

The optimal exercise environment for women's self-esteem: with or without mirror?

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ABSTRACT

Physical activity has a positive psychological effect on one's self-esteem. Yet, environmental factors play a role in this positive effect, they can increase as well as decrease the effect on self-esteem during physical activity. A mirror, present in many gyms, might increase self-focus, which in turn will lead to an increment of body concerns. Especially for people with skin problems, this might affect the increase of self-esteem. This research has focused on setting up and testing a protocol to answer the research question: What is the influence of mirrors present in a feedback system during sports on self-esteem of women with skin problems? The outcome is an improved research protocol, which can now be used for a larger number of participants.

Author Keywords

Self-Esteem; Physical Activity; Skin Problems; Design Research; Mirror

ACM Classification Keywords

Design, Human Factors; Social And Behavioral Sciences; Psychology; Health

INTRODUCTION

Physical activity has got a wide range of physical as well as psychological advantages, such as prevention or treatment of common (chronic) diseases. Other positive psychological changes include an increased positive mood, a decrease in negative mood and an increased self-esteem [7][8][3][16][2]. This research has focused on improving one's self-esteem through physical activity. For this paper self-esteem is interpreted as "The evaluative component of self-concept. It is the extent to which the person feels positive about himself." [18].

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However, some environmental factors might prevent these psychological changes, due to performing exercises, from happening. A mirror might have an influence on the self-esteem, since a mirror is associated with the psychological response to physical activity [10][6][13][12][9][17][5]. The positive psychological effects due to performing physical exercises may not be experienced as a result of the presence of a mirror in the exercise environment. The mirror might increase self-focus, which in turn will lead to an increment of body concerns. This results in a decreased perceived self-efficacy, which is being considered a component of self-esteem for this research [13][5][12].

Moreover, for patients with dermatological problems, another factor influencing the self-esteem is dermatological-related anxiety. This anxiety seems to be negatively related to the willingness to participate in physical exercise. Perhaps there is a connection between participation in sports and exercises and the anxiety of getting one's skin observed by others [15][14].

With these findings in mind, this experiment has focused on the effect of mirrors on the self-esteem of women with skin problems. Knowledge of these effects could be useful for designing the optimal exercise environment. For women with skin problems, this exercise environment might encourage positive psychological effects such as an increased self-esteem due to performing exercises.

Consequently the initial research question is "What is the influence of mirrors present in a feedback system during sports on self-esteem of women with skin problems?". It was hypothesized that women with skin problems, who exercise in a mirrored exercise environment, report a smaller increase in self-esteem than women with skin problems who sport on a non-mirrored exercise environment. This research has focused on verifying the method to answer the initial research question after scaling up. Furthermore, the goal is to improve the method to enable future researchers to act out the protocol with minimal obstacles. Therefore, the research question answered in this paper is: "What changes should be made to the study design to enable future research to answer the initial research question?"

METHOD

Participants

Participants were two women with skin problems with a mean age of 24,5 (range= 20-29). Skin problems were defined as visible acne, other impurities or scars. Besides, participants should be moderately active before starting the research. In this research, 'moderately active' was interpreted as: women who irregularly do sports, varying from 1-3 times a week. Participants who are highly active might react differently to the mirror, considering prior research has shown highly active women have an increased self-efficacy after performing a bout of exercise in front of a mirror [13]. Other characteristics of the participants are presented in Table 1.

Sample size

Participant nr.	Physical activities	Times a week	Activities in the past	Injuries
1	Fitness	1-3	Korfball, fitness, boxing	Weak ankles
2	Soccer	2	Soccer, Swimming	Back, now building up again.

Table 1: Participants Characteristics

To make sure the research can be conducted in the future, a sample size calculation has been made. In order to be able to achieve a power of 80% to detect a difference with an α coefficient of .05, a sample size of 167 per test group is needed. In case a drop-out rate of 10% is also taken into consideration a sample size of 184 per test group will be needed [4].

Recruitment

Participants were recruited in two ways. Firstly, with advertisement flyers (Appendix A) distributed in eight beauty salons in the centre of Eindhoven. The beauty salons were asked to hand out the flyer to women with skin problems. The women were free to take a flyer and contact the researchers by phone or e-mail. Secondly, participants were recruited from a University campus by means of word-of-mouth. Because of the possibility to bias the participants while advertising for people with skin problems and a low self-esteem, the advertisements were phrased as a call for an experiment about a new environment for exercising. Before processing gathered data, an extended explanation of the experiment purpose was given to the participants. After a person contacted the researchers, an individual appointment was organized so that it could be confirmed that the person fitted all criteria of the participant protocol. Potential participants were told that they would be

invited to perform 30 minutes of exercise, twice a week for three weeks in a row, and fill out a series of questionnaires and interviews.

Recruitment took place over a period of approximately four weeks. Of the five people who were recruited, two attended the experimental sessions. The remainder did not correspond participant protocol. All participants were native Dutch speakers.

Study Design

The study took place over a period of time of three weeks. One participant was asked to exercise with mirror, the other participant without mirror. Both participants exercised twice a week.

Measures

Screening questionnaire. The questionnaire (Appendix C) was used to make sure the participants met the participant protocol. The questions were about the sport-behaviour of the participants and possible injuries they might have or had. The questionnaire was represented in Dutch for the ease of participants' expressing.

Self-esteem. The Rosenberg's Self-Esteem Scale (RSE) (Appendix D) was used in this research to measure the effect of the workouts on participant's self-esteem. This scale consists of ten items targeting different aspects of self-esteem. Responses on these items are given on a four point scale from (1) strongly disagree to (4) strongly agree. Previous research has shown RSE to be a reliable method with an internal consistency $\alpha=.87$ [1]. The participants were asked to fill in the RSE before starting their first exercise in the first week, halfway the research (before starting the fourth workout) and before finishing their last exercise in the third week. It was chosen to present the RSE questionnaire in English to prevent the research to become inaccurate as a result of translation. Also, participants were left alone while filling in the RSE.

External influences. In order to get a grip on external factors that could influence the emotional state of the participants when filling in the RSE questionnaire, the participants were asked to report on their daily activities. The participants were handed a diary (Appendix E) in which they were asked to write down one highlight and one lowlight of their day and how much impact they think this had on their emotional state on a scale from one to five. Participants were instructed to report on activities they considered too personal with writing down 'Private activity' and to give a rate without giving any specifics of the activity. The diary was represented in Dutch for the ease of participants' expressing.

End interview. In order to gain insights in how the participants experienced participating, an interview (Appendix F) was done with two of the researchers at the end of the experiment. Questions were asked about the kind of exercises, the environment, the questionnaires and the procedure of the experiment.

Procedure

A prototype was used, which was made by the researchers themselves. The exercise sessions took place in the Student Sport Centre in Eindhoven. A sports hall was reserved for every session of the participants.

Three different workouts were designed, all containing a five minute warm-up, ten minutes of training the abs, followed by ten minutes training legs, and lastly a five minute cool-down. The workout tutorials were shown by a female instructor doing the exercise combined with audio instructions in Dutch. Words of encouragement were also provided via audio in Dutch. The same playlist was played during each session, a towel and water was available in each session.

To derive an insight in the effect of a mirror on the self-esteem of women with skin problems during sports, two situations were compared:

Situation one. Feedback system with mirror. In the first situation, a designed mirror was used. The mirror used was 190cmx74cm and a 17-inch screen was implemented in the mirror (Figure 1). The screen showed the workout video.

Situation two. Feedback system without mirror. The second situation served as a control situation. In this setting, a laptop, placed on a chair, was used to show the video. The laptop showed the same workout video as used in situation one.

In total, the research consisted of a total of six sessions. In each session, participant one exercised according to situation two, and participant two exercised according to situation one. The sessions would look as follows:

Session one. The participant was asked to fill in a consent form (Appendix B), the screening questionnaire, the first RSE and the diary was handed out. Afterwards, the participant was guided to the sports hall where a mat and the exercise were provided.

Session two and three. The participant was guided to the sports hall where a mat and the exercise were provided.

Session four. Before starting the exercise, the participant was asked to fill in a second RSE. Then, the participant was guided to the sports hall where a mat and the exercise were provided.

Session five. The participant was guided to the sports hall where a mat and the exercise were provided.

Session six. Before starting the exercise, the participant was asked to fill in a third RSE. Then, the participant was guided to the sports hall where a mat and the exercise were provided. After the final workout was completed, the end interview was conducted with the participant by the researchers.

When all practicalities of the research were finished, a gift set worth € 30 was handed over to the participants to thank

them for her participation. Participants were not informed about this on beforehand.

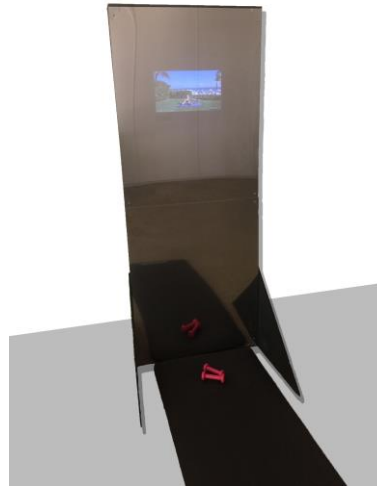


Figure 1: The prototype used during the research (mirror with implemented screen)

Data Analysis Strategy

Two kinds of data analysis strategies were used. The first part was focussed on the analysis of the different measures. The measures were tested on their accuracy and usefulness for verifying the revised research protocol proposal.

Part I

The results from the RSE questionnaire were calculated according to the corresponding protocol. The grade decided whether the participant had a low, average or high self-esteem. The data from the diary measuring the external influences was analysed qualitative as well as quantitative. The content of the high- or low light was thematically analysed. Secondly, the rating the participants gave to the high- or low light was processed quantitatively and added into the Table of the thematic analysis. After all measures were evaluated individually, the researchers performed a multilevel analysis to compare different aspects to each other. The results from the RSE were compared with the external influences to see whether the RSE results have been influenced by events that happened right before filling in the RSE. Besides, the results from the RSE from participants in situation one (with mirror) and in situation two (without mirror) were compared to each other.

Part II

The second part of the data analysis is about finding the critical points within the research protocol. On the results of the end interviews, a thematic analysis was performed to find the positive and negative parts of the research method. After the research was completed, a session was organized with all involved researchers. During the session all aspects of the research were discussed and presented in the discussion section of this paper.

Participants	RSE no	Score	Highlight	Rate (1-5)	Lowlight	Rate (1-5)
Participant 1	1	19 (normal range)	Sports	3	Afternoon fatigue	4
	2	19 (normal range)	Work	2	Private family issues	4
Participant 2	1	16 (normal range)	Elected board of study association	3	Having a headache constantly	4
	2	18 (normal range)	GLOW (project) and speaking to a student from the second year	5	Coming home from a night out	3

Table 2: RSE results combined with External Influences

RESULTS

Part I

Participant one scored the same on the second RSE as on the first RSE. Results from the diary show that lowlights on these days were rated as an influence of four (on a scale 1-5) as can be seen in Table 2. The highlights had less influence on the days the RSE was filled in and were rated with a score of three and two. For participant two, the second RSE showed an increased self-esteem in comparison with the first RSE. On the day of the first RSE the diary showed that the highlight rated with a score of three had less influence on the participant than lowlight rated with a four. On the day of the second RSE the participant had a highlight rated with a score of five influencing while her lowlight was rated with a three.

Part II

From the critical observation with all involved researchers, the following results were gathered. While recruiting, the researchers have spoken to eight different experts in the field of skin problems. All experts immediately confirmed that they get in touch with insecure women regularly. Also, all experts were willing to help and there were no rejections of the researchers leaving behind some flyers. The researchers got a message from four people due to the flyers, of whom was one woman suitable to participate. There were some participants questioning the link to the beauty therapist and why the researchers chose to advertise at such a specific place.

The screening questionnaire confirmed participants to be moderately active. Furthermore, participant two mentioned an injury, which in the end also resulted in her quitting the experiment halfway the research.

The RSE questionnaire measured the self-esteem of the participants. Together with the protocol the researchers were able to calculate the different RSE values.

While analyzing the measure of the external influences, it was noticed that one of the participants gave more detailed answers. However, for both of them it was understood what the low- and highlight of the day was. Both participants filled in the diary for every day in the research.

The end interviews were transcribed and a thematic analysis was performed on this (see Appendix G). In general the participants were positive about the research. One participant mentioned that the RSE is confronting to fill in because of the psychological focus. The other participant mentioned the RSE gives the impression the research was not about exercising. It was also mentioned by one participant that the mirror had a confronting effect.

When it comes to the procedure, the researchers noticed a couple of things. Firstly, the mirror distorted reality. One appeared tighter and taller in the mirror. Besides, the screen implemented in the mirror was not visible while exercising on the matt. The participant without mirror did not experience distortion or invisibility of the screen. It was not possible to test all six sessions, since participant two had to quit after three sessions. Yet, all different workouts were tested and no complaints have come to the attention of the researchers.

DISCUSSION

The primary purpose of this research was to verify the method in order to answer the research question after scaling up. In this way researchers were able to examine what influence a mirror present in a feedback system during sports has on the self-esteem of women with skin problems. Findings address multiple obstacles in the protocol.

Considering the recruiting of participants yielded two participants suiting the participant protocol, another approach of recruiting participants should be taken. It is suggested to contact more experts in the field of skin

problems, dermatological doctors in the hospital and to place calls on online dermatological forms.

Because one of the participants reported an injury halfway the experiment, it was decided to finish the experiment after three times performing the exercises for both participants. The current study design was spread over three weeks, since the researchers tried to include long-term effects. Reflecting on the duration of the experiment, it is suggested that the research should be modified to only exercising once. It is strongly believed this modification will contribute to a more specific answer to the research question, as the research question does not focus on long term effects. Also, from a design perspective, the purpose of a new design would be to get people with a low self-esteem to exercise. Thus, their experiences on the short-term would have the most value for design decisions.

Shortening the experiment also results in consequences for the measures. The screening questionnaire should remain, since participants still need to suit the participant protocol. Nonetheless, the RSE should be filled in right before the workout and just after the workout. External influences will be minimized, since few events will occur that might affect their emotional state of the participant. Logically, the diary to track participants' daily activities can be excluded from the research. The end interview should remain, as this interview gives insight to how the participants experienced participating in the research. However, the aim of the interview will be more valuable to discuss the results rather than they would function as results.

Moreover, an adjustment to the length of the RSE should be made, since one of the participants mentioned the questionnaire to be confronting. From an ethical perspective, it was chosen to shorten the RSE to the five positively worded items (Appendix H). This is possible as it has been found the 5 positively worded items and 5 negatively worded items make an equal impact when assessing one's self-esteem [19]. Participants should not be harmed under any circumstances, thus an adjusted RSE is recommended for the revised research protocol.

Evidently, the data analysis strategy should be altered too. In the revised research protocol, a participant's first RSE should be compared to the second RSE. The difference between both RSEs of one participant is valuable for drawing conclusions.

Reflecting on the used prototype during the experiment, some comments should be made. During the interview, one participant reported a distortion in the reflection of the mirror. The reflection in the mirror was stretched. Considering this could have had an influence on the self-esteem of the participants, the prototype should be adjusted to a non-distorted reflection. Moreover the participant exercising with the presence of the mirror indicated that she could not see the screen showing the exercises when they were doing the exercises lying on the ground. Therefore it

is suggested to use a mirror sized at least 2.00x2.00 meter whilst using a 21-inch screen placed in the middle of the mirror at a height of 0.60 meter.

Lastly, our findings suggest a mirror present in a feedback system during sports has a small impact on the self-esteem of women with skin problems. The findings suggest exercising in a mirrored environment might increase the self-esteem and exercising in a non-mirrored environment does not influence the self-esteem. This is in contrast with the findings of Katula & McAuley and Focht & Hausenblas [13][5][12].

Notwithstanding, the current study intended to improve the protocol to research the influence of mirrors present in a feedback system during sports on the self-esteem of women with skin problems. Scaled-up further research should be done to draw conclusions on the effect of mirrors present in a feedback system on the self-esteem of women with skin problems. With this knowledge, optimal exercise environments can be improved and designed for women.

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