that could be answered on a Likert scale (from 1 to 5) (Benisovich, Rossi, Norman, & Nigg, 1998). Items on this scale asked the respondents how confident they were (1 = *not at all confident* to 5 = *extremely confident*) that they would still be going to exercise when they faced any of the situations described by the items. Examples of self-efficacy items include *I have to exercise alone* and *It's raining or snowing*. Scores on the 18 items were averaged into a self-efficacy score ( $\alpha = .89$ ), with higher scores indicating higher self-efficacy.

***Personality characteristics.*** In order to measure how respondents scored on the Big Five personality dimensions, they were asked to fill in the 50-item IPIP questionnaire (Goldberg, Johnson, Eber, Hogan, Ashton, Cloninger, & Gough, 2006). In this questionnaire respondents

were requested to rate how accurately the 50 statements described them as a person by responding on a Likert scale from 1 to 5 (1= *very inaccurate* to 5 = *very accurate*). Examples of the statements addressing personality were *I make friends easily* and *I am often down in the dumps*. After reverse coding items that were negatively framed we summed up the values to obtain an average score for each personality dimension. A high score indicated a strong disposition on the particular personality dimension. The items within all subscales had relatively high internal consistency, with a Cronbach's alpha above .80 for all 5 personality dimensions.

### 2.2.3 Data analysis

***Rating of motivational messages.*** By using paired sample t-tests we determined whether there actually is a difference in the motivational value of messages written by peers and messages written by experts. We did that for both the average score over all the stages combined and for the average scores for each distinct stage, in order to be able to determine whether there are any fluctuations within the different stages.

***Components of the TTM and personality characteristics.*** In order to get a detailed impression of the study sample we used descriptive statistics to assess the respondents' stage of change, and to calculate their scores on decisional balance, self-efficacy and the 5 personality dimensions. As respondents clearly had to indicate their current stage of change, no further calculations were needed to assess this. Regarding the two remaining components of the TTM, the scores of all respondents were averaged into a final score for both decisional balance and self-efficacy. The same procedure was applied for the scores on the five personality dimensions.

## 3. Results

### 3.1 Study 1 - Comparing the content of peer- and expert-written messages

#### Description of the study group

Table 3 gives an overview of the demographical information of the 25 experts in our study. The majority was female and Dutch, and everybody received at least some college degree. Ages varied between 21 and 62 years with a mean score of 33.29 years ( $SD = 11.22$ ).

With respect to their main work field, the majority stated to work directly with patients that are overweight (i.e. fitness coaches) ( $n = 10$ , 40%), 7 respondents (28%) were teaching and conducting research in the field of Health Psychology, and 8 participants (32%) stated to work directly with individual patients with health problems (i.e. behavioural coaches). Furthermore, 13 respondents (52%) stated to be familiar with the Transtheoretical Model, whereas 12 respondents (48%) stated to have never heard of it before. 11 of those being familiar with the TTM were either working as behavioural coaches or as researchers in the field of Health Psychology, whereas only two participants that were working as fitness coaches stated to be familiar with it.

Table 3

*Demographical information of participants (Study 1,  $n = 25$ )*

Variable		Mean	SD	n	%
<b>Gender</b>	Female			17	68%
	Male			8	32%
<b>Age</b>		33.64	10.95		
<b>Nationality</b>	Dutch			16	64%
	German			9	36%
<b>Degree</b>	College degree			10	40%
	Master's degree			11	44%
	PhD			4	16%
<b>Work field</b>	Fitness coaches			10	40%
	Behavioural coaches			8	32%
	Research in HP			7	28%
<b>Working experience</b>	< 5 years			12	48%
	5-15 years			9	36%
	> 15 years			4	16%
<b>TTM</b>	Yes			13	52%
	No			12	48%

### Comparing motivational messages of peers and experts

Table 4 gives a detailed description of the distribution of expert- and peer-generated messages across the higher order processes and the ten processes of change. As expected, the distribution of expert- and peer-generated messages across the two higher order processes differed significantly from each other ( $X^2(1) = 7.41$ ,  $n = 3266$ ,  $p < 0.01$ ). In general, experts generated proportionally more experiential messages ( $n = 129$ , 33.9%) than peers did ( $n = 800$ , 27.7%) and therefore less behavioural ones. When comparing the distribution along the ten processes of change between expert- and peer-generated messages, we noted a significant difference as well ( $X^2(9) = 270.04$ ,  $n = 3266$ ,  $p <$

.01). Post hoc analyses revealed that the differences occurred predominantly on the following processes: *Consciousness raising*, *Environmental reevaluation*, *Social liberation*, *Counter conditioning* and *Stimulus control* (see Table 4).

During the coding of the expert-written messages, both coders felt that the messages written by participants who indicated to work as fitness coaches did not really fit into the style of the messages written by other experts. A possible explanation for this difference in style might be that eight out of ten (80%) fitness coaches stated to never have heard of the TTM before, whereas 11 out of 15 (73.3%) behavioural coaches and researchers indicated to be familiar with it. Familiarity with the TTM might have caused behavioural coaches and researchers to think in different patterns when being asked to generate those messages. This led to the idea to do another comparison between expert- and peer-written messages, but this time exclusively with the messages of behavioural coaches and researchers ( $n = 15$ ). Omitting the messages of fitness coaches provided us with a new framework of 254 messages that is going to be referred to as *messages of health professionals*. When looking at the messages of *health professionals* alone, the difference in distribution across the higher order processes remained significant

( $X^2(1) = 20.95, n = 3140, p < .01$ ), and this time the difference appeared to be even stronger: 40.6% of all messages written by health professionals were coded as experiential messages and 59.4% as behavioural messages, whereas peers generated respectively 27.7% experiential and 72.3% behavioural messages. Concerning the distribution across the ten processes of change, the difference between messages written by peers and messages written by health professionals was significant as well

( $X^2(9) = 217.25, n = 3140, p < .01$ ). When comparing these two datasets the differences occurred in particular on the experiential processes *Consciousness raising* and *Social Liberation*, as experts generated almost twice as many messages that were coded to belong to those categories than peers did. Furthermore, those differences occurred predominantly on the processes *Self-reevaluation*, *Self-liberation* and *Stimulus control*.

Table 4

*Chi-square goodness of fit test to analyse the distribution of messages from either experts (n = 380) or HPs (n = 254) compared to the distribution of messages from peers (n = 2886). Distribution of messages refers to count of messages across the higher order processes and the processes of change.*

Higher order processes										
	Messages from peers (n=2886)		Messages from experts (n =380)			Messages from HPs (n = 254)				
	n	%	n exp.	n obs.	%	n exp.	n obs.	%		
Exp. process	800	27.7%	105	129	33.9%	70.4	103	40.6%		
Beh. process	2086	72.3%	75	251	66.1%	184	151	59.4%		
$X^2(1)= 7.41, n = 3266, p < 0.01$						$X^2(1)= 20.95, n=3140, p <.01$				
Processes of change										
	Messages from peers (n=2886)		Messages from experts (n = 380)			Std. res.	Messages from HPs (n = 254)			Std. res.
	n	%	n exp.	n obs.	%		n exp.	n obs.	%	
CR	138	4.8%	18.3	28	7.4%	<b>2.3</b>	12.2	22	8.7%	<b>2.8</b>
DR	59	2.0%	7.6	4	1.1%	-1.3	5.1	1	0.4%	-0.8
ER	79	2.7%	10.3	3	0.8%	<b>-2.3</b>	6.9	3	1.2%	-1.5
SOL	11	0.4%	1.5	16	4.2%	<b>12.2</b>	1	14	5.5%	<b>13</b>
SR	513	17.8%	67.8	78	20.5%	1.2	45.3	63	25%	<b>2.6</b>
SEL	939	32.5%	124	107	28.2%	-1.5	82.7	45	18%	<b>-4.2</b>
HR	238	8.2%	31.2	33	8.7%	0.3	20.9	23	9.1%	0.5
CC	289	10.0%	38.1	23	6.1%	<b>-2.4</b>	25.5	18	7.1%	-1.5
RM	512	17.7%	67.4	62	16.3%	-0.7	45	45	18%	0
SC	108	3.7%	14.1	26	6.9%	<b>3.17</b>	9.4	20	7.9%	<b>3.5</b>
$X^2(9)= 270.04, n = 3266, p < .01$						$X^2(9)=217.25, n=3140, p<.01$				

Note. If Standard residual is > 1.96 or < -1.96 it is significant with  $p < .05$ .

Significant differences (in comparison to messages of peers) are reported in bold.

### 3.2 Study 2: Evaluating the motivational value of peer- and expert-written messages

#### Description of the study group

Table 5 provides an overview of the sample of the second study: In total 312 participants completed the survey, of which 151 (48.4%) were male and 161 (51.6%) were female. With regard to their nationality, the majority stated to be American (n = 193, 61.9%), followed by German (n = 17, 5.4%) and Dutch (n = 7, 2.2%). The age of respondents ranged



between 18 and 69, with an average age of 30.65 years ( $SD = 10.09$ ). Furthermore, most of the respondents stated to having at least finished their high school ( $n = 132$ , 42.3%) or having received a college degree ( $n = 142$ , 45.5%). Concerning their current level of employment, more than half of the respondents stated to be currently employed ( $n = 169$ , 54.2%), or to still be studying ( $n = 113$ , 36.2%).

Regarding their current stage of change, only 7.7% of the participants ( $n = 24$ ) stated to be in the *Precontemplation stage* and did thus not consider engaging in any kind of physical activity in the future. 55 (17.6%) of the participants stated to be still in the *Contemplation stage*, followed by 52 (16.7%) respondents in the *Preparation stage*, and 64 (20.5%) already in the *Action stage*. The majority of respondents stated to be in the *Maintenance stage* ( $n = 117$ , 37.5%), which means that they have been engaging in regular exercise for more than 6 months now. Concerning the other two components of the TTM, participants scored rather low on their perceived self-efficacy over all the stages ( $M = 2.78$ ,  $SD = .79$ ), but very high on decisional balance ( $M = 4.03$ ,  $SD = .59$ ).

With regard to the Big Five personality traits, respondents had a mean score of 3.86 on Openness ( $SD = .66$ ), a mean score of 3.64 on Conscientiousness ( $SD = .73$ ), and a mean score of 3.14 on Extraversion ( $SD = .88$ ). For the two remaining traits, Agreeableness had a mean score of 3.73 ( $SD = .59$ ) and Neuroticism had a mean score of 2.52 ( $SD = .83$ ).

Table 5

*Demographical information, and descriptive statistics of the components of the TTM and personality traits of participants of study 2 for either AMT respondents ( $n = 193$ ), SONA respondents ( $n = 119$ ), and all respondents combined ( $n = 312$ )*

Demographical information							
Variable		AMT respondents (n = 193)		SONA respondents (n= 119)		Total (n = 312)	
		n	%	n	%	n	%
Gender	Female	85	44.0%	76	63.9%	161	51.6%
	Male	108	56.0%	43	36.1%	151	48.4%
Age	Mean	35.17		23.33		30.65	
	SD	10.24		3.13		10.09	
Nationality	American	192	99.5%	1	0.8%	193	61.9%
	Dutch	1	0.5%	16	13.4%	17	5.4%
	German	0	0%	95	79.8%	95	30.4%
	Other	0	0%	7	5.9%	7	2.2%
Degree	High school	70	36.3%	62	52.1%	132	42.3%
	Bachelor	100	51.8%	42	35.3%	142	45.5%
	Master	15	7.8%	2	1.7%	17	5.4%
	PhD	4	2.1%	0	0%	4	1.3%
	Other	4	2.0%	13	10.9%	17	5.1%

Employment status	Employed	159	82.2%	10	8.4%	169	54.2%
	Unemployed	15	7.8%	4	3.4%	19	6.1%
	Retired	4	2.1%	0	0%	4	1.3%
	Student	10	5.2%	103	86.6%	113	36.2%
	Other	5	2.6%	2	1.7%	7	2.2%

Components of the TTM							
Variable		AMT respondents (n = 193)		SONA respondents (n= 119)		Total (n = 312)	
		n	%	n	%	n	%
Stage of Change	Precontemplation	19	9.8%	5	4.2%	24	7.7%
	Contemplation	34	17.6%	21	17.6%	55	17.6%
	Preparation	35	18.1%	17	14.3%	52	16.7%
	Action	34	17.6%	30	25.2%	64	20.5%
	Maintenance	71	36.8%	46	38.7%	117	37.5%
Self-efficacy							
(1 – 5)							
		Mean		2.72		2.78	
		SD		0.84		.79	
Decisional balance							
(1 – 5)							
		Mean		4.11		4.03	
		SD		0.60		.59	

Personality traits							
Variable		AMT respondents (n = 193)		SONA respondents (n= 119)		Total (n = 312)	
		Mean	SD	Mean	SD	Mean	SD
Big Five							
(1 – 5)							
		Openness		3.80		3.86	
		Conscientiousness		0.71		.66	
		Extraversion		3.86		3.64	
		Agreeableness		0.74		.73	
		Neuroticism		2.94		3.14	
				0.95		.88	
				3.46		3.72	
				0.64		.59	
				3.66		2.52	
				0.51		.83	
				2.67			
				0.65			

### Motivational value of peer and expert-written messages

Table 6 provides an overview of the rating of the motivational value of either peer- or expert-generated messages for each stage. A paired sample t-test revealed that there is indeed a difference in the motivational value of messages that were generated by peers or those that were generated by experts. Over all stages combined, messages written by peers were rated to be more motivating ( $M = 3.50$ ,  $SD = .51$ ) than messages written by experts ( $M = 3.45$ ,  $SD = .49$ ,  $p = .037$ ). When looking closer at the separate stages of change, it appeared that in four out of five stages messages generated by peers were rated to be significantly more motivating than messages written by experts (see Table 6). Only in the contemplation phase messages written by experts were perceived to be more motivating than those written by peers ( $p = .014$ ).

In order to get a more detailed idea of the distribution of preferences for either expert- or peer-written motivational messages, we split the dataset into two groups according to the respondents of the AMT and respondents of the SONA survey. As expected, the two datasets differed very strongly with regard to the demographics: With regard to their nationality, almost all respondents of the AMT survey were American

( $n = 192$ , 99.5%), whereas respondents of the SONA survey were mostly German ( $n = 95$ , 79.8%) or Dutch ( $n = 16$ , 13.4%). Furthermore, as the majority of the AMT respondents indicated to be working, more than half of the participants already received their college degree ( $n = 100$ , 51.8%) or higher, whereas almost all of SONA respondents indicated to be still studying ( $n = 103$ , 86.6%).

When looking at the preferences of AMT respondents (see Table 6), the results stayed almost the same as for the whole dataset, with differences in the motivational value of peer- versus expert-written messages being strongly significant. Again, messages written by peers were overall rated to be more motivating than messages written by experts ( $p < .001$ ). Also when looking closer at the distinct stages of change, in all stages except for the Contemplation stage, messages written by peers were rated to be more motivating than messages written by experts; furthermore, those findings were all significant (see Table 6).

Preferences of the SONA respondents on the other hand were different from the other findings so far (see Table 6): Combined over all the stages, no significant difference in the motivational value of either peer- or expert-written messages could be found. Only in the Contemplation stage and Action stage significant differences could be found ( $p < .05$ ); however, in those stages messages written by experts were rated to be more motivating than messages written by peers. For the remaining stages, no significant differences could be found.

Table 6

*Rating of the motivational value of peer- and expert-generated messages for all respondents together ( $n = 312$ ), and for AMT respondents ( $n = 193$ ) and SONA respondents ( $n = 119$ ) separately*

		AMT respondents ( $n = 193$ )		SONA respondents ( $n = 119$ )		Total of respondents ( $n = 312$ )	
		Expert-generated messages	Peer-generated messages	Expert-generated messages	Peer-generated messages	Expert-generated messages	Peer-generated messages
Precontemplation	Mean	3.29**	3.45**	3.26	3.35	3.28**	3.42**
	SD	.59	.61	.43	.54	0.55	.59
Contemplation	Mean	3.56	3.53	3.41**	3.23**	3.51*	3.43*
	SD	.58	.53	.50	.59	.55	.57
Preparation	Mean	3.48*	3.59*	3.29	3.36	3.40*	3.50*
	SD	.46	.49	.46	.52	.47	.51
Action	Mean	3.57**	3.69**	3.42*	3.29*	3.50	3.52
	SD	.47	.49	.43	.51	.46	.49
Maintenance	Mean	3.68*	3.80*	3.51	3.42	3.60	3.63
	SD	.66	.55	.55	.52	.62	.57

Total	Mean	3.50**	3.60**	3.39	3.33	3.45*	3.50*
	SD	.51	.50	.44	.49	.49	.51

Note. Total number of messages: n = 150

\* Significant difference between expert- and peer-generated messages with  $p < .05$

\*\* Significant difference between expert- and peer-generated messages with  $p < .01$

#### 4. Discussion

This study relied on the previous work of De Vries et al. (2016b), who have recently been focussing on constructing a mobile application that sends tailored text messages to its users in order to start, increase or maintain their current level of physical activity. The messages are tailored in such a way that they fit to the current stage of change of the user as proposed by the Transtheoretical Model of Change (Prochaska & DiClemente, 1982). To ensure that only the most motivating messages are going to be used for further implications, we decided to study in depth the differences that may occur between motivational messages written by peers and motivational messages written by health experts. As studies up to now have been finding mixed results to the question what kind of messages are more qualified in this setting (cf. Coley et al, 2013; Kristan & Suffoletto, 2015), we established two assumptions that were examined by two distinct studies: First, we expected messages written by experts and messages written by peers to differ in content in terms of the processes that are proposed by the TTM. Second, those messages were assumed to differ in motivational value in the context of motivating somebody to start, increase or maintain his or her level of physical activity.

Concerning the first assumption, the results of the first study confirmed that messages written by experts and messages written by peers did indeed differ in content. Overall, experts generated proportionally more messages that belonged to experiential processes, whereas peers focussed more on generating messages that belonged to the behavioural processes. Generally speaking, this implies that peers found it easier to come up with ‘action-oriented’ messages, while experts concentrated more on ‘thinking-oriented’ processes. Taking into account that 11 out of the 15 selected experts (73.3%) stated to be familiar with the TTM, while the majority of peers (n = 469, 97.9%) stated to have never heard of it, one could have expected to find a divergence like that. As people who are familiar with the TTM know that it is important to focus on experiential as well as behavioural processes, they may have a deeper understanding of the underlying processes when generating motivational messages. With

regard to the ten distinct processes of change, experts generated remarkably more messages that belonged to Consciousness raising, Social liberation and Self-reevaluation, which all belong to the experiential processes, than peers did. In contrast to that, peers generated proportionally more messages that were coded as Self-liberation or Reinforcement management, which both belong to the higher order category of behavioural processes.

When relating these findings to previous studies, Kristan and Suffoletto (2015) have found comparable differences in the content of expert- and peer-written messages. They did not evaluate the written messages in terms of the TTM like we did, but they categorized the messages according to three classifications: informational, strategy-facilitating and motivational messages. When looking closer at the definitions, informational messages, which are described as “including knowledge about a medical condition and its effect on the body” (p.47), can be aligned to the process Consciousness raising of the TTM. Furthermore, strategy-facilitating messages, which are classified as listing specific behavioural tools to manage stress or other barriers, can be equated with the process Social liberation, which according to the codebook of De Vries et al. (2016b) is a process that “increases the awareness of the individual to see social opportunities or alternatives if being physically active in the society.” (p.2). When comparing those descriptions, and keeping in mind that 82% of the expert-written messages in the study of Kristan and Suffoletto (2015) were categorized as either informational or strategy-facilitating, it is no surprise to find that experts generate proportionally more experiential messages than peers did. Those findings illustrate how people with different professional backgrounds consider divergent aspects to be most important when trying to motivate somebody to change a certain type of behaviour. When considering to implement a mobile application that relies on the use of motivational text messages, those differences in content and their differing effects on people have to be taken into account in order for the application to be effective. Before starting to send the messages, it would therefore be useful to assess which aspects motivate the individual user and to adapt the motivational messages to his or her preferences. To give an example, the application could start with some questions that assess why the user is trying to change his or her behaviour in the context of physical activity, what he or she considers to be important in order to change and what aspects have motivated the user the most in past attempts to change certain behaviours. This way the selection of motivational messages can be customized to the personal preferences of the user to ensure for the most motivating effect possible.

Our second assumption, which stated that there is a difference in the motivational value of expert- and peer-written messages, could be confirmed as well: Combined over all the stages, messages written by peers were rated to be more motivating than those written by experts. Also when looking closer at the distinct stages of change, messages written by peers were almost always rated to be of higher motivational value. These findings are in line with the results Coley et al. (2013), who found that peer-written messages were more successful in generating longitudinal engagement with a web-assisted programme for smoking cessation than expert-written messages. Coley et al. (2013) concluded that peer-written messages were superior in that they were “written in a smoker’s own words, reflected shared or real-world experiences of smokers and allowed other smokers to more easily identify with the message content” (Coley et al., 2013, p.7). Furthermore, they found that what participants valued the most in peer-written messages was that they “represent the day-to-day issues associated with smoking cessation and the social and interpersonal influences on quitting” (p.7). These findings suggest that when generating messages to change someone’s behaviour, it is better to focus on ‘social’ and ‘real-life’ aspects than on messages that favour biomedical strategies and general information on health.

However, when looking closer at the dataset, the results do not remain so clear when comparing the ratings of motivational value between respondents of AMT and respondents of the SONA study. As already mentioned above, we set up the study on those two distinct website to ensure a broad variety of respondents. The results for the American respondents stayed almost the same as the overall results: In all stages (except for the Contemplation stage), messages written by peers were rated to be more motivating than those written by experts. In this dataset alone, the difference in the ratings of motivational values between those two kinds of messages was even higher than in the combined dataset. Results for the European respondents on the other hand were different: Here, combined over all the stages, no significant differences in the preference for either peer- or expert-written messages could be found. Only when looking closer at the distinct stages of change a clear preference could be found: In the Contemplation stage and Action stage, participants rated expert-written messages to be more motivating than peer-written messages, which is in contrast to the implications of the preferences that have been found before. At first sight those differences might be due to the fact that respondents of both AMT studies, namely 1) generation of peer-written messages and 2) rating of the motivational value, are better comparable. As both studies were conducted on the same platform, respondents already share the characteristic of

being a member of AMT, and the distribution across gender, educational status and other characteristics are expected to be comparable.

Two other possible explanations for the differences in ratings of the motivational value could be those of language difficulties and cultural differences. Concerning the language difficulties, peer-written messages were all written by Americans who were fluent and proficient of the English language. Expert-written messages on the other side were written by health experts from Germany or the Netherlands. Furthermore, as experts were allowed to generate messages in their mother tongue, the majority of messages had to be translated into English by one of our researchers. A possible explanation for the different preferences of the respondents may thus be that AMT respondents liked peer-written messages more because they were written by Native English speakers, whereas SONA respondents liked those messages more that resembled their own knowledge of the English language.

Regarding the cultural differences, participants of our studies did not only share the same language with either peers or experts, but also shared the same cultural values and standards with them. Uskul, Sherman and Fitzgibbon (2009) explored the role of cultural factors in the health persuasion process in depth by examining “whether the persuasiveness of a health message is determined in part by the cultural background of the message recipient, and the extent to which the message is framed to be congruent with culturally divergent motivational styles” (p.538). They found that white British participants were more persuaded by gain-framed messages than by loss-framed messages, whereas the opposite applied to East-Asian participants who were more persuaded when they received loss-framed messages. These results indicate that cultural differences moderate the effect of gain- or loss-framed messages on health messages, and moreover suggest that culture may account for other differences in the preference for certain messages as well.

A fourth possible explanation for those differences might be the discrepancies in educational status: The majority of SONA respondents was still studying and only received their high school degree, while most of the AMT respondents were already employed and graduated with a Bachelor’s or Master’s degree. However, when checking for this discrepancy in our data analysis, no significant effects could be found.

Another interesting finding that should be evaluated in depth is that even though the general trend favoured peer-written messages over expert-written ones, respondents in all datasets that had to rate motivational messages for the Contemplation stage rated expert-

written messages to be of higher motivational value than peer-written ones. This is particularly interesting because especially this phase indicates that users are actively thinking about changing their behaviour. Those results imply that people who are actively thinking about a behaviour change favour those messages more that are rather ‘thinking-oriented’, which can be equated with experiential messages, than ‘behaviour-oriented’ behavioural messages.

With regard to the implementation of the mobile application of De Vries et al. (2016b), these findings of the second assumption illustrate the importance of studying in depth the personal and cultural values and also the current stage of change of one’s target group before starting to generate motivational messages. If an application aims to target a wide variety of different people, it would be advisable to incorporate a means to assess the user’s stage of change, and his or her personal and cultural standards beforehand and then tailor the messages in accordance with those parameters. To give an example, the application should start with an assessment of the current stage of change, and of the cultural values and individual preferences of the user, and then add monthly follow-ups to the setup to see if any of those criteria have changed. By using the results of the assessments to tailor the messages to the individual user the problem of discrepancies in the preferences for motivational messages can be solved.

### **Limitations of this study**

There are some practical and procedural limitations that have to be mentioned. First of all, the experts that we approached in our first study were either Dutch or German, but none of them were Native English speakers. As a result, the majority of the generated messages had to be translated by our researchers, which could have been of influence on the ratings of the messages in the second study. However, doing it that way provided us with the opportunity to make a comparison between different countries of origin as well.

Furthermore, another limitation might be that our assumptions were not tested in the open fields, but only in the setting of two online studies. Respondents of the study were asked to rate how motivating they found the messages when imagining a particular situation, but the actual motivating value in terms of an increase in physical exercise could not be measured. Hereby we could not really examine the actual effectiveness of the mobile application in real life and see whether it actually changes an individual's level of physical activity. However,



the theoretical setup still provided us with important insights and gives motivation to continue with the implementation of this mobile application in the future.

### **Future directions**

Due to the limitation that our assumptions could not be tested in the open field, it would be advisable for future research to conduct a pilot study in which the actual application and its effectiveness will be tested in real-life. This way it can be guaranteed that only the most effective messages will be used for the attempt to motivate somebody to achieve a behaviour change in the context of physical activity.

Another thought for future research is to assess whether the components of the TTM, namely decisional balance and self-efficacy, can have an impact on the way people rate the motivational value of the generated messages. In this study we already tested how respondents scored on those two components, but we did not evaluate whether those scores have any effect on the rating. To give an example, it may be the case that somebody who scores high on decisional balance prefers another style of motivational messages in comparison to somebody who scores low on this component. This kind of evaluation could also be applied to the scores on the Big Five dimensions or other personality characteristics that may differ between the respondents. The findings of this evaluation could eventually be integrated into the monthly assessments mentioned before to tailor the application to the individual needs of the user.

### **Conclusions**

Concluding, with the current need of fighting the prevalence of obesity worldwide, the idea of implementing a mobile application that draws on the theory of the TTM is very promising in motivating people to engage in physical exercise, as long as it takes into consideration the cultural and individual differences that go along with it.

The aim of this study was to analyse in depth what kind of messages are of highest motivational value in the context of motivating somebody to start, increase or maintain their current level of physical exercise by means of a mobile application. Although our results should be interpreted with care due to the methodological shortcomings mentioned before, peer-written messages seem to be of higher motivational value in the context of physical activity than messages written by experts. However, users who are in the Contemplation stage

and currently thinking about changing their behaviour in the near future are more susceptible to messages written by experts.

Furthermore our results give the indication that cultural and individual differences may be of some influence on the way people are being motivated in the context of text messages and physical activity. In order to reach the best effect possible it would therefore be of added value to further analyse the impact of individual and cultural differences of the users on the preferences for motivational text messages and incorporate those implications as well.

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## Appendix

### Appendix A – Survey of Study 1

#### 1. Welcome, information and consent

Thank you for participating in this survey.

In this survey we investigate the language used by people when trying to encourage or motivate someone to engage more in physical activity. From this we would like to see if there is some common way to encourage people effectively by means of a mobile application that sends motivational text messages to its users.

Remember there are no WRONG answers; we are interested in your opinion. Completing this survey should not take longer than 20 minutes.

Contact person: Franciszka Bayer (f.bayer@student.utwente.nl), University of Twente

This study is part of the COMMIT/ project.

Your data will be anonymized and can be used for publication purposes or shared amongst the COMMIT/ partners. Any data resulting from this survey may be used in any further applications coming out of the COMMIT/ project.

However, your text messages may also be read by a larger public, for example for teaching purposes or for linguistic analysis. At any time, all messages will be treated anonymously.

Data from this research project may be published in the future. You hereby give consent for the use of your text messages for research purposes by the present investigator and investigators in other academic institutions engaged in similar work.

Your participation is voluntary and you are free to terminate your participation in this survey at any time.

If you are 18 or older, you want to participate in this survey and you agree to all these conditions, please agree below:

\* Have you read all the above and do you consent to participate in this survey?

x Yes, I agree and consent to participate

x No, leave this survey

## 2. Participant information

\* What is your gender?

x Female

x Male

\* What is your age?

\* What is your nationality?

x Dutch

x German

x Other (please specify)

\* What is the highest degree that you received?

x College degree (BA, BSc)

x Masters (MA, MSc)

x PhD

x Other (please specify)

\* What is your main work field in Health Psychology?

x Working directly with individual patients with health problems (e.g. medical consultant, behavioural coach)

x Working directly with individual patients that are overweight (e.g. fitness coach)

x Teaching and conducting research (in the field of HP)

x Other (please specify)

\* How long have you been working in the field of Health Psychology?

x < 5 years

x 5 – 15 years

x > 15 years

### 3. Scenario instructions

In this survey we will present you with three short scenarios, which all describe a person with a certain degree of physical (in)activity.

With the relevant scenario in mind you are asked to come up with some motivational messages which you think will help the person begin, maintain or expand his current physical activity habits and which could be used in different circumstances.

The scenarios that are described are purposely not explicit in nature. With each scenario you are asked to come up with three messages, which you think would help a person in that scenario. Please keep in mind that different people could be motivated with different messages.

Thank you for participating in this survey, on the next page the first scenario will be described.

\*Note: The motivational messages can either be written in Dutch, German or English.

### 4. Scenario 1

Consider a middle-aged person, with a steady personal life and solid friend foundation. This person lacks regular exercise in his/her daily life and is unwilling to consider starting with this, at least not within the next 6 months.

*First, imagine you have to provide this person with motivational messages during a long period of time (e.g. 1 year) and these messages take into account the current exercise habits*



*as described. These messages would be provided every other week (e.g. week 1 and week 3 of every month).*

\* What would be 3 messages you can think of? Please type them in below.

x First:

x Second:

x Third:

*Now, imagine you have to provide this person with motivational messages during a short period of time (e.g. 1 month) and these messages take into account the current exercise habits as described. These messages would be provided three times a week (e.g. Monday, Wednesday and Friday).*

\* What would be 3 messages you can think of? Please type them in below.

x First:

x Second:

x Third:

## 5. Scenario 2

Consider a middle-aged person, with a steady personal life and solid friend foundation. This person lacks regular exercise in his/her daily life, but has been thinking about starting to exercise regularly and wonders if he/she will be able to do it. This person is opting to start in the next 6 months.

*First, imagine you have to provide this person with motivational messages during a long period of time (e.g. 1 year) and these messages take into account the current exercise habits as described. These messages would be provided every other week (e.g. week 1 and week 3 of every month).*

\* What would be 3 messages you can think of? Please type them in below.

x First:

x Second:

x Third:

*Now, imagine you have to provide this person with motivational messages during a short period of time (e.g. 1 month) and these messages take into account the current exercise habits as described. These messages would be provided three times a week (e.g. Monday, Wednesday and Friday).*

\* What would be 3 messages you can think of? Please type them in below.

x First:

x Second:

x Third:

## 6. Scenario 3

Consider a middle-aged person, with a steady personal life and solid friend foundation. This person lacks regular exercise in his/her daily life, but has been actively thinking about starting to exercise regularly and is starting to get ready for the necessary changes. This person is opting to start in the next 30 days.

*First, imagine you have to provide this person with motivational messages during a long period of time (e.g. 1 year) and these messages take into account the current exercise habits as described. These messages would be provided every other week (e.g. week 1 and week 3 of every month).*

\* What would be 3 messages you can think of? Please type them in below.

x First:

x Second:

x Third:

*Now, imagine you have to provide this person with motivational messages during a short period of time (e.g. 1 month) and these messages take into account the current exercise habits as described. These messages would be provided three times a week (e.g. Monday, Wednesday and Friday).*

\* What would be 3 messages you can think of? Please type them in below.

x First:

x Second:

x Third:

#### 7. Scenario 4

Consider a middle-aged person, with a steady personal life and solid friend foundation. This person has recently incorporated regular exercise in his/her daily life, but it has not been for an extended period of time. This person has been active for less than 6 months.

*First, imagine you have to provide this person with motivational messages during a long period of time (e.g. 1 year) and these messages take into account the current exercise habits as described. These messages would be provided every other week (e.g. week 1 and week 3 of every month).*

\* What would be 3 messages you can think of? Please type them in below.

x First:

x Second:

x Third:

*Now, imagine you have to provide this person with motivational messages during a short period of time (e.g. 1 month) and these messages take into account the current exercise habits as described. These messages would be provided three times a week (e.g. Monday, Wednesday and Friday).*

\* What would be 3 messages you can think of? Please type them in below.

x First:

x Second:

x Third:

### 8. Scenario 5

Consider a middle-aged person, with a steady personal life and solid friend foundation. This person participates in regular exercise in his/her daily life, and has been doing so for an extended period of time. This person has been active for more than 6 months.

*First, imagine you have to provide this person with motivational messages during a long period of time (e.g. 1 year) and these messages take into account the current exercise habits as described. These messages would be provided every other week (e.g. week 1 and week 3 of every month).*

\* What would be 3 messages you can think of? Please type them in below.

x First:

x Second:

x Third:

*Now, imagine you have to provide this person with motivational messages during a short period of time (e.g. 1 month) and these messages take into account the current exercise habits as described. These messages would be provided three times a week (e.g. Monday, Wednesday and Friday).*

\* What would be 3 messages you can think of? Please type them in below.

x First:

x Second:

x Third:

## 9. Debrief survey

Thank you for your participation.

In this survey you were asked to come up with motivational messages for a fictional person. In the description of this fictional person we varied his/her progress into changing his/her behavior to be more physically active (from not at all to being regularly active). We did this because we want to know if people automatically motivate people in a different way if they know how willing they are to change or how far they are in their progress. We assume there is a difference in the topic of the messages for each scenario (of which you only got three, but of which we used five; ranging from not motivated to really motivated) we described.

For further questions or contact email: [f.bayer@student.utwente.nl](mailto:f.bayer@student.utwente.nl)

\* Are you familiar with the Transtheoretical Model of Behaviour Change?

x Yes

x No

## Appendix B – Survey of Study 2

### 1. Welcome, information and consent

Dear ladies and gentlemen,

I would like to thank you for participating in the survey for my masterthesis.

In this survey we aim to investigate how motivating certain text messages are to certain people. The interest lies on the particular context of motivating somebody to start, increase or maintain his or her level of physical activity. From this we would like to see if there is some common way to encourage people effectively by means of a mobile application that sends motivational text messages to its users.

Remember, there are NO WRONG answers; we are simply interested in your opinion. Please respond to every question; completing the whole survey should not take longer than 15-20 minutes.

This study is part of my masterthesis in the field of Health Psychology at the University of Twente in Enschede. Contact person: Roelof de Vries ([r.a.j.devries@utwente.nl](mailto:r.a.j.devries@utwente.nl)), Human Media Interaction, University of Twente

Your data will be processed anonymously and may be used for publication purposes or shared amongst our partners. If you answer 'Yes' to the question below, you give consent for the use of your answers for research purposes by the present investigator and investigators in other academic institutions engaged in similar work. Your responses will stay anonymous at all times.

Your participation is voluntary and you are free to terminate your participation in this survey at any time. If you are 18 or older, you want to participate in this survey and you agree to all these conditions, please agree below.

Kind regards, Franciszka

\* Have you read all of the above and do you consent to participate in this survey?

x Yes, I agree and consent to participate

x No, leave this survey

## 2. Participant information

\* What is your gender?

☒ Male

☒ Female

\* What is your age?

\* What is your nationality?

☒ American

☒ Dutch

☒ German

☒ Other (please specify)

\* What is the highest degree that you completed?

☒ High school

☒ College degree (BA, BSc)

☒ Masters (MA, MSc)

☒ PhD

☒ Other (please specify)

\* What is your current employment status?

☒ Employed

☒ Unemployed

☒ Retired

☒ Student

☒ Other (please specify)

### 3. Instructions

On the next pages we will present you with two short scenarios, in which we ask you to imagine yourself as a person with a certain level of physical (in-)activity. In those scenarios you are either described as someone who is unwilling to exercise, someone who only needs a nudge to start exercising, or someone who is already exercising but could use help staying motivated to maintain the exercising.

For each scenario you will be presented with a selection of potential text messages that are designed to motivate people in the circumstances mentioned above.

With the relevant scenario in mind you are asked to rate how motivating you would find these messages if you imagine being the person previously described.

Thank you for participating in this survey, on the next page you will be presented with the first scenario.

### 4. Scenario 1

Below the particular scenario and the thirty motivational text messages are given. The intended context for the messages is that you receive them via your smartphone in your daily life. The sender of the messages is not specific, but could be considered someone who wants the best for you as a person, like a friend or personal coach.

*Imagine yourself as someone who is lacking regular exercise in his or her daily life. You are unwilling to consider starting with regular exercise, at least not within the next 6 months.*

\* Please rate how motivating or demotivating you find the following messages if you imagine yourself as the person described.

- 1 - Very demotivating
- 2 - Slightly demotivating
- 3 - Neither demotivating nor motivating
- 4 – Slightly motivating
- 5 – Very motivating



- x Wouldn't it be worth for your own well-being to start exercising?
- x What do you think will your health be like in 5 years?
- x Can you think of any positive consequences that regular exercise could have for you?
- x Don't you think that you would feel better if you start to exercise now?
- x Exercising is not only a good way to stay fit, but also to get rid of some troubles in your head.
- x Think of all the great results you could achieve within a year if you start now to do some exercise.
- x If you start today with some regular exercise you will look fabulous for that party next month.
- x Look around in your neighbourhood if you can find any facilities to do some sports.
- x Regular exercise will make you feel fitter and more active.
- x Think about the physical disadvantages that result from your inactivity.
- x Imagine yourself as a healthier you, and compare that to your current self.
- x The longer you push exercise aside, the longer you are denying yourself a better quality of life.
- x After some exercise you can enjoy your dinner even more and also sleep better.
- x Try out something new today and surprise yourself with some physical activity. Who knows, maybe you will actually enjoy it?
- x Treat yourself with something after a successful workout.
- x You can do this, let's go run!
- x You'd be so proud of yourself
- x Regular exercise can only improve your life.
- x Your friends believe in your abilities
- x Only thing standing between you and your goal is the excuse you keep telling yourself.
- x You'll be able to eat more food if you work hard!
- x Just think, the sooner you start, the sooner you will see returns.
- x Lets make life great by getting healthy!
- x Imagine how great you would feel after some exercise.
- x Exercise is good for your health, your body, your mind, your mood, your sleep, and your sex life. Why aren't you doing it?
- x Exercise makes life less stressful
- x You will be much happier and more energetic if you exercise.

- x You can do it!
- x Everyone will be so proud of you!
- x Exercise increases sexual performance.

## 5. Scenario 2

Below the particular scenario and the thirty motivational text messages are given. The intended context for the messages is that you receive them via your smartphone in your daily life. The sender of the messages is not specific, but could be considered someone who wants the best for you as a person, like a friend or personal coach.

*Imagine yourself as someone who is lacking regular exercise in his or her daily life, but has been actively thinking about starting to exercise regularly. You are wondering if you are able to do it and opting to start in the next 6 months.*

\* Please rate how motivating or demotivating you find the following messages if you imagine yourself as the person described.

- 1 - Very demotivating
- 2 - Slightly demotivating
- 3 - Neither demotivating nor motivating
- 4 – Slightly motivating
- 5 – Very motivating

- x The weather is perfect for a good run!
- x How about joining your friends that are already exercising? It will not only improve your health, but also your social relationships.
- x Feeling a bit unhappy with yourself currently? You don't have to! You are worth being the self that you imagine yourself to be.
- x If you start working out today you will see results within two weeks. And wouldn't that be a great feeling?
- x Hello XXX, you want to have a more active lifestyle. What are the most important reasons for that change? Write them down.
- x What is your goal for this week? You could plan to go for a run on tuesday!

- x It's a good idea to implement some regular exercise in your life - what is your personal goal?
- x Hello XXX, once a week you take the bike to get to work. Tomorrow starts a new week, why don't you take the bike everyday from now on?
- x Today is the day to start working on a new you! The first step is always the most difficult one, be brave and go for it.
- x You can do it - start your way into a more active and healthy life.
- x You can do it! Overcome your inner weakness and sign up for a fitness studio as soon as possible.
- x Why don't you set a personal start date for yourself? This way you make sure that you will definitely start to exercise.
- x Everyone has to start somewhere - start with easy steps.
- x Think of three reasons why it would be a good idea to start with exercising.
- x Don't forget, you committed to start with some exercise in the future, and now is the time to stick to your promises.
- x You can become healthier if you choose to.
- x You will feel better
- x You would look and feel great if you exercised!
- x I know you can do it
- x Woo hoo! Today is your first day of your new walking off the pounds regime.
- x Prolong your life by exercising
- x Find an exercise buddy and hold each other accountable.
- x How long do you want to be around for your family and friends?
- x You are perfectly capable of exercising!
- x You can start something anytime.
- x This is all on you! It's time to take your life back
- x Change your thoughts and you will change your world
- x Healthy now will lead to healthy later. Before you know it this will be a routine and not feel like work. It's a good habit!
- x. I'm sure one of your friends would love to go out for a walk/jog with you.
- x Let's be active!

## 6. Scenario 3

Below the particular scenario and the thirty motivational text messages are given. The intended context for the messages is that you receive them via your smartphone in your daily life. The sender of the messages is not specific, but could be considered someone who wants the best for you as a person, like a friend or personal coach.

*Imagine yourself as someone who is lacking regular exercise in his or her daily life, but has been actively thinking about starting to exercise regularly. You're starting to get ready for the necessary change and opting to start in the next 30 days.*

\* Please rate how motivating or demotivating you find the following messages if you imagine yourself as the person described.

- 1 - Very demotivating
- 2 - Slightly demotivating
- 3 - Neither demotivating nor motivating
- 4 – Slightly motivating
- 5 – Very motivating

- x Start now! The beginning is always the most difficult part of the whole journey.
- x Did you already find some workout/sport that suits your current physical level?
- x Keep an eye out for some nice areas in your district where you can go jogging.
- x Start to make a weekly agenda to set fixed times for your exercises.
- x Think about all the positive consequences that will result from your exercise.
- x Can you think of ways that help you avoiding barriers that are holding you back right now?
- x You will feel much better about yourself with a little exercise in your daily routine.
- x 65% of the Dutch population is regularly exercising. Why not become one of them? You can do it!
- x Try out different sports, and then think about which one you liked the most. Is there any club nearby which offers this sport?
- x Why start in 30 days if you can start now?
- x Ask a fitness coach to give you some directions on how to best exercise and how to maximize your achievements.

- x If you work out you will feel better in every possible way. It helps to stay positive and more efficient during the day.
- x What are the main reasons for not exercising? And what are the reasons why you actually should? Think about it and motivate yourself.
- x Treat yourself right and let yourself experience the positive effects that physical exercise has on your life.
- x Have you talked to a friend about this decision? Exercising with others can be a huge motivation to keep at it.
- x You can be healthier and happier, just by exercising
- x Exercising with friends is fun and relaxing.
- x You can do it. The rewards are too great to stop.
- x You are in control of your destiny.
- x Remember, a little change is better than no change at all - be proud of what you do, even if it's just exercising for five minutes.
- x Congrats on all the exercise!
- x You're making great progress
- x No Sweat, No fun. Know Sweat. Know Fun.
- x Don't distract yourself from your goal
- x Get ready to work, you will soon begin to feel better
- x Extend your life with just a few minutes of exercise everyday.
- x Fat is not healthy.
- x Keep up the great work
- x You can do it!
- x Think how much better you feel about yourself from the last time.

## 7. Scenario 4

Below the particular scenario and the thirty motivational text messages are given. The intended context for the messages is that you receive them via your smartphone in your daily life. The sender of the messages is not specific, but could be considered someone who wants the best for you as a person, like a friend or personal coach.

*Imagine yourself as someone who has recently incorporated regular exercise in his or her daily life, but not for an extended period of time. You have been active for less than 6 months.*

\* Please rate how motivating or demotivating you find the following messages if you imagine yourself as the person described.

- 1 - Very demotivating
- 2 - Slightly demotivating
- 3 - Neither demotivating nor motivating
- 4 – Slightly motivating
- 5 – Very motivating

x If you stop now, all this work of yours was for nothing.

x Ask fitness coaches or friends to think of a workout that is tailored to your individual level.

x If you keep on exercising regularly, you can treat yourself with some candy without feeling guilty.

x Think of something that could make exercising even more fun for you. Try it out the next time.

x You've been exercising more lately. Can you already feel the improvements?

x You've started to exercise, now keep up the good work! Do you realize how it improves your mental wellbeing?

x This week will be your week! If you give 100% today you will feel so satisfied with yourself tomorrow!

x You look good! Stay committed and you will see even better results next month.

x Good job working out this week! Keep up the good work and enjoy your weekend feeling satisfied with what you have already achieved.

x It's often more fun to exercise together. Ask your friends to join you.

x You can be proud of yourself. You achieved your first personal goal!

x Don't you agree that you feel more relaxed than before?

x Focus on the good feeling that you have after working out. This is what you are striving for.

x Think of the most important reasons why you wanted to begin with exercising. Do you have the feeling that your expectations are being fulfilled?

x Arent't your friends already envying you because of your great shape?

x You can do this.

x You are amazing, I'm proud of what you're doing!

x Great job on exercising!

- x You look marvelous! Keep it up buddy!
- x I'm happy to see you are still exercising, how long do you think you can go?
- x Don't give up now! You've got it!
- x Don't give up - it's important to stay strong even when you feel like quitting.
- x Exercising with others helps keeping you accountable.
- x Think positive
- x You are off to a great start keep going.
- x Being healthy is a lifestyle change not just an exercise. Live it!
- x Doctors recommend exercise.
- x Don't give up now! No pain, no gain!
- x Keep Pushing!
- x Your family loves you.

## 8. Scenario 5

Below the particular scenario and the thirty motivational text messages are given. The intended context for the messages is that you receive them via your smartphone in your daily life. The sender of the messages is not specific, but could be considered someone who wants the best for you as a person, like a friend or personal coach.

*Imagine yourself as someone who has been participating in regular exercise in his or her daily life for an extended period of time. You have been active for more than 6 months now.*

\* Please rate how motivating or demotivating you find the following messages if you imagine yourself as the person described.

- 1 - Very demotivating
- 2 - Slightly demotivating
- 3 - Neither demotivating nor motivating
- 4 – Slightly motivating
- 5 – Very motivating

- x Think back to before you started exercising, Do you see how much you have improved?
- x You have come this far, you should be proud of your achievements.

- x It's great that you are exercising so regularly - I bet that feels pretty good.
- x Aren't your friends already envying you because of your discipline?
- x Why stop now? You have already achieved so much.
- x For the last months, you have exercised more than 65% of people of the same age. Good job!
- x Quite amazing how you keep it up. And don't you love the way it makes you feel?
- x Imagine all the jealous looks you'll get at the beach this summer! You will love it!
- x Try to set daily goals that you can reach. A bit of exercising (e.g. going for a strong walk) is always better than none.
- x Congrats, you've succeeded in another healthy week full of exercising.
- x Wow, I am very proud of you! It's great to see how much you've been exercising lately.
- x It's great to see all the positive effects on your body, and also that you feel much fitter and more balanced after working out.
- x Again a week passed, and you made it to the fitness studio 3 times! Others should be impressed and follow your exemplary discipline.
- x Work out with friends. You will not only stay healthy, but also improve your social life.
- x How about signing in for the marathon in your city?
- x You're close to your goal!
- x You look so healthy.
- x Great job exercising! Keep it up!
- x Don't strive to be better than others, strive to be better than the person you were yesterday.
- x If you dream you can achieve
- x Making time for yourself and to workout should be a priority in your life. It's important to make time for you!
- x It's tempting to celebrate at the end of the week, but habits set quickly. Don't forget to move today!
- x Live every day like it's your last!
- x Be an inspiration for the gang!
- x You have done amazing things and there is more to come
- x You are awesome!
- x Maybe I will start working out with you!
- x You have done phenomenal so far. Keep it up!
- x You are doing great! You have already been going at this for more than 6 months!



x Just imagine how good you will look after all this exercise!

### 9. Some last questions

Consider this definition of regular exercise: regular exercise is any planned physical activity (e.g., brisk walking, aerobics, jogging, bicycling, swimming, rowing, etc.) performed to increase physical fitness. Such activity should be performed 2 to 5 times per week for 20-60 minutes per session. Exercise does not have to be painful to be effective but should be done at a level that increases your breathing rate and causes you to break a sweat.

\*Do you exercise regularly according to that definition?

- x Yes, and I have been for MORE than 6 months.
- x Yes, and I have been for LESS than 6 months.
- x No, but I intend to in the next 30 days.
- x No, but I intend to in the next 6 months.
- x No, and I do NOT intend to in the next 6 months.

### 10. Self-efficacy

This part looks at how confident you are to exercise when things get in the way. Read the following items next to the rating scale and click on the button that best expresses your confidence about still going to exercise when you face the described situation of each item in your leisure time.

Please answer using the following 5-point scale:

- 1 - Not at all confident
- 2 - Somewhat confident
- 3 - Moderately confident
- 4 - Very confident
- 5 - Completely confident

- x I am under a lot of stress.
- x I am depressed.
- x I am anxious.
- x I feel I don't have the time.
- x I don't feel like it.
- x I am busy.
- x I am alone.
- x I have to exercise alone.
- x My exercise partner decides not to exercise that day.
- x I don't have access to exercise equipment.
- x I am travelling.
- x My gym is closed.
- x My friends don't want me to exercise.
- x My significant other does not want me to exercise.
- x I am spending time with friends or family who do not exercise.
- x It's raining or snowing.
- x It's cold outside.
- x The roads or sidewalks are snowy.

### 11. Decisional balance

This section looks at positive and negative aspects of exercise. Read the following items and indicate by clicking the appropriate button, how important each statement is with respect to your decision to exercise or not to exercise in your leisure time.

Please answer using the following 5-point scale:

- 1 - Not important
- 2 - A little bit important
- 3 - Somewhat important
- 4 - Quite important
- 5 = Extremely important

If you disagree with a statement and are unsure how to answer, the statement is probably not important to you, which would correspond to rating a 1.

How important are the following opinions in your decision to exercise or not to exercise?

- x I would have more energy for my family and friends if I exercised regularly. \*
- x I would feel embarrassed if people saw me exercising.
- x I would feel less stressed if I exercised regularly. \*
- x Exercise prevents me from spending time with my friends.
- x Exercising puts me in a better mood for the rest of the day. \*
- x I feel uncomfortable or embarrassed in exercise clothes.
- x I would feel more comfortable with my body if exercised regularly. \*
- x There is too much I would have to learn to exercise.
- x Regular exercise would help me have a more positive outlook on life. \*
- x Exercise puts an extra burden on my significant other.

Note: Those marked with \* pros, those without cons.

## 12. Personality questionnaire

Very good, almost done! This questionnaire contains phrases describing people's behaviors.

Please use the appropriate button in the rating scale below to describe

how accurately each statement describes you. Describe yourself as you generally are now, not as you wish to be in the future. Describe yourself as you honestly see yourself, in relation to other people you know of the same sex as you are, and roughly your same age. So that you can describe yourself in an honest manner, your responses will be kept in absolute confidence. Please read each statement carefully.

Please answer using the following 5-point scale:

- 1 - Very inaccurate
- 2 - Moderately inaccurate
- 3 - Neither inaccurate nor accurate
- 4 - Moderately accurate

## 5 - Very accurate

- x Often feel blue.
- x Dislike myself.
- x Am often down in the dumps.
- x Have frequent mood swings.
- x Panic easily.
- x Rarely get irritated.
- x Seldom feel blue.
- x Feel comfortable with myself.
- x Am not easily bothered by things.
- x Am very pleased with myself.
- x Feel comfortable around people.
- x Make friends easily.
- x Am skilled in handling social situations.
- x Am the life of the party.
- x Know how to captivate people.
- x Have little to say.
- x Keep in the background.
- x Would describe my experiences as somewhat dull.
- x Don't like to draw attention to myself.
- x Don't talk a lot.
- x Believe in the importance of art.
- x Have a vivid imagination.
- x Tend to vote for liberal political candidates.
- x Carry the conversation to a higher level.
- x Enjoy hearing new ideas.
- x Am not interested in abstract ideas.
- x Do not like art.
- x Avoid philosophical discussions.
- x Do not enjoy going to art museums.
- x Tend to vote for conservative political candidates.
- x Have a good word for everyone.

- x Believe that others have good intentions.
- x Respect others.
- x Accept people as they are.
- x Make people feel at ease.
- x Have a sharp tongue.
- x Cut others to pieces.
- x Suspect hidden motives in others.
- x Get back at others.
- x Insult people.
- x Am always prepared.
- x Pay attention to details.
- x Get chores done right away.
- x Carry out my plans.
- x Make plans and stick to them.
- x Waste my time.
- x Find it difficult to get down to work.
- x Do just enough work to get by.
- x Don't see things through.
- x Shirk my duties.

### 13. Debrief survey

Thank you very much for your participation.

In this survey you were shown thirty text messages in the context of different scenarios and asked to rate how motivational they were for you. The messages you were asked to rate were either written by peers without expertise knowledge of motivating people, or by experts who are working in the field of Health Psychology.

With these questions we want to find out if there is a difference in the motivational value of messages generated by peers or by experts with profound knowledge in this field.

For further questions or contact email: [r.a.j.devries@utwente.nl](mailto:r.a.j.devries@utwente.nl)