Factors related to misperception of physical activity in The Netherlands and implications for health promotion programmes

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SUMMARY
With respect to health risk behaviours, many people are unaware of their own risk behaviour and regard their behaviour as more healthy than it really is. This article studied differences between people with and without misperception of their physical activity with respect to several reference points: the social comparison style of people (upward, equal and downward); the body self-image with regard to their weight [body mass index (BMI) and self-rated weight]; and linkages of physical activity with different outcome expectancies (health, appearance, weight, feeling fit, relaxation and stress relief). Results from 516 respondents (response 52%; 56% women) with a mean age of 53.7 years found that respondents who incorrectly think that their physical activity is adequate (overestimators) tend to rate their physical activity more often in comparison to others. Furthermore, overestimators and people who correctly think they exercise enough more often use downward comparison, while underestimators and people who know they exercise too little mostly use upward comparison. People who, rightly or not, think their weight is adequate or who have a lower BMI, more often assume that their physical activity is sufficient or high. People who, rightly or not, think that their physical activity is adequate more often score higher on other reasons to be physically active besides health. Increasing the accuracy of people’s self-perceptions of physical activity may be important to incorporate into strategies to promote physical activity in populations at risk of inactivity.

Key words: misperception; physical activity; social comparison; BMI

INTRODUCTION
Recent studies have shown that with respect to health risk behaviours, many people are unaware of their own risk behaviour and regard their behaviour as more positive than it really is (Lechner et al., 1997; Oenema and Brug, 2003a; De Ridder and Lechner, 2004). Typically, this lack of awareness or misperception exists for behaviours in which the threshold between what is healthy and what is unhealthy is not very straightforward. For example, several studies have shown that misperception often occurs for behaviours like physical activity (Ronda et al., 2001; De Ridder and Lechner, 2004; Smeets and De Vries, 2004), nutrition (fat, fruit and vegetables) (Brug et al., 1994; Lechner et al., 1997; Oenema and Brug, 2003a) and sun behaviour (Lechner and De Vries, 2002). In a study on physical activity among the Dutch general population it was found that of those who did not meet the physical activity guideline, 51% estimated their own physical activity as sufficient or high (De Ridder and Lechner, 2004). For a health risk behaviour like smoking this phenomenon does not occur, since it is very clear that smoking is always unhealthy, and people obviously know whether they smoke or not. For behaviours where the threshold between healthy and unhealthy behaviour is less obvious, however,
two types of misperception could occur: first, people lack explicit knowledge of what healthy behaviour actually entails, and second, they do not seem to be able to review their own behaviour and rate it correctly.

Studies have shown that the misperception that people have of their health behaviour has several consequences. If people (incorrectly) think their health behaviour is sufficient, their cognitions about the healthy behaviour are very positive, even though in reality they do not behave in accordance with the healthy guideline. It is conceivable that people will not react to an intervention meant to change determinants and behaviour, when they (incorrectly) believe their behaviour is already adequate. Furthermore, lack of awareness of health risk behaviours has important consequences for the application of the Stages of Change concept (Prochaska and DiClemente, 1983), resulting in misclassification. In a study on physical activity it was found that of all those who objectively were in the stage precontemplation (since they did not behave in accordance with the physical activity guideline, and had no intention to change their behaviour), 61% thought they were doing adequate (De Ridder and Lechner, 2004). According to people’s own subjective estimation of their behaviour, they would be placed in action or maintenance. In summary, the consequences of lack of awareness of health risk behaviours may limit the effectiveness of strategies to promote physical activity among these groups.

Although the occurrence and consequences of misperception of health behaviour have been studied several times, still little is known of the reasons or causes of this misperception. A few studies have shown that the lack of knowledge of health guidelines is related to lack of awareness of health risk behaviours; however, this only explains a limited portion in the variance of awareness (De Ridder and Lechner, 2004; Van Herten, 2004). Another possible reason for misperception could be that people use different reference points to rate their behaviour, in addition to or instead of the health reference point that health educators or researchers use most of the time. It has been suggested that people with misperception more often use downward comparison and more often compare themselves with people who behave less healthy (Oenema and Brug, 2003b). Social comparison has two main functions: to gather objective information (Martin et al., 2002), or for self-enhancement (Wood, 1989, 1996). When people want to gather objective information, they tend to compare themselves with similar others (Martin et al., 2002). When people compare themselves with others for reasons of self-enhancement, they more often compare themselves with people who are less successful, using downward comparison (Wood, 1989, 1996). In this light, it could be expected that people’s misperception of their own behaviour would be related to downward comparison, while an accurate perception would be related to comparing themselves with others that are equal, or even with other people who are doing better, using upward comparison.

Further, for health behaviours such as physical activity that may be related to body appearance, people may use their body self-image as a reference point for rating their own behaviour. They might have thoughts like ‘If I am not overweight, my physical activity level must be sufficient’. Alternatively, people may choose to be physically active for their appearance, for losing weight, for relaxation or for general stress relief. People’s general attitude towards physical activity is based on more outcome expectancies than only health-related outcomes (Eagly and Chaiken, 1993; Trost et al., 2002), and it is conceivable that if these non-health-related outcome expectations are met people no longer perceive their physical activity as too low.

Gaining insight into possible factors related to individuals’ misperceptions of their physical activity might provide indications for the development of effective strategies for promoting active behaviour. The aim of this article was to study the differences between people with and without misperception of their physical activity with respect to several reference points: the social comparison style of people (upward, equal and downward); the body self-image with regard to their weight [body mass index (BMI) and self-rated weight]; and linkages of physical activity with different outcome expectancies (health, appearance, weight, feeling fit, relaxation and stress relief). It is expected that people who overestimate their physical activity, more often use downward comparison, regard themselves as being overweight less often, and more often have other reasons to be physically active besides health than those who are realists of their low physical activity.
METHODS

Respondents and procedure
The study used a random sample of 1000 addresses, which were extracted from the national Dutch postal guide. Only persons who had given the organization permission to disclose their address for research purposes could be included. Respondents received the anonymous questionnaire by mail together with a letter explaining the goal of the study (‘to study physical activity of the Dutch population’) and a return envelope. Around 10 days after receiving the questionnaire all respondents received a second letter which was used both as a thank you letter for the respondents and as a reminder to fill in the questionnaire for those who had not yet responded. Of all respondents, 516 returned the questionnaire, resulting in a response of 52%.

Questionnaire
The questionnaire was based on a systematic literature review and earlier studies (Ronda et al., 2001; De Ridder and Lechner, 2004; Smeets and De Vries, 2004). The questionnaire was pre-tested among a random sample of the general Dutch population (N = 12). They evaluated its clarity, completeness, correctness and feasibility. Besides demographics, several concepts were assessed.

Physical activity was assessed in two ways. Respondents were asked to rate their own physical activity, with answers on a five-point scale, varying from very low, to sufficient, to very high. This subjective assessment of behaviour was based on several previous validated studies on subjective estimations of behaviour (Lechner et al., 1997,1998; Ronda et al., 2001; De Ridder and Lechner, 2004; Smeets and De Vries, 2004). For the more detailed assessment of physical activity the SQUASH was used (Wendel-Vos and Schuit, 2002; Wendel-Vos et al., 2003), a measure previously validated among Dutch adults to assess health enhancing physical activity, linked to the physical activity guideline (ACSM, 1998). The SQUASH consists of 14 questions on physical activity, which assesses for each activity item how many days per week this activity is performed, for how many minutes per day and with what intensity (low, moderate and high). Examples of questions: ‘how many days per week do you go to work or school on foot or by bicycle? How many minutes does this activity take per day? How intensive is this activity? (low, moderate and high)’. The ACSM (1989) physical activity recommendations state that people should be moderately physically active for at least 30 min per day on at least five, but preferably all days of the week. By analysing the SQUASH-questionnaire, respondent were categorized according to whether they reported meeting or not meeting these guidelines (being moderately active for at least 30 min on at least 5 days per week).

Based on a combination of the two measures of physical activity, the respondents were divided into four groups as follows:

(i) High realists: respondents who meet the physical activity guideline, and rate their physical activity as sufficient or high.
(ii) Overestimators: respondents who do not meet the physical activity guideline, but who rate their physical activity as sufficient or high.
(iii) Underestimators: respondents who meet the physical activity guideline, but who rate their physical activity as (very) low.
(iv) Low realists: respondents who do not meet the physical activity guideline and rate their physical activity as (very) low.

Assessment of social comparison was based on several previous validated studies (De Ridder and Lechner, 2004; Bos et al., 2005; Steenhuis et al., 2006). Respondents were first asked if they compare themselves with others when they estimate their own physical activity. Then, respondents were to keep in mind the person with whom they compare themselves most often, with respect to their physical activity. For this reference person the respondent was asked how physically active this person was in comparison with the respondent—him or herself, with answers on a five-point scale, varying from much more physically active, to equally physically active, to much less physically active. Additionally, respondents were also asked how healthy and how active (in a more general sense) this reference person was, with answers on a five-point scale, varying from much more healthy/active, to much less healthy/active.

With regard to bodyweight self-image, two aspects were assessed. Respondents’ own estimation of their bodyweight was assessed with the question ‘How would you rate your weight?’ with answers on a five-point scale,
varying from much overweight, to correct weight, to much underweight (Steenhuis et al., 2006). In order to assess the BMI (body weight/height\(^2\)) of respondents, their weight (in kilos) and height (in metres) were assessed, based on self-report.

Different outcome expectancies that can be used as a guiding principle for estimating physical activity were assessed by asking respondents to what extent several aspects were reasons for them to be physically active: health, appearance, weight, feeling fit, relaxation and stress relief. Respondents could answer on a four-point scale, ranging from no reason at all to a very important reason for being physically active (Bolman et al., 2004; De Ridder and Lechner, 2004).

Statistics
Descriptive statistics were used to describe the sample with regard to demographics. Cohen’s Kappa was calculated to analyse the level of agreement between the more objectively (meeting physical activity guideline) and the more subjectively assessed physical activity (sufficiently physically active or not), and between the more objective (BMI less or above 25) and more subjective estimation (being overweight or not) of overweight. For analysing Cohen’s Kappas, the variables were dichotomized. Differences between groups were analysed using Chi-square tests and one-way ANOVAs. For the calculation of the BMI the respondents were categorized into four groups, consistent with international standards (Sarafino, 2006). Respondents with a BMI <20 were categorized as underweight, respondents with a BMI between 20 and 25 were categorized as correct weight, respondents with a BMI from 25 to 30 were categorized as overweight, and respondents with a BMI >30 were categorized as severely overweight. All statistical analyses were done with SPSS for Windows (differences were considered significant at \(p < 0.05\)).

RESULTS
The average age of the respondents was 53.7 years (SD = 18), ranging from 19 to 91 years. Over half of the respondents were female (\(N = 289\), 56%). Thirty-one per cent had a low level of education (primary or basic vocational school), 31% had a medium level (secondary vocational school or high school) and 38% had a high level of education (higher vocational school or university). The distribution of demographics differed from the general Dutch adult population (Dutch Central Bureau for Statistics, 2005); the respondents more often were female, had a higher level of education and more often were in the age group 65 and older. Of all respondents 33% (\(N = 168\)) did not meet the guideline for physical activity and 44% were overweight (BMI >25). In the general Dutch adult population 46% did not meet the guideline for physical activity and 46% are overweight (Dutch Central Bureau for Statistics, 2005).

Of the respondents who did not meet the guideline for physical activity, 48% had a misperception of their physical activity, as they estimated their physical activity to be sufficient or high. Level of agreement between meeting the physical activity guideline and the more subjective estimation of the physical activity was low (Cohen’s Kappa = 0.29). The classification of the respondents into the four groups resulted in 267 respondents in the group high realists (52%), 81 in the group overestimators (16%), 79 in the group underestimators (15%) and 87 in the group low realists (17%).

Social comparison
The overestimators more often than the other three groups rated their physical activity in comparison to others \([\chi^2 (3, N = 514) = 12.68, p < 0.01]\); 70% of this group reported rating their physical activity in comparison to others, while the high realists (57%), underestimators (49%) and low realists (45%) used social comparison less often.

As Table 1 illustrates, high realists and overestimators, more often than underestimators and low realists, compared themselves with people who were less or equally physically active, less healthy, and less or equally active in general. Underestimators and low realists, more often than high realists and overestimators, compared themselves with people who were more physically active, more healthy and more active in general.

Body self-image
The average BMI for all respondents was 25.16 (SD = 4.56) ranging from 16 to 40. The four groups differed significantly in average BMI
score, high realists (BMI = 24.3) and overestimators (BMI = 24.4) scored significantly lower on BMI than underestimators (BMI = 27.3) and low realists (BMI = 26.6) [F(3, 499) = 12.65; p < 0.001].

In line with the BMI score, high realists and overestimators, more often than underestimators and low realists, estimated themselves as having a correct weight. In contrast, the latter two groups estimated themselves to be overweight more frequently the former two groups did (Table 2). If the BMI scores were categorized in the official categories of underweight, correct weight, overweight and severely overweight, the results show that high realists and overestimators were most often categorized as correct weight, while the other two groups were most often categorized as (severely) overweight (Table 2). However, even among the high realists and overestimators, 39 and 32% were still categorized as overweight. If both the BMI score and the self-rated weight were dichotomized into overweight versus not overweight, the level of agreement between the two weight estimations was rather high (Cohen’s Kappa = 0.69); 85% made a correct estimation of their weight.

Respondents who were overweight used social comparison to others less often. Of the respondents with a BMI score ≤25, 60% reported rating their physical activity in comparison with others, while the respondents with a BMI score of >25 less often (51%) compared themselves with others [χ² (1, N = 505) = 4.52, p < 0.05].

Outcome expectancies as reasons for physical activity

Different expectancies that people can use as a guiding principle for estimating their physical activity were assessed by asking respondents to what extent the aspects health, appearance, weight, feeling fit, relaxation and stress relief were reasons for them to be physically active (Table 3). For the overestimators feeling fit scored highest as a reason to be physically active, for the other three groups health scored highest on reasons for being physically active. As the results show, the high realists and overestimators had very similar scores on the different reference reasons. On the opposite side, the respondents who estimated their physical activity to be low (underestimators and low realists) were also quite similar in their scores. The high realists showed higher scores than the low realists on the reference reasons health, appearance, relaxation and stress relief. Furthermore, the overestimators scored higher on the reasons feeling fit and relaxation than the respondents who estimated their physical activity to be low (underestimators and low realists).

DISCUSSION

In previous research (Ronda et al., 2001; De Ridder and Lechner, 2004; Smeets and De Vries, 2004), as well as in this study, large differences were found between the more objective and the more subjective estimation of physical
activity. Around half of all respondents who did not meet the guideline with respect to physical activity, estimated their physical activity to be sufficient or high. The level of agreement between meeting the physical activity guideline and respondents’ own estimation of their physical activity was, as expected, very low. This study focussed on trying to find factors that were associated with this misperception. The study addressed several reference points people use as possible factors associated with misperception of their physical activity: the social comparison style of people; the body self-image with regard to their weight; and linkages of physical activity with different outcome expectancies.

As the results showed, overestimators and people who correctly think they are physically active enough (high realists) more often use downward comparison, while underestimators and people who know they exercise too little (low realists) mostly use upward comparison. For the high realists it can be expected that they more often use downward comparison. Since their physical activity is indeed at the higher level of the population in general, they are bound to see more people who behave less healthy. The same is true in reverse for the low realists; since they are among the more sedentary portion of the population. For the overestimators and underestimators the results are not that logical. Especially for the overestimators it seems problematic that they compare themselves to reference persons who behave even unhealthier than they do themselves, since it gives them a false sense of having a healthy physically active behaviour. From a more theoretical perspective this downward comparison can be explained, since research has shown that downward comparison can be done for reasons of self-enhancement or feeling good about one’s own behaviour (Wood, 1989,1996). If for the overestimators self-enhancement was the main reason for comparing their own behaviour to that of others, the higher percentages that use downward comparison were to be expected. From this perspective,

### Table 2: Body self-image with regard to weight and BMI for the high realists, overestimators, underestimators and low realists

<table>
<thead>
<tr>
<th>Weight</th>
<th>High realists (%)</th>
<th>Overestimators (%)</th>
<th>Underestimators (%)</th>
<th>Low realists (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-estimation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Underweight</td>
<td>6</td>
<td>5</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Correct weight</td>
<td>62</td>
<td>61</td>
<td>26</td>
<td>46</td>
</tr>
<tr>
<td>Overweight</td>
<td>32</td>
<td>34</td>
<td>69</td>
<td>50</td>
</tr>
<tr>
<td>$\chi^2$ (6, $N = 505$) = 38.1, $p &lt; 0.001$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BMI</th>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Underweight</td>
<td>8</td>
<td>9</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Correct weight</td>
<td>53</td>
<td>59</td>
<td>34</td>
<td>42</td>
</tr>
<tr>
<td>Overweight (25–30)</td>
<td>32</td>
<td>24</td>
<td>43</td>
<td>36</td>
</tr>
<tr>
<td>Severe overweight (&gt;30)</td>
<td>7</td>
<td>8</td>
<td>18</td>
<td>19</td>
</tr>
<tr>
<td>$\chi^2$ (9, $N = 503$) = 25.8, $p &lt; 0.01$</td>
<td></td>
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</tbody>
</table>

### Table 3: Differences in outcome expectancies for being physically active between the high realists, overestimators, underestimators and low realists, using one-way ANOVA

<table>
<thead>
<tr>
<th></th>
<th>High realists (Hr)</th>
<th>Overestimators (Ov)</th>
<th>Underestimators (Un)</th>
<th>Low realists (Lr)</th>
<th>Differences $p &lt; 0.05$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health</td>
<td>3.42</td>
<td>3.38</td>
<td>3.22</td>
<td>3.15</td>
<td>Hr &gt; Lr</td>
</tr>
<tr>
<td>Appearance</td>
<td>2.46</td>
<td>2.40</td>
<td>2.30</td>
<td>2.09</td>
<td>Hr &gt; Lr</td>
</tr>
<tr>
<td>Feeling fit</td>
<td>3.34</td>
<td>3.68</td>
<td>3.07</td>
<td>3.05</td>
<td>Ov &gt; Un, Lr</td>
</tr>
<tr>
<td>Weight</td>
<td>2.83</td>
<td>2.72</td>
<td>2.87</td>
<td>2.71</td>
<td>n.s.</td>
</tr>
<tr>
<td>Relaxation</td>
<td>2.60</td>
<td>2.63</td>
<td>2.19</td>
<td>2.14</td>
<td>Hr, Ov &gt; Un, Lr</td>
</tr>
<tr>
<td>Stress relief</td>
<td>2.45</td>
<td>2.41</td>
<td>2.14</td>
<td>2.01</td>
<td>Hr &gt; Lr</td>
</tr>
</tbody>
</table>

Answering scores ranging from 1 (no reason) to 4 (very important reason).
they intentionally look for people who behave worse than themselves, in order to be able to use self-enhancement and feel reassured about their own behaviour.

There was a relation between misperception and both body self-image and BMI. People who think their weight is adequate or who have a lower BMI more often assume that their physical activity is sufficient or high. These thoughts are understandable, since many interventions aimed at increasing physical activity, stress the importance of physical activity as an important way to reduce or prevent overweight. And indeed several studies have found strong associations between lack of physical activity and being overweight (Ball et al., 2001; Vuori, 2001; Jequier, 2002). However, even though lack of physical activity could lead to being overweight, the reverse—not being overweight means being sufficiently physically active—does not have to be true. The results indicate that there might be a misperception that suggests that ‘if you are not overweight, your physical activity is sufficient’. And, consequently, ‘if you are not overweight, there is no need to be more physically active’. Such beliefs are damaging to the effectiveness of interventions aimed to increase physical activity, and therefore need to be corrected.

Respondents who are overweight used social comparison to others less often to rate their physical activity. This seems plausible, especially since respondents were pretty accurate in estimating their own weight as being overweight or not. If respondents indeed make a strong connection between weight and physical activity, they already ‘know’ how they are doing with regard to their physical activity based on their weight, and have little extra reason to compare themselves to others.

The perception of people’s own behaviour was related to several outcome expectancies. For overestimators feeling fit scored highest as a reason to be physically active, even higher than health. This reason seems accord with the general estimation in this group that weight is not a problem. Both positive factors, feeling fit and not being overweight, could strengthen beliefs like ‘I’m feeling fit, my weight is adequate, so my physical activity is sufficient’.

The respondents differed from the general Dutch adult population; they were highly educated, somewhat older and more often met the guideline for physical activity (Dutch Central Bureau for Statistics, 2005). Therefore, results found cannot simply be generalized to the whole Dutch population. It might be that in the general population where less people meet the guideline for physical activity and where misperception of physical activity is more prevalent the findings could be even more significant.

This study tried to find factors related to misperception of physical activity-based cross-sectional data. However, based on cross-sectional data it is by definition impossible to determine causal relationships. It could therefore be that the misperception itself causes people to some degree to use different reference points, which are in accordance with the perception of their own behaviour and other cognitions. However, for a less changeable characteristic such as BMI, this reverse relation seems practically hardly possible (on a short term). Further research is needed to gain more insight into these processes, and to study whether these factors related to misperception of physical activity also occur in other health risk behaviours.

**Practical implications**

Health education interventions should first target at increasing awareness of insufficient physical activity levels. When misperception of health behaviour is highly prevalent, interventions aimed at increasing healthy behaviour through changing psychosocial determinants will not be effective. The first step in health education should therefore be to make people aware of their unhealthy behaviour, before trying to change the psychosocial determinants.

People who incorrectly think that their physical activity is adequate tend to compare their behaviour more often to others. From a health education perspective, this provides opportunities to intervene. However, these overestimators more often use downward comparison, comparing themselves to people who behave even more unhealthy. If we want to change awareness in overestimators, we might need to change their social comparison structure. When overestimators start comparing themselves with people who are behaving healthy, in accordance with the physical activity guidelines, they will be confronted with differences compared to their own behaviour, and with the need to change to more healthy behaviour. Using role models in interventions that present the healthy
behaviour could be a method to increase awareness of unhealthy behaviour. Further research on the best methods for applying these role models in health education interventions is still needed (Oenema and Brug, 2003b). Interventions that use personalized feedback may change this comparison style by presenting a personalized reference person in their intervention, who demonstrates what healthy behaviour actually entails. Several studies on tailored interventions have proven that personalized feedback can be a potentially effective method (Oenema et al., 2001; Oenema and Brug, 2003a); little is known, however, of the effects of using comparison persons within tailored interventions.

Results showed that other outcome expectancies besides health are relevant in respondents’ estimation of whether their physical activity is sufficient. Health educators and researchers should realize that people are not only driven by health motives when engaging in physical activity. Interventions to stimulate physical activity should also include these other outcome expectancies, besides health, since they provide important additional reasons for being physically active.

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