Experiences of adheres and nonadheres with an application based on the TransTheoretical model with stage tailored and peer-designed text messages

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Abstract

Background: Nowadays people do not engage in the recommend levels of physical activity. Despite that people in general have favourable attitudes towards healthy behaviours, people often encounter difficulties when trying to maintain a workout schedule. Persuasive technology can stimulate individuals to change their behaviour. This qualitative study is aimed to examine experiences of adheres and nonadheres with the Motiapp. The application (Motiapp) is developed to motivate people to keep exercising or to start exercising. The Motiapp is based on the TransTheoretical Model (TTM) and sends daily text messages to exercise. These text messages are tailored to stage of change of the user and are peer-designed.

Method: Individual in-depth interviews about their experiences with the Motiapp were conducted with 15 adheres and with 15 nonadheres of the Motiapp. Interviews were audio-recorded, transcribed and analysed both deductively and inductively.

Results: The participants adhered to the Motiapp, because the application was easy to use and the participants were curious about the effects of the Motiapp. The participants nonadhered to the Motiapp, because they got no messages anymore, got a new mobile phone or they disliked certain aspects of the Motiapp. Overall, the messages of the Motiapp were experienced positively. Participants indicated that most of the messages were personal, persuasive and relevant. Moreover, the behavioural processes of the TransTheoretical model were helpful to motivate them to exercise. More than half of the participants indicated that the Motiapp had a positive effect, because it was a reminder to exercise. The other participants indicated that the Motiapp had no effect. However, the participants indicated that the messages were a confirmation to their exercise behaviour. The participants would change the time of receiving the messages and would enlarge the Motiapp with an activity tracking system – to track their activities and to share their activities with friends and the messages should include pictures and links to exercise activities.

Conclusion: There are no noticeable difference between the adheres and nonadheres. The most reason for nonadherence are unintentionally. Moreover, it seems adherence can be increased by an easily working application. In general the Motiapp was experienced positively. The messages were experienced as personal and a reminder to exercise. Finally, participants would find a more comprehensive application motivating to exercise more.

Keywords: Adheres, Nonadheres, Participants, Exercise, Messages, Motiapp

1. Background

Regular physical exercise attributes a great benefit to people's general health (Warburton, Nicol & Bredin, 2006). Exercise is beneficial for a person's physical as well as psychological well-being (Penedo & Dahn, 2005). Active individuals are more likely to be better adjusted, perform better on tests of cognitive functioning, exhibit

reduced cardiovascular responses to stress (Bennett & Carroll, 1990) and report fewer symptoms of anxiety and depression (Blair, LaMonte, & Nichaman, 2004). Exercise also improves people's self-confidence and self-esteem (Folkins & Sime, 1981). Recommend is that adults between the age of 18 and 54, exercise at least five times a week for half an hour, such as strenuous walking. Adults also have to exercise at least three times a week for half an hour more intensively, such as aerobics, football or tennis (van Uffelen, Paw, Hopman-Rock & van Mechelen, 2008). However, a great number of people do not engage in the recommended levels of the physical activity. This due to the low perceived benefits and high perceived barriers, such as physical exertion and the time to exercise (Lovell, Ansari & Parker, 2010). It seems that people should be stimulated to exercise more often.

To get people to exercise more a behavioural change is needed. Getting an individual to change their everyday behaviours and their lifestyle is challenging. However, recent developments in persuasive technology for health behaviour change has had promising results. Persuasive technology can be defined as interactive information technology designed for changing users attitude or behaviour (Oinas-Kukkonen & Harjumaa, 2008). Persuasive technology is used to persuade, motivate and activate individuals' health behaviour change. Persuasive technology plays a role in stimulating people to take responsibility for their own health and well-being.

A persuasive technology that is widely used are applications (apps). It is not uncommon for individuals to have tried using apps on their computers or mobile phones to track physical activity (Consolvo, Everitt, Smith & Landay, 2006). Figures from Telecompaper shows that 81 percent of the Dutch people aged 18 to 80 years are in the possession of a mobile phone (Marketingfacts, 2018). The use of an smartphone app for a health behaviour change is effective, because an app is constantly accessible, easily adjustable to the needs of the user, able to provide tailored feedback, has a large reach and can make use of interactive features (Griffiths, Lindenmeyer, Powell, Lowe & Thorogood, 2006). Smartphone apps that promote physical activity are popular. Worldwide 875,683 active apps are available in iTunes and 696,527 active apps in Google Play. Middelweerd, Mollee, van der Wal, Brug & te Velde (2014) categorized 17,756 of the total amount as fitness applications. Previous research suggests that the use of behaviour change techniques in apps is effective (Abraham & Michie, 2008). Commonly used behaviour change techniques in apps are goal-setting, prompt intention formation, providing feedback on performance, self-monitoring and reviewing behavioural goals. A review of apps to promote physical activity among adults showed that these apps are not based on theoretical models (Middelweerd et al., 2014). Similarly, Cowan et al. (2013) found that the key constructs of a behaviour change theory are seldom used in apps that target physical activity. However, the commonly used apps with behaviour change techniques (goal setting, prompt intention formation, providing feedback on performance, self-monitoring and reviewing behavioural goals) showed large effect sizes on behavioural change (Middelweerd et al., 2014).

An effective health behavioural change model that can be used is The TransTheoretical Model (Prochaska &Velicer, 1997). The TransTheoretical Model (TTM) is a dynamic integrative behaviour change model focused on the individual. Five stages of change associated with the TTM describe individuals willingness to change their behaviour. The five stages of change can be practically applied and classify individuals in to progressing stages for changing behaviour, i.e., precontemplation, contemplation, preparation, action and maintenance. When moving through these stages people encounter processes of change, experiences and actions that influence the progression through these stages. Moreover, motivation is required for the focus, effort and

energy is needed to move through the stages. According to Prochaska and Velicer (1997) the five stages are defined as follow. Precontemplation is the stage in which people are not intending to take action in the foreseeable future, usually measured in the next 6 months. Contemplation is the stage in which people are intending to change in the next 6 months. Preparation is the stage in which people are intending to take action in the immediate future, usually measured in the next month. Action is the stage in which people have made specific overt modifications in their life styles within the past 6 months. Maintenance is the stage in which people are working to prevent relapse, but do not apply change processes as frequently as people in the action stage.

While the stages of change are useful in explaining when changes in cognition, emotion and behaviour take place, the processes of change can help to explain how and why the progression through these stages occur. Ten covert and overt processes will usually be experienced when successfully progressing through these stages of change and attaining the desired behavioural change. The ten processes can be divided into two groups: experiential processes and behavioural processes. Experiential processes are focused on changing people's ideas and behavioural processes are focused on changing people's actions. The experiential processes include the following. Consciousness raising - involves increased awareness about the causes, consequences and cures for a particular problem behaviour. Dramatic relief - produces increased emotional experiences followed by reduced affect if appropriate action can be taken. Self-re-evaluation - combines both cognitive and affective assessments of ones self-image with and without a particular unhealthy habit. Environmental re-evaluation - combines both affective and cognitive assessments of how the presence or absence of a personal habit affects ones social environment. Social liberation - requires an increase in social opportunities or alternatives especially for people who are relatively deprived or oppressed. The behavioural processes include the following. Self-liberation - is both the belief that one can change and commitment and recommitment to act on that belief. Helping relationships - combine caring, trust, openness and acceptance as well as support for the health behaviour change. Counterconditioning - requires the learning of healthier behaviours that can substitute for problem behaviours. Reinforcement management - provides consequences for taking steps in a particular direction. Stimulus control - removes cues for unhealthy habits and adds prompts for healthier alternatives.

The effectiveness of the processes depends on their associated stages of change (Marcus et al., 1998). Table 1 shows the stages of change combined with the ten process of change. The checkmark indicates the stage of change combined with the process of change.

Table 1 *Stages of change combined with the ten processes of the TransTheoretical Model*

	Stages of change				
Ten processes	Precontemplation	Contemplation	Preparation	Action	Maintenance
Consciousness raising	√	√			
Environmental re-evaluation	√	√			
Dramatic relief	√	√			
Social liberation	√	√			
Self-re-evaluation		√	√		
Self-liberation			√	√	
Helping relationships			√	√	√
Counter conditioning			√	√	√
Reinforcement management				√	√
Stimulus control				√	√

Developers of persuasive technology who want people to change their behaviour could use the TTM to tailor the information they provide to the stage the user is in. According to Marcus et al. (1998) stage based interventions

can be more effective than non-stage based interventions. Their study tested a tailored intervention - tailored to the participants stage of change and associated processes, versus, a non-stage based intervention. The results showed that both interventions increased physical activity levels, but the tailored version increased physical activity levels the most. Spencer et al. (2006) remarks that individuals using the appropriate processes of change as they move through the stages is essential for behavioural change. It seems that the TTM is an effective behavioural change model especially when the stages are combined with the processes.

To translate a health behavioural change model, like the TTM, into an application, text messages can be used. Text messages can stimulate behavioural change. There are four components to an effective persuasive text message. To be specific, present a simple and tailored message that is easy to understand, send the message at an appropriate time, at an appropriate place and do not use irritating strategies (Maheshwari, Chatterjee, & Drew, 2008). A systematic review of 18 studies that evaluated the use of a cell phones to provide health information showed that providing care and support via cell phones and text messaging improved health related outcomes and increased knowledge and self-efficacy (Perez-Ferre et al., 2010). Subsequently, a reminder system with text messages alerts users when it is time to engage in a healthy behaviour, such as going for a walk . Time reminders are examples of 'cueing' or 'stimulus control' processes, which involve changing an individual's environment to present a conditional stimulus to perform a desired health behaviour, for example keeping a gym bag by the door as a physical reminder to work out (Prestwich, Perugini, & Hurling 2009). The technique of text messages as a reminder to engage in a particular behaviour has successfully changed individuals health behaviour (Khonsari et al., 2015). Text messages can be tailored to individuals. Using tailored text messages to influence someone's behaviour has proven effective in various contexts, for example with dieting (Mutsuddi & Connelly, 2012). In addition, their research showed that tailored text messages in combination with a behaviour change theory or model to influence someone's behaviour can be effective for physical activity. Tailoring text messages to a theory or model can enhance motivation to attend to and process health information (Rimer & Kreuter, 2006).

Text messages can be designed by experts, peers or other people. Usually experts design the text messages. However, Coley et al. (2013) showed that peer-designed text messages can be more engaging and more relevant to the users in comparison to expert-designed text messages.

Despite that people in general have favourable attitudes towards healthy behaviours, people often encounter difficulties when trying to maintain a workout schedule (Ryan, Patrick, Deci & Williams, 2008). Another research showed that only one of every two people would continue a physical activity program (Morgan & Dishman, 2001; Marcus et al, 2000). It seems that many people dropout of a physical activity program before attaining its benefits. This high dropout rate typically occurs within the first 6 months of a program, often before any health benefits are realized (Ainsworth, 2000). The people who dropout a program are also defined as the 'nonadheres' which means the extent to which an individual is not able to proceed a program or treatment. The people who proceed a program or treatment are defined as the 'adheres' (Hugtenburg, Timmers, Elders, Vervloet & van Dijk, 2013). Factors to dropout are lack of time, lack of insight, motivation, failed previous attempts, fear of injury, costs and boredom (Salmon, Owen, Crawford, Bauman & Sallis, 2003; Teferra, Hanlon, Beyero, Jacobsson, & Shibre, 2013). Nonadherence can be divided into unintentional nonadherence or intentional nonadherence. Unintentional nonadherence involves participation as instructed but failing to do so for some reason. For example, forgetfulness and carelessness (Wroe, 2002). Intentional nonadherence involves making a reasoned decision not to take part as instructed based on perception feelings or beliefs. Intentional nonadherence

reflects a rational decision making process by which the users outweighed the benefits against the effects (Wroe, 2002; Lehane, & McCarthy, 2007).

Adherence can be divided in short-term and long-term adherence. Long term adherence can be defined as at least 1 year of regular participation. Most studies are limited to six months or less. However, factors of short term adherence can be related to long-term adherence. Facilitators related to short-term physical adherence include social support, education (Dayer, Heldenbrand, Anderson, Gubbins & Martin, 2003) and motivation which includes enjoyment and self-efficacy (White, Randsell, Vener & Flohr, 2005; Huberty et al., 2008). Social support is an important factor. However, more for the initiation for activity and not for the maintenance of long-term physical activity (White et al., 2005).

There are many methods developed to increase adherence. Most methods attempt to change the user's behaviour by using reminders, counselling, reinforcement, education or a combination of these methods. Vervloet, Linn & Weert (2012) showed that mobile devices using reminder systems through text messaging increases adherence and can be useful in measuring adherence in the short term.

Another method to increase adherence is the acceptance of technology. An important model to ensure that technology is accepted by users is the Technology Acceptance Model (TAM) (Venkatesh & Davis, 2000). This model suggests that when users are presented with a new technology a number of factors influence their decision about how and when they will use it. Two influential factors are the perceived ease of use and perceived usefulness. The perceived ease of use is the degree to which a person believes that using a particular system would be free from effort and the perceived usefulness is the degree to which a person's beliefs that using a particular system would enhance his or her job performance.

The application (Motiapp) is developed to motivate people to keep exercising or to start exercising. The Motiapp is based on the TransTheoretical Model. The Motiapp sends daily text messages to exercise. These text messages are tailored to the stage of change (TTM) of the user and are peer-designed. The main objective of this study was to elaborate on the experiences of adheres and nonadheres with the Motiapp. The following research question can be addressed: '*What are the experiences with the Motiapp of the adheres and nonadheres?'*

The following sub-questions can be examined:

(1) What are the self-reported reasons for adherence and nonadherence to the Motiapp?
(2) What are the perceived experience of the messages and which messages (aligned to the ten processes) are recalled?
(3) What are the perceived experience (perceived ease of use and perceived usefulness) of the Motiapp in general?
(4) What is the potential use (intentions, recommendations and improvements) of the Motiapp?

2. Method

2.1 Setting

The current study was part of a Randomized Control Trial (RCT). This RCT was a three month trial of the Motiapp, with a begin survey (T0), biweekly surveys (T1) and a final survey (T2). All people were randomly assigned to one of the two conditions. The first condition consists of people who received notifications based on the stage of change they are in. The second condition consists of people who received notifications not based on the stage of change they are in, but randomly. However, this will not be taken further into account during this study.

To approach people for the RCT a convenience sample was taken. Emailing lists, personal lists, flyers, Twitter, Facebook and a student system for course credits were used. In total 118 people started to use the Motiapp. The people could participate anonymously or sign up with their name and email address. The Motiapp is an application to motivate people with simple motivational text messages to either start doing physical activity or to keep doing physical activity. The Motiapp starts with a survey. This survey ensures that people are assigned to their stage of change. Based on the stage of change the participants are in, the participants received applicable notifications (text messages), which are aligned to the ten processes. The participants received daily notifications that could either be rated 'Motivating' or 'Not motivating'. The participants were asked to rate these messages considering their own situation. If the participant thought the message contributed a little to their motivation to start doing physical activity or to keep doing physical activity. For three months the participants received a notification every day at 18.00 o'clock. Besides the daily notifications, every two weeks a survey was filled in. These surveys were only used for the RCT to keep track of changes in the exercise behaviour. The survey consists of 20 questions, 6 about the self-efficacy, 6 about the decisional balance, 1 about the stage of change and 4 about the glteg. Finally, at the end of three months a final survey was filled in. This survey offered the possibility to give feedback on the use of the app.

2.2 Procedure and participants

The design of this study was a semi-structured interview with adheres and nonadheres of the Motiapp. At the moment of data collection for the RCT, 47 people did adhere and 71 people did not adhere to the Motiapp. People did adhere to the Motiapp when the final survey was filled in. From the RCT fifty-three participants signed up with their name and email address. These fifty-three participants were asked to participate in this study, twenty-seven adheres and twenty-six nonadheres of the Motiapp. The participants were contacted by e-mail and invited to participate in a face to face interview about their experiences with the Motiapp. With participants who were willing to participate, an appointment for a face-to-face interview was made. In total 30 participants responded of which 15 adheres and 15 nonadheres were interviewed. Table 2 shows the demographics of the participants.

Table 2
Demographics of the adheres and nonadheres of the Motiapp

Demographics	Adheres (n = 15)	Nonadheres (n = 15)	**Total (N = 30)**
Gender (Female)	10	8	**18**
Gender (Male)	5	7	**12**
Age years, mean (S.D.);[range]	25.2 (8.7) [21-56]	24.4 (2.5) [21-30]	**24.8 (6.4) [21-56]**

The sample included both female (n = 18) and male (n = 12) participants of which ten females and five males did adhere and eight females and seven males did not adhered to the Motiapp, with an average age of 24,4 years. This study was approved by an Ethical Commission. The interviews were conducted in Dutch by a master student of Communication Studies. All interviews were audio-recorded and transcribed. The interviews took between 25 and 40 minutes, with an average duration of 30 minutes. Quotations appearing in this article have been translated from Dutch into English.

2.3 Instrument

A semi-structured interview scheme was used. The interview scheme was pre-tested with two adheres of the Motiapp. The aim of the pre-test was to optimize the interview scheme before conducting the interviews. The pre-tests were not included in the research results.

The interview consisted of two parts. In the first part of the interview, the participants were emphasized that they had the right to withdraw the interview and that there were no good or wrong answers. In addition, it was stated that the participants had the right not to answer any questions, regardless of their reasons for it. Furthermore, the anonymity of participants was assured. Followed by the request for their permission to record the interview. After the participants agreed on these conditions, the interview started.

In the second part 5 themes were covered. Table 3 shows an overview of the themes and example questions.

Table 3

Overview of the interview themes and example questions

Theme	Question
Pre-Motiapp behaviour	How many times a week do you exercise? How many hours a day do you use your mobile phone?
Reasons participant did adhere and did not adhere	Why did you stop using the app? Why did you proceed with the use of the app?
Perceived experiences with the messages and recalled messages of the Motiapp	
Aspects of the messages	How did you perceive the messages?
Single word naming	Describe the messages in one word?
Structure of the messages	How do you think the messages have been prepared?
Recalled messages	Is there something you notice about the messages?
Perceived experience of the Motiapp in general	
Perceived ease of use	How did you experience the use of the app in general?
Perceived usefulness	What kind of effect did the app have on you?
Potential use	
Intentions to reuse	Do you have the intention to reuse the app?
Recommendations	Would you recommend the app?
Improvements	What would you improve about the app?

First the participants were asked about their exercise behaviour before the use of the Motiapp. Followed by the reasons participants did adhere and did not adhere to the Motiapp. The perceived experiences with the messages and the recalled messages of the Motiapp, which included the aspects of the messages, single-word naming (Strain, Patterson & Seidneberg, 1995), structure of the messages and the recalled messages (aligned to the ten processes of TTM) (Prochaska & Velicer, 1997). The perceived experiences of the Motiapp in general, which included the perceived ease of use and usefulness of the Motiapp (Venkatesh &Davis, 2000). The potential use of the Motiapp, which included the intention to reuse, the recommendations and the improvements for the Motiapp. During the interview, the participants were asked for permission to retrieve their assessed messages.

Subsequently, the participants were encouraged to motivate their answers and elaborate upon their experiences. After the discussion of these five themes the participants were appreciated for their participation.

2.4 Analysis

A multistep content-analytic procedure was applied to analyse the qualitative data. After the interviews had been transcribed, the interviews were coded in order to acquire basic insight into the content. The codebook that was used for this coding session consisted codes that had been derived from the Technology Acceptance Model (Venkatesh & Davis, 2000). Furthermore, this codebook consisted of new codes about adherence, recalled messages, reuse, recommendations and improvements for the Motiapp. In other words, both a deductive and inductive content analysis were used to develop the codebook (Elo & Kyngäs, 2008). After a first coding session, the codebook was refined and new codes and subcategories were added to the codebook. Subsequently, the new codebook was discussed with a second researcher. This discussion led to another coding session, where the final codes and subcategories in the codebook were defined on the basis of consensus between the first and the second researcher.

3. Results

In the following paragraphs the participants experiences with the Motiapp are described. Starting with pre-Motiapp behaviour (3.1), followed by reasons participants did adhere and did not adhere to the Motiapp (3.2), their perceived experiences of the messages (3.3), their perceived experiences of the Motiapp in general (3.4) and the potential use (3.5). In each paragraph a distinction is made between adheres (N = 15) and nonadheres (N = 15) of the Motiapp.

3.1 Pre-Motiapp behaviour

Table 4 shows the frequency of mobile phone use and the frequency of exercise a week by adheres and nonadheres of the Motiapp.

Table 4

Frequency of mobile phone use and exercise times a week by adheres and nonadheres of the Motiapp

Participants	Adheres (n = 15)	Nonadheres (n = 15)	**Total (N = 30)**
Use of telephone			
0 till 3 hours	6	3	**9**
3 till 6 hours	6	9	**15**
6 till 9 hours	2	3	**5**
9 till 12 hours	1	-	**1**
Exercise times per week			
1 -2 time a week	9	4	**13**
3- 4 times a week	5	10	**15**
5 -7 times a week	1	1	**2**

The majority of the participants used their mobile phone more than three hours a day. Most of the adheres used their mobile phones ranging from null till three hours a day or three till six hours a day. Most of the nonadheres used their mobile phone ranging from three till six hours a day.

All of the participants exercise. Seventeen people exercise three or more times a week. The participants go to the gym or practice team sports, like football. Nine adheres exercise two times a week. Ten nonadheres exercise three times a week. It seems that in general the participants are all active.

3.2 Reasons participants did adhere and did not adhere to the Motiapp

Table 5 shows the reasons why participants did adhere to the Motiapp. The adheres gave multiple reasons for their adherence to the Motiapp. The main reason these participants (n = 10) adhered to the Motiapp was, because the app was simple and easy to use. Moreover, the adheres were curious about the effect of the app. This is illustrated by, '*I found the research interesting. I was curious to see what it did and if it in the end would motivate me to exercise more. That would be a nice bonus of course (P18)'* Another reason a few adheres indicated was that the Motiapp functioned as a reminder to exercise. Finally, three participants adhered to the Motiapp, because afterwards those participants got course credits for their participation.

Table 5
Reasons participants did adhere and did not adhere to the Motiapp

	Adheres (n = 15)	
	The app was easy to use	10
	Curious if the Motiapp had effect	5
	The app functioned as a reminder	3
	After adherence of the Motiapp the participants got awarded	3
	Total	**19**
	Nonadheres (n = 15)	
Unintentional	Got no messages anymore	5
	Got a new mobile phone	4
	Did not finish the app within time	2
	Total unintentional	**11**
Intentional	The biweekly surveys were too much	2
	The messages were disturbing	1
	Stopped because of another programme	1
	Total intentional	**4**
	Total	**15**

Table 5 shows the reasons why participants did not adhere to the Motiapp. Eleven nonadheres unintentionally did not adhere to the Motiapp. Reasons for unintentional nonadherence are, got no messages anymore, got a new mobile phone and did not finish the app within time. Some nonadheres (n = 3) indicated that after a while they did not receive any messages anymore. This is illustrated by,

> '*Well it differed a lot, then I got no messages for a full week and sometimes every couple of days. I hardly got messages three days in a row. I think that there is something wrong with the app (P2*)'.

Other nonadheres (n = 2) indicated that the messages came only if the application was opened. This is illustrated by,

> *'I did not get those messages unless I opened the app myself. I thought that was a little bit inconvenient. When my telephone memory was full, I realised that I did not use the app, so I deleted it (P22)*'.

Four nonadheres indicated nonadherence to the Motiapp, because those participants got a new mobile phone. The nonadheres indicated that they forgot to reinstall the application on their new mobile phone, because it was not really important. This is illustrated by, *'I stopped purely because I got another mobile. I forgot about the app, so actually I did not miss the app (P1)'.* Two nonadheres indicated adherence to the Motiapp, but not within the set timeframe.

Four nonadheres intentionally did not adhere to the Motiapp. Reasons for intentional nonadherence are, the biweekly surveys are too much, the messages were disturbing and stopped because of another program. Two nonadheres indicated that the biweekly surveys took too much time to fill in. The messages were a small effort, but the questionnaire was to intensive. This is illustrated by,

> *'I found the messages ok, it was just one click. However, you had to fill in a survey every two weeks.*

You could not swipe the survey away or fill it in later. That was quite annoying. I turned off the pop-up notifications in my phone, so I would not receive the surveys anymore. In addition, the notifications too did not pop-up (P20)'.

One nonadhere indicated the messages were irritating. This is illustrated by,

'*In the beginning I always answered the messages and completed the survey, but after a while I did not like it anymore. I did not keep track of it. I started to ignore the messages, because sometimes I had more than one message a day. I perceived the messages as annoying (P23)*'.

Another nonadhere stopped, because of the participation of another programme to lose weight. This is illustrated by,

'*It is pure laziness. I had downloaded the Motiapp and I reviewed the first few messages, furthermore I did not do anything with it. However, if I had not participated in another programme I would have taken the Motiapp more seriously (P26)*'

Interim summary

Almost all participants exercise two or three times a week. It seems that in general all the participants exercise regularly. The adheres did adhere to the Motiapp, because the app was easy to use and the adheres were curious about the effects. Nonadheres unintentional did not adhere to the Motoiapp, because of technological failure or forgetfulness. Nonadheres intentional did not adhere to the Motiapp, because of aspects they disliked about the Motiapp.

3.3.Perceived experiences of the messages and the recalled messages of the Motiapp

The perceived experiences of the messages and the recalled messages of the Motiapp, by adheres (*n = 15)* and nonadheres (*n = 15)* of the Motiapp can be divided into the perceived aspects of the messages, the single word naming, the perceived structure of the messages, the spontaneously recalled messages and the named messages.

3.3.1 Perceived aspects of the messages

Table 8 shows the perceived aspects of the messages by adheres and nonadheres of the Motiapp. All participants indicated several aspects about the messages. The perceived opinions of the messages are divided in positive-, sometimes positive or negative- and negative aspects.

Table 8

Aspects of the perceived messages by adheres and nonadheres of the Motiapp

	Participants*	Adheres (n = 15)	Nonadheres (n = 15)	**Total (N = 30)**
Positive aspects	The messages were persuasive	5	3	**8**
	The messages were relevant	4	4	**8**
	The messages were personal	6	5	**11**
	The messages created awareness	4	2	**6**
	The messages were a reminder	7	4	**11**
	The messages were confirming	4	4	**8**
	The messages were a compliment	-	1	**1**
	The messages varied	3	1	**4**
	The punctuation of the messages was convincing	2	3	**5**
	Total positive aspects	**35**	**27**	**62**
Sometimes positive or negative	The message were sometimes persuasive	7	5	**12**
	The message were sometimes relevant	7	5	**12**
	The messages were sometimes personal	4	3	**7**
	It depends on the moment and time of the messages	5	8	**13**
	Total sometimes positive or negative	**23**	**21**	**44**
Negative aspects	The messages were not persuasive	3	5	**8**
	The messages were not relevant	4	4	**8**
	The messages were not personal	5	7	**12**
	The messages were not varied	2	1	**3**
	The messages were an overkill	3	2	**5**
	The messages were irritating	4	3	**7**
	The messages were confronting	2	3	**5**
	Total negative aspects	**23**	**25**	**48**
	Total	**81**	**73**	**154**

*The participants mentioned multiple aspects about the messages

The participants indicated the messages sixty-two times as positive. The participants indicated that the messages were persuasive, relevant, personal, created awareness, a reminder, confirming, a compliment, varied and that the punctuation was convincing. More than a third (n =11) of the total number of participants (N = 30) indicated that the messages were personal. Those participants felt personally addressed by the messages, because it corresponded with their exercise levels. Moreover, eleven participants indicated that the messages were a reminder to exercise.

The adheres indicated more positive aspects about the messages than the nonadhres of the Motiapp.

The participants indicated that the messages were sometimes positive or negative forty-four times. The participants indicated that the messages were sometimes persuasive, -relevant, -personal, and it depends on the moment and time of the messages. Twelve participants indicated that the messages were sometimes relevant and twelve participants indicated that the messages were sometimes persuasive. Thirteen participants indicated how they perceived the messages depends on the moment and time. This is illustrated by,

> '*It depends on the mood I am in. If I was lazy, I found the messages convincing. If I was busy and had no time, than I thought go away with your messages(P12)'*.

Adheres indicated a little more sometimes positive and negative aspects about the messages. The adheres indicated more often that the reception of the messages depends on the context of the messages (persuaive, relevant or personal), while the nonadheres indicated more often that it depends on the moment and time.

Finally, the participants indicated the messages forty-eight times as negative. The participants indicated that the messages were not persuasive, -relevant, -personal, -varied, an overkill, irritating and confronting. More than a third (n = 12) of the total participants (N = 30) indicated that the messages were not personal. Moreover, eight participants indicated that the messages were not relevant and eight participants indicated that the messages

were not persuasive. The nonadheres indicated a little more negative aspects about the messages than the adheres. However, it seems that in general the participants experienced the messages positively.

3.3.2 Single word naming

Table 9 shows the single word naming of the messages. The participants described the messages in one word. Almost half (n =14) of the participants described the messages with positive words, such as reminder, motivating and interesting. Four participants indicated the messages with the word neutral. However, eight participants indicated the messages with a negative word, namely unnecessary. Four participants indicated the messages with other words, such as difficult, helpful and variable. In general the adheres described the messages in one word more positively and the nonadheres described the messages in one word more negatively.

Table 9
Single word evaluation of the messages by adheres and nonadheres of the Motiapp

	Participants	Adheres (n = 15)	Nonadheres (n = 15)	**Total (N = 30)**
Positive	Reminder	5	1	**6**
	Motivating	4	1	**5**
	Interesting	1	2	**3**
	Neutral	1	3	**4**
Negative	Unnecessary	3	5	**8**
	Other	1	3	**4**
	Total	**15**	**15**	**30**

3.3.3 Perceived structure of the messages of the Motiapp

Table 10 shows the opinions about the perceived structure of the messages of the Motiapp by adheres and nonadheres of the Motiapp.

Table 10
Opinions about the perceived structure of the messages by adheres and nonadheres of the Motiapp

Participants	Adheres (n = 15)	Nonadheres (n = 15)	**Total (N = 30)**
The messages were based on the surveys	6	6	**12**
The messages were chosen random	4	4	**8**
The messages were adaptive	4	3	**7**
No idea how the messages were chosen	1	2	**3**
Total	**15**	**18**	**30**

The participants thought the messages were based on the surveys, chosen randomly or are based upon an adaptive system. More than one third (n = 12) of the participants indicated that the messages were chosen based on the surveys. Nine participants indicated that the messages were chosen random and eight participants indicated that the messages were based on an adaptive system. A few participants (n = 3) had no idea how the messages were chosen. There are no noticeable difference between the adheres and nonadheres of the Motiapp.

Interim summary

In general the messages were experienced as positive. Main positive aspects about the messages were that the messages were personal and a reminder. Main negative aspects about the messages were that the messages were not personal, relevant or persuasive. However, participants too indicated that the experiences with the messages depends on the moment and time of reception.

3.3.4 Spontaneously recalled messages

Table 11 shows the frequency of the spontaneous recalled messages aligned to the ten processes by adheres and nonadheres of the Motiapp. The ten processes are divided in helpful and unhelpful.

Table 11

Spontaneous recalled messages aligned to the ten processes by the adheres and nonadheres of the Motiapp

	Total messages in each process	Participants	Adheres (n = 15)	Nonadheres (n = 15)	**Total (*N* = 30)**
Experiential processes					
Helpful	30	Consciousness raising	9	4	**13**
	26	Dramatic relief	1	-	**1**
	30	Environmental re-evaluation	-	-	**-**
	10	Social liberation	-	-	**-**
	30	Self-re-evaluation	1	-	**1**
Total messages	**126**	**Total helpful**	**11**	**4**	**15**
Unhelpful	30	Consciousness raising	1	2	**3**
	26	Dramatic relief	1	1	**2**
	30	Environmental re-evaluation	10	5	**15**
	10	Social liberation	-	-	**-**
	30	Self-re-evaluation	-	-	**-**
Total messages	**126**	**Total unhelpful**	**12**	**8**	**20**
Behavioural processes					
Helpful	30	Self-liberation	1	-	**1**
	30	Helping relationships	6	-	**6**
	30	Counterconditioning	3	1	**4**
	30	Reinforcement management	3	5	**8**
	21	Stimulus control	7	1	**8**
Total messages	**141**	**Total helpful**	**20**	**7**	**27**
Unhelpful	30	Self-liberation	-	-	**-**
	30	Helping relationships	1	-	**1**
	30	Counterconditioning	1	-	**1**
	30	Reinforcement management	-	-	**-**
	21	Stimulus control	3	-	**3**
Total messages	**141**	**Total unhelpful**	**5**	**-**	**5**
	267	**Total**	**47**	**19**	**66**

The participants indicated the experiential processes fifteen times as a helpful process. Thirteen participants indicated consciousness raising as a helpful process. The participants indicated messages, such as 'you have to make time to exercise', 'exercise makes you less stressful' and 'exercise makes you feel fit and healthier'. The participants perceived these messages as motivating and personal. This is illustrated by, *'It was motivating when the app said; 'if you go exercise now, than you will feel better about yourself'(P3)'.* The processes dramatic relief and self-re-evaluation are both indicated once by the participants.

The participants indicated the experiential process twenty times as an unhelpful process. Fifteen participants indicated environmental re-evaluation as an unhelpful process. The participants indicated messages, such as 'your family wants to see you grow old', 'your family and friends want you to live long' and 'do it for your family'. The participants perceived these messages as a threat. The participants indicated conscious raising three times and dramatic relief twice as an unhelpful process.

The participants indicated the behavioural processes twenty-seven times as a helpful process. The participants indicated self-liberation once, helping relationships six times and counterconditioning four times. In addition, eight participants indicated reinforcement management as a helpful process. The participants indicated messages, such as 'you are doing great', 'great job', 'keep up the good work' and 'you can do it'. The participants perceived these messages as a compliment and stimulating. This is illustrated by, '*If the messages contained a compliment, for example, 'you did good last week, ensure that you will do it again this week', I*

found the messages motivating (P6)'. Moreover, eight participants indicated stimulus control as a helpful process. The participants indicated messages, such as 'go for a walk', 'take a half hour to exercise', 'it only takes 30 minutes' and 'take the stairs instead of the elevator'. The participants perceived these messages as convincingly, because the steps to exercise are clear and understandable.

The participants indicated the behavioural processes five times as an unhelpful process. The participants indicated helping relationships once, counterconditioning once and stimulus control three times as an unhelpful process.

In general, the experiential processes are indicated more unhelpful than helpful and the behavioural processes are indicated more helpful than unhelpful. The adheres recalled more messages than the nonadheres. The adheres indicated the processes, helping relationships and stimulus control as a helpful process, while the nonadheres indicated the process reinforcement management as a helpful process. Furthermore, there are no noticeable difference between the adheres and nonadheres of the Motiapp.

3.3.5 Named messages

During the interview the assessed messages of each participant were shown. Table 12 shows the frequency of the named messages aligned to the ten processes by adheres and nonadheres of the Motiapp. The processes are divided in helpful and unhelpful.

Table 12
The frequency of the named messages aligned to the ten processes by the adheres and nonadheres of the Motiapp

	Total messages in each process	Participants	Adheres (n = 15)	Nonadheres (n = 15)	**Total (N = 30)**
Experiental processes					
Helpful	30	Consciousness raising	-	3	**3**
	26	Dramatic relief	2	-	**2**
	30	Environmental re-evaluation	1	2	**3**
	10	Social liberation	1	-	**1**
	30	Self-reevaluation	3	-	**3**
Total messages	**126**	**Total helpful**	**7**	**5**	**12**
Unhelpful	30	Consciousness raising	2	1	**3**
	26	Dramatic relief	3	2	**5**
	30	Environmental re-evaluation	5	3	**8**
	10	Soical liberation	2	-	**2**
	30	Self-re-evaluation	3	-	**3**
Total messages	**126**	**Total unhelpful**	**15**	**6**	**21**
Behavioural processes					
Helpful	30	Self-liberation	-	-	**-**
	30	Helping relationships	6	4	**10**
	30	Counterconditioning	-	-	**-**
	30	Reinforcement management	5	8	**13**
	21	Stimulus control	3	3	**6**
Total messages	**141**	**Total helpful**	**14**	**15**	**29**
Unhelpful	30	Self-liberation	1	-	**1**
	30	Helping relationships	1	3	**4**
	30	Counterconditioning	2	1	**3**
	30	Reinforcement management	-	-	**-**
	21	Stimulus control	3	2	**5**
Total messages	**141**	**Total unhelpful**	**7**	**6**	**13**
	267	**Total**	**43**	**33**	**76**

The participants indicated the experiential processes twelve times as a helpful process. The participants indicated consciousness raising three times, dramatic relief twice, environmental re-evaluation three times, social liberation once and self-re-evaluation three times as a helpful process.

The participants indicated the experiential processes twenty-one times as an unhelpful process. Eight participants indicated environmental re-evaluation as an unhelpful process. The participants indicated messages, such as 'be healthy for your family',' you are doing this for your friends and family as much as for yourself and your friends' and 'your family wants you to be around'. The participants perceived these messages as not motivating and not personal, because the participants did not exercise for other people. The participants only exercise for themselves. Five participants indicated dramatic relief as an unhelpful process. The participants indicated messages, such as 'you may find it more difficult to exercise as you get older', 'start working out before it is too late' and 'you are not getting any younger'. The participants perceived these messages as pedantic and not motivating. This is illustrated by,

> *'I found 'seven years younger or live less than active persons' not motivating. It felt if I was in elementary school again (P15)'.*

The participants indicated the behavioural processes twenty-nine times as a helpful process. Ten participants indicated helping relationships as a helpful process. The participants indicated messages such as, 'sport with friends', 'I know how hard it is to find time to exercise' and 'get your friends to work out with you'. The participants perceived these messages as relevant and personal, because friends do make it easier to exercise. In addition, thirteen participants indicated reinforcement management as a helpful process. The participants indicated messages, such as 'you are doing great', 'keep up the good work' and 'be proud of your accomplishments'. The participants perceived these messages as a compliment, motivating and a confirmation to their behaviour. The participants indicated stimulus control six times as a helpful process.

The Participants indicated the behavioural processes thirteen times as an unhelpful process. The participants indicated self-liberation once, helping relationships four times and counterconditioning three times. In addition, the participants indicated five times stimulus control as an unhelpful process. The participants indicated messages, such as 'get up and get going, no excuses' and 'go do something'. The participants perceived these messages as not personal and aggressive. This is illustrated by,

> '*With the messages such as* '*get up and get going, no excuses', I thought calm down, don't be so aggressive. The messages really forced itself on me (P3)'* .

In general the experiential processes are indicated more unhelpful than helpful and the behavioural processes are indicated more helpful than unhelpful. The adheres indicated more messages than the nonadheres. Furthermore, there are no noticeable difference between the adheres and nonadheres of the Motiapp.

Interim summary

In general, the behavioural processes are perceived as more helpful and the experiential processes are perceived as more unhelpful. Moreover, the behavioural processes are indicated more often than the experiential processes. Helpful processes are helping relationships, reinforcement management, stimulus control (behavioural processes) and consciousness raising (experiential processes). Unhelpful processes are environmental re-evaluation and dramatic relief (experiential processes). The adheres indicated more messages than the nonadheres.

3.4 Perceived experiences of the Motiapp in general

The perceived experiences of the Motiapp in general, by adheres (*n = 15)* and nonadheres (*n = 15)* of the Motiapp can be divided into perceived ease of use and the perceived usefulness.

3.4.1 Perceived ease of use

Table 6 shows the aspects of the perceived ease of use of the Motiapp in general and the surveys by adheres and nonadheres of the Motiapp. Participants mentioned multiple aspects about the ease of use of the Motiapp in general and the surveys. The perceived aspects can be divided in positive and negative.

Table 6
Aspects of the perceived ease of use of the Motiapp in general and the surveys by adheres and nonadheres of the Motiapp

	Participants	Adheres (*n* = 15)	Nonadheres (*n* = 15)	**Total (*N* = 30)**
Motiapp				
Positive aspects	It was easy to install	1	2	**3**
	The app was easy to use	12	13	**25**
	Good that the messages could not be swiped a way	1	2	**3**
	Total positive aspects	**14**	**17**	**30**
Negative aspects	It was not easy to install	1	2	**3**
	The app was difficult because of the English language	2	2	**4**
	Irritating that the messages could not be swiped a way	1	-	**1**
	The messages came at a wrong time	4	2	**6**
	Total negative aspects	**8**	**6**	**14**
	Total	**21**	**23**	**44**
Surveys				
Positive aspects	The surveys were easy to fill in, short and clear	10	2	**12**
	The surveys created awareness of how much you exercise	2	7	**9**
	Total positive aspects	**12**	**9**	**21**
Negative aspects	The surveys were too long and took a lot of time	4	6	**10**
	The survey is too difficult because of the English language	3	4	**7**
	The surveys came at the wrong time and too often	4	5	**9**
	The survey could not be swiped away	4	1	**5**
	The questions were not always clear	10	7	**17**
	Total negative aspects	**25**	**23**	**48**
	Total	**37**	**32**	**69**

Positive aspects mentioned by the participants were that the application in general was easy to install, easy to use and it was good that you could swipe the messages away. The majority (*n* = 25) indicated that the application was easy to use, because the messages just pop-up, you did not have to open the application to receive a message and you only had to click on motivating or not motivating. This is illustrated by, '*You did not have to open the application every time, you could just easily click if it was motivating or not (P18)'.*

Negative aspects mentioned by the participants were that the application in general was not easy to install, difficult because of the English language, irritating because the messages could not be swiped away and the messages came at the wrong time. Six participants indicated that the messages came at the wrong time. They found the messages at six o'clock too rigid. This is illustrated by,

> *'Unfortunately you could not set the time for the messages. For me there are certain times where it would be more relevant to get a messages, for example in the morning (P27)*'.

Overall, the participants were more positive than negative about the application in general. Furthermore, there are no noticeable difference between the adheres and nonadheres of the Motiapp.

Positive aspects mentioned about the surveys were that the survey was easy to fill in, short and clear and created awareness. Twelve participants indicated that the survey was easy to fill in, short and clear. This is

illustrated by, *'Every survey was the same. At a given moment you know what you have to fill in. You still read it, but you did not have to think about it (P4)'.* Nine participants indicated that the surveys created awareness. This is illustrated by, '*Normally I am not aware of how much I exercise, but with this survey you could indicate whether you were exercising enough or not (P2)'.*

Negative aspects mentioned about the surveys were that the surveys were too long, took a lot of time, were difficult because of the English language, came at the wrong time, too often, could not be swiped away and the questions were difficult. The majority (n = 17) indicated that the questions in the survey were not always clear. The participants found it difficult to make a distinction between the terms heavy-, mild- and light exercise and the response scales were vague. This is illustrated by,

> '*It was hard to decide what kind of athlete you were, heavy, mild or light. For example I race the bike, that is heavy, but I also cycle to school is that heavy too?(P22)'.*

Ten participants indicated that the surveys were too long and took a lot of time. Moreover, nine participants indicated that the surveys came at the wrong time and too often.

The adheres were positive about the aspects that the survey was short, clear and easy to fill in, while the nonadheres were more positive about the awareness the surveys created. Furthermore, there are no noticeable difference between the adheres and nonadheres. In general the surveys were experienced more negatively.

3.4.2 Perceived usefulness

The perceived usefulness can be divided into the self-reported reasons why the Motiapp had a positive effect, no effect and a negative effect.

Positive effect

Table 7 shows the self-reported positive reasons why the Motiapp had a positive effect by adheres and nonadheres of the Motiapp. Participants mentioned multiple reasons for the positive effect of the application.

Table 7

The reasons for the perceived usefulness, divided in a positive effect, no effect and negative effect by the adheres and nonadheres of the Motiapp

	Participants	Adheres (n = 15)	Nonadheres (n = 15)	**Total (*N* = 30)**
Positive effect		**9**	**7**	**16**
Positive reasons	The messages were a confirmation	2	2	**4**
	The messages were a reminder to exercise	5	4	**9**
	The messages created awareness	4	-	**4**
	Started exercising more	2	2	**4**
	It stimulated to continue my own exercise scheme	2	1	**3**
	Total positive reasons	**15**	**9**	**24**
No effect		**5**	**8**	**13**
Positive reasons	The messages were a confirmation	1	5	**6**
	The messages were a reminder to exercise	2	-	**2**
	The messages created awareness	-	1	**1**
	The effect of the messages depends on the moment of reception	-	2	**2**
	Exercise already at regular times	2	4	**6**
	Total positive reasons	**5**	**12**	**17**
Negative reasons	The messages came at the wrong time	2	1	**3**
	The messages had no meaningful content	2	1	**3**
	Not started exercising more	2	3	**5**
	Total negative reasons	**6**	**5**	**11**
	Total	**11**	**17**	**28**
Negative effect		**1**	**-**	**1**
Negative reason	The messages were irritating	**1**	**-**	**1**
	Total	**1**	**-**	**1**

More than half (n = 16) of the total number of participants indicated that the Motiapp had a positive effect. Participants indicated that the Motiapp had a positive effect, because the messages were a confirmation, the messages were a reminder, the messages created awareness, participants started exercising more, and were stimulated to continue their exercise scheme. The majority (n = 9) indicated that the messages worked as a reminder to exercise. This is illustrated by,

> '*Often you do want to exercise, but you forget it. However, when you received a message like, 'you are doing well, but you can do more', you are remembered to go exercise (P10)'.*

Nine adheres and seven nonadheres indicated that the application had a positive effect. Both indicated a positive effect, because the messages reminded the participants to exercise. The adheres indicated also that the messages created awareness. Furthermore, there are no noticeable differences between the adheres and nonadheres of the Motiapp.

No effect

Table 7 shows the self-reported reasons why the Motiapp had no effect by adheres and nonadheres of the Motiapp. The participants mentioned multiple reasons why the Motiapp did not work for them. These reasons can be divided into positive and negative. More than a third (n = 13) of the total number of participants indicated that the Motiapp had no effect. Positive reasons the participants indicated were the messages were a confirmation, the messages were a reminder, the messages created awareness, the effect of the messages depends on the moment of reception and the participants already exercise at regular times. Almost half (n = 6) of the participants indicated that the messages were a confirmation to their own exercise behaviour. This is illustrated by,

> *'I found the messages the most motivating when you already had plans to exercise or when you already exercised. Then I thought, yes I am indeed doing good (P6)'.*

Six participants indicated that they already exercise at regular times. For example in team sports, like football.

Negative reasons for the lack of effectiveness of the Motiapp were that the messages came at the wrong time, the messages had no meaningful content and the participants did not start exercising more.

Five adheres and eight nonadheres indicated that the Motiapp had no effect. The nonadheres indicated more positive reasons than the adheres. Furthermore, there are no noticeable differences between the adheres and nonadheres of the Motiapp.

Negative effect

Table 7 shows the self-reported reasons why the Motiapp had a negative effect by adheres and nonadheres of the Motiapp. One adhere, of the total number of participants (N = 30) indicated that the application had a negative effect. This negative effect is caused by the participants injury. The participant was not able to exercise during the use of the app. The messages were perceived as irritating. This is illustrated by,

> *'It brought another effect with it than desired, it did not cause motivation but irritation. Getting every time again and again a message and I could not do anything. It felt like spam. It was too much (P14)'.*

Interim summary

Sixteen participants of the total number of participants (N = 30) indicated that the Motiapp had a positive effect. Adheres and nonadheres indicated the following reasons. The messages were a confirmation, the messages were a reminder and participants started exercising more. Thirteen participants of the total number of participants (N = 30) indicated that the Motiapp had no effect. Despite no effect the nonadheres showed more positive reasons for the perceived usefulness of the Motiapp. One participant indicated that the Motiapp had a negative effect, due to the fact the participant was injured and could not exercise.

3.5 Potential use

The potential use of the Motiapp, by adheres (n = 15) and nonadheres (n = 15) of the Motiapp, can be divided into the intention to reuse, recommendations and improvements for the Motiapp.

3.5.1 Intention to reuse and recommendations

Table 13 shows the intentions to reuse and the recommendations of the Motiapp by adheres and nonadheres of the Motiapp.

Table 13

Intentions to reuse and recommendations of the Motiapp by adheres and nonadheres of the Motiapp

Participants	Adheres (n = 15)	Nonadheres (n = 15)	**Total (N = 30)**
Intention to reuse			
Yes	4	4	**8**
No	11	11	**22**
Recommend the motiapp			
Yes	10	9	**19**
No	5	6	**11**

Almost a third of the participants indicated to reuse the Motiapp. Those participants indicated to reuse the Motiapp if the application got improved. Two third of the participants indicated not to reuse the Motiapp. Reasons for not reusing the Motiapp are the following. Participants did not get motivated by applications. There are no results, this is illustrated by, *'I did not have the feeling that it was motivating or that it helped me to exercise more (P3)'*. The application did not work properly, this is illustrated by, '*I did not get the messages. I had to go to the application to get a message (P22)'.*

Nevertheless, two third of the participants would recommended the Motiapp to others. The participants would recommended the Motiapp to people who do not exercise, have no motivation to exercise, forget to exercise or have weight problems. This illustrated by, '*I think I would recommend the app specific to people who forget or find it hard to exercise (P18*)'. One third of the participants would not recommended the Motiapp. Reasons for not recommending the Motiapp are the following. The application did not succeed for themselves and the participants prefer a more comprehensive application. This is illustrated by,

> '*To gain insight in your own activities is missing in this app. I think this is a very essential aspect of an application, because it makes it more personal and possibly makes you more aware of your movement pattern (P27)*'.

Furthermore, there are no noticeable difference between the adheres and nonadheres of the Motiapp.

3.5.2 Improvements for the Motiapp

Table 14 shows the improvements for the Motiapp by adheres and nonadheres.

Table 14
Improvements for the Motiapp by adheres and nonadheres of the Motiapp

	Participants	Adheres (n = 15)	Nonadheres (n = 15)	**Total (N = 30)**
Lay-out	The lay-out should be improved (e.g. colours)	2	2	**4**
Surveys	The surveys should be more compacter	2	3	**5**
	The surveys should show your progress	1	2	**3**
	Total	**3**	**5**	**8**
App in general	The Motiapp should be linked to an account	-	1	**1**
	The Motiapp should be in Dutch	1	2	**3**
	The Motiapp should have a main menu	-	4	**4**
	The Motiapp should be linked to a personal goal	3	1	**4**
	Total	**4**	**8**	**12**
Tracking system	The Motiapp should include an activity tracker	6	9	**15**
Messages	The messages should be more varied and attractive	6	4	**10**
	The time of receiving the messages should be changeable	6	1	**7**
	The messages should be based on an adaptive system	5	3	**8**
	Total	**17**	**8**	**25**
	Total	**32**	**32**	**64**

The participants indicated improvements for the lay-out, surveys, application in general, a tracking system and the messages. The majority of the participants indicated improvements for the messages. The participants would make the messages more varied and attractive, for example with pictures and links to exercise activities. This is illustrated by,

> *'Perhaps if something visual had been included in the messages, for example a picture of someone who is exercising, I would be motivated more to exercise (P5)*'.

In addition, the participants would make the time of the messages changeable and the messages should be based on an adaptive system. Moreover, half of the participants would include an activity tracker, to track their activities and share their activities with friends. This is illustrated by,

> *'An activity tracker would be an improvement for the Motiapp The app can trace your activity and send attuned messages (P21)'.*

Twelve participants indicated improvements about the application in general. The following improvements are made. Link an account to the Motiapp. The language should be in Dutch. Make a main menu for the Motiapp. This is illustrated by, '*For me it was not clear what I could do with the Motiapp, for example see the history of my messages (P24)'.* Make personal goals linked to the Motiapp.

The adheres indicated more improvements about the messages while the nonadheres indicated more improvements about the application in general. Furthermore, there are no noticeable difference between the adheres and nonadheres of the Motiapp.

Interim summary

On third of the participants did want to reuse the Motiapp and two third of the participants did not want to reuse the Motiapp. However, two third of the participants would recommend the Motiapp and one third would not. All participants had improvements for the Motiapp. The participants would include an activity track system to track their activity and share activities with friends, make the time of the messages changeable and make the messages more varied and attractive.

4. Discussion

The main objective of this study was to elaborate on the experiences of adheres and nonadheres with the Motiapp. The research question of this study was, '*What are the experiences with the Motiapp of the adheres and nonadheres?*'. The following sub-questions were answered: (1) What are the self-reported reasons for adherence and nonadherence to the Motiapp? (2) What are the perceived experience of the messages and which messages (aligned to the ten processes) are recalled? (3) What are the perceived experience (perceived ease of use and perceived usefulness) of the Motiapp in general? (4) What is the potential use (intentions, recommendations and improvements) of the Motiapp?

However, the outcomes of this study need to be interpreted with caution. It could be possible that the users who were willing to participate in this study were initially more positive or negative about the intervention than users who did not want to participate. In addition, it was not obligated to fill in individual details when downloading the Motiapp. Participants who did not do this could not be reached to participate in this study. This might indicate that our results may not be generalizable. Moreover, the interview scheme was only pre-tested with two adheres and was not tested with nonadheres. In addition, the results of this study rely on the participants' memories of the application. The time since participation varied among the participants (mean time since intervention was about two to three months). In anticipation of this possible limitation, during the interview the participants were provided with a short summary of the different aspects of the application. Yet, more than half of the participants still had difficulties remembering specific messages of the Motiapp. However, all of the participants were able to describe general experiences with the Motiapp.

4.1 Reasons participants adhered and did not adhered to the Motiapp

The randomized control trial (RCT) of the Motiapp showed that the dropout rate is still very high. During the RCT, more than 50% of the participants stopped using the Motiapp. This is in line with the study of Morgan & Dishman (2001). In their study was said that only one out of two people continues an intervention. In this study participants did not adhere to the Motiapp, because the participants received no messages, got a new mobile phone, did not finish within time (unintentionally), found the surveys too much, found the messages disturbing and participated in another programme (intentionally). Interestingly, most of the indicated reasons were unintentionally. According to Wroe (2002) People nonadhere, because they forget and are careless. However, findings showed that most participants dropped out, because the application did not work properly. Expected is that applications work properly, because an application is constantly accessible, easily adjustable to the needs of the user, able to provide tailored feedback, has a large reach and can make use of interactive features (Griffiths, et.al., 2006). However, this study showed that there are still many technical difficulties within an application. Ash, Berg & Coiera, (2004) said in their study that an application depends on a technological system and that it should be taken into account that technical errors can be present. In this study it seems that technical errors have large effects on individuals to dropout. It therefore appears that pilot testing is still very useful. Before an application in a RCT is used it is important to pilot test the application for technical errors

Interestingly, a few participants did not adhere to the Motiapp, because the biweekly surveys were too long and took too much time. In general all the participants perceived the surveys negatively and indicated the surveys were too long, took too much time and the questions were not always clear. However, the surveys were only part of the RCT and will not be included in a further development of the application. Though, the size and duration of the surveys can be considered. De Vaus (2002) indicated that a survey should be structured, easy to

fill in, contain simple questions and not include jargon. It seems that the longer the duration of a RCT the shorter the survey must be. The length of a survey in combination with the duration of a RCT should be taken into account. For the use of a survey in a RCT the survey should be pretested for longer periods.

Nevertheless, nearly 50% of the participants adhered to the Motiapp (RCT). In this study the participants adhered because the participants were curious about the effects, the app was a reminder to exercise and a few participants got course credits for it. Interestingly, almost all the adheres indicated the Motiapp was easy to use. According to the Technology Acceptance Model the perceived ease of use is an important factor for the potential use of an application (Venkatesh & Davis, 2000). It seems that the ease of use of an application could be a predictor for adherence (El Ansari & Lovell, 2009). This corresponds to the fact that an application should work properly.

In total six people started the use of the Motiapp for course credits. Only three participants adhered to the Motiapp. Expected is that a reward system ensures that people preform a certain behaviour (Slade, & Owens, 1998). However, in this study it seems that the course credits did not guaranteed adherence. These participants can be considered as all the other participants in this study

4.2 Perceived experiences of the messages of the Motiapp

In general the participants experienced the messages positively. The adheres indicated more experiences than the nonadheres. Most participants indicated that the messages were most of the time personal, relevant and persuasive. This is in line with the expectations of the stages of change of TransTheoretical Model (TTM) (Prochaska & Velicer,1997). The participants were linked to their stage of change and based upon the stage of change personal attuned messages were send. It seems that the messages were experienced as personal, relevant and persuasive. Moreover, participants experienced sometimes the messages as not personal, relevant and persuasive. A possible explanation for this might be that the participants were classified in the random condition (were the messages are not based on the stage of change the user is in) of the RCT, which were not included in this study.

In this study the behavioural processes are perceived as more helpful than the experiential processes. The participants indicated relationships, reinforcement management, stimulus control (behavioural processes); and consciousness raising (experiential process) as helpful processes. This means that the participants were more motivated by messages that directly change their actions instead of their ideas. Thisis in line with processes of the TTM, were the experiential processes are more prevalent in the earlier stages, for individuals who do not exercise and the behavioural processes are more prevalent in the later stages, for individuals, as the participants in this study, who do exercise. Interestingly, the participants found the process consciousness raising (experiential process) motivational. According to the TTM, consciousness raising is the first step in the process to behavioural change, this means making individuals aware of the importance of exercising. However, in this study all participants were already active. Nevertheless, the participants perceived these messages (consciousness raising) as motivating. An explanation for this could be that the active participants are more open to the facts about their health, because the participants did already implement those facts in their daily lifestyles. As indicated in the results (§3.3, §3.4) the messages were a reminder to exercise and a confirmation to their own exercise behaviour. It seems it could be expected that participants perceived the consciousness processes as motivating. Despite the fact that in early studies (active) individuals find the behavioural processes more

motivational. It can be assumed that consciousness raising is also an effective process for individuals in a later stage of the TransTheoretical Model.

Another interesting fact is that almost all participants indicated the environmental re-evaluation process (experiential processes) as unhelpful. The participants found this an unhelpful process, because the messages did not relate to themselves. A possible explanation for this could be that all participants live in an individualistic society. Characteristics for an individualistic society are that individuals go for their own success, achievements, self-actualizations and self-respect (Costa, Terracciano & McCrae, 2001). It seems that messages that do not directly relate to the participant are perceived as less helpful. In future use the messages that relate to the processes environmental re-evaluation can be omitted.

4.3 Perceived experiences of the Motiapp in general

In general the participants experienced the Motiapp positively. Adheres and nonadheres both indicated positive and negative experiences. The participants found the Motiapp, easy to install, easy to use and the participants found it good that the messages could not be swiped away. According to the Technology Acceptance Model when the perceived ease of use is high an application is accepted (Venkatesch & Davis, 2000). This corresponds with the previous statement that it seems that high perceived ease of use is a predictor for adherence. Bani-Ahmad (2015) showed that the ease of use of an application includes the following aspects (1) simple to install, easy to remove, and easy to update, (2) intuitive, pleasant, efficient and effective, (3) does not need a third party-software, (4) adheres to standards and (5) has an effective error handling (Bani-Ahmad). Some of these aspects have already been appointed by the participants, but not all of them. These requirements seem to establish a high ease of use.

However, the results of this study showed that a few participants did find some aspects less easy to use. These participants indicated that the Motiapp was not easy to install, difficult because of the English language and it was irritating that the messages could not be swiped away. Moreover, it was indicated that the messages came at the wrong time. The participants indicated that the messages would be more effective if the user could set their own preferable time. It seems that the effectiveness of the messages increases when the application includes an option for the users to set their own time.

More than half of all the participants indicated that the Moitapp had a positive effect. Interestingly, adheres and nonadheres both indicated positive effects. Findings showed that the participants found the messages a reminder to exercise, a confirmation of their own exercise behaviour and a few participants started exercising more. According to the Technology Acceptance Model it is important that the usefulness is high, because it indicates to what extent an individual beliefs the applications help change their behaviour (Venkatesch & Davis, 2000). It seems that a high perceived ease of use and usefulness generally provide a good overall experience.

The purpose of the Motiapp was to motivate people to start exercising or keep exercising. Literature shows that behavioural change occurs after six months (Longstaffe, Moffatt, & Whalen, 2000). Interestingly, after three months a few participants indicated they started exercising more. It seems that the first steps for behavioural change can occur in the first three months. Possible explanations for the first steps to behavioural change are the peer-designed text messages and the TransTheoretical Model. As expected the results showed that the text messages worked as a reminder to exercise. Which is similar to Khonsari et.al. (2015) who indicated that text reminders contribute to engage in a particular behaviour. However, it is not known if these first steps to

behavioural change can lead to actual behaviour change. Additional research is needed to examine if the use of the application in the long term can ensure that behavioural change takes place.

Nevertheless, almost half of the participants indicated that the Motiapp had no effect. As expected, nonadheres indicated more often that the Motiapp had no effect. Despite the participants indicated the Motiapp had no effect, the participants unconsciously indicated positive effects. The messages were a confirmation to their exercise behaviour. The participants felt good about their behaviour through the confirming messages. In this way the participants were encouraged to continue this behaviour. Those participants already showed the desired behaviour, but are still triggered by the daily reminders. This is underlined by The Fogg Behaviour Model, which includes three factors; motivation, ability and triggers (Fogg, 2009). These factors are needed to accomplish a certain behaviour. Daily reminders can trigger the participants, because the motivation and ability are already present. It seems that applications can be effective for individuals who already show the desired behaviour. It can be assumed that the peer designed text messages and the TransTheoretical Model are not only effective to motivate people to exercise, but also to keep individuals to exercise.

4.4 Potential use of the Motiapp

The results in this study showed that one third of the participants would reuse the Motiapp and two third would not reuse the Motiapp. Interestingly, most participants would recommend the Motiapp to others. However, all participants indicated the Motiapp needed improvements. The participants would enlarge the Motiapp with an activity track system - to track their activities and to share their activities with friends, the time of the messages should be optional and the messages should include pictures and links to exercise activities. It seems that the participants want an even more personalized application. Interestingly, the participants want an application that is ease to use, but prefer a more comprehensive application. It appears that the participants find a more comprehensive application more motivational. It is assumed that a more comprehensive and personalized application motivates individuals more to exercise.

5. Conclusion

In summary, the present study elaborates on the experiences with the Motiapp by adheres and nonadheres. An important contribution of this study was that the experiences of the participants are discussed to gather information how the participants perceived an application that motivates to exercise. Overall, there are no noticeable difference in the perceived experience between the adheres and nonadheres of the Motiapp. Moreover, in general the Motiapp was experienced positively. The messages were experienced as personal, a reminder to exercise and a confirmation to their exercise behaviour. Which is in line with the use of the stages of change of the TransTheoretical Model and the peer-designed text messages. Finally, participants indicated that a more comprehensive and a working application motivates them to exercise more.

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