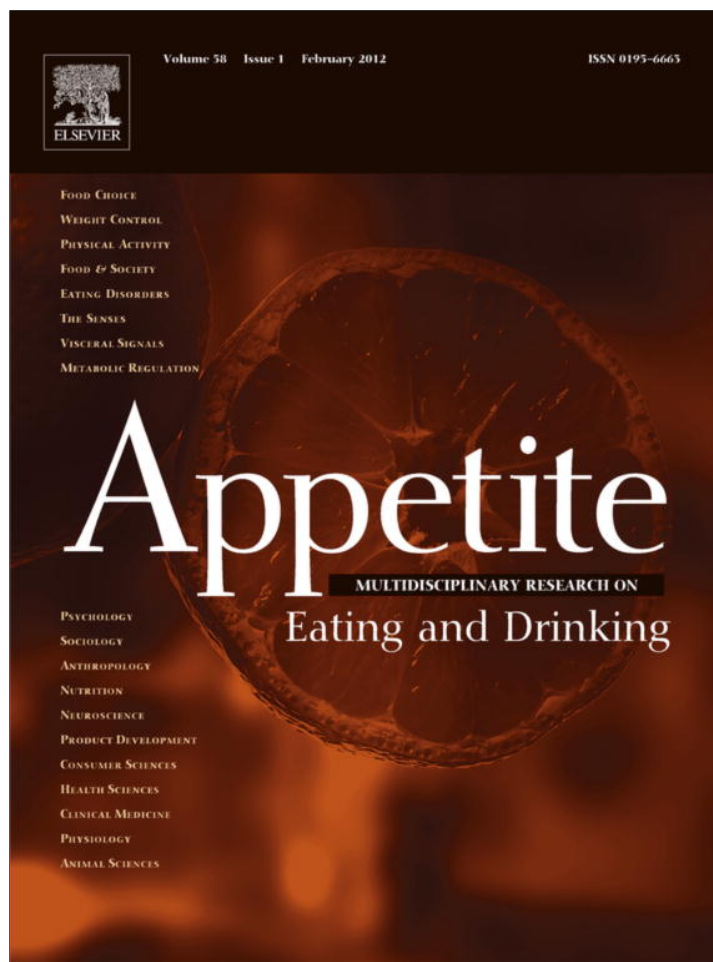


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Research report

Differentiating between successful and unsuccessful dieters. Validity and reliability of the *Perceived Self-Regulatory Success in Dieting Scale*Adrian Meule^{a,*}, Esther K. Papies^b, Andrea Kübler^{a,c}^a Department of Psychology I, University of Würzburg, Marcusstr. 9-11, 97070 Würzburg, Germany^b Department of Psychology, Utrecht University, P.O. Box 80140, 3508 TC, Utrecht, The Netherlands^c Institute of Medical Psychology and Behavioural Neurobiology, University of Tübingen, Gartenstr. 29, 72074 Tübingen, Germany

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ABSTRACT

Dieting and the wish to lose weight are ubiquitous in our society. Only few people, however, are successful in long-term weight loss and -maintenance. The *Perceived Self-Regulatory Success in Dieting Scale* (PSRS) is a succinct 3-item measure that can be used to differentiate between successful and unsuccessful dieters. However, psychometric properties of the scale have not yet been investigated. We re-analyzed data from several studies and demonstrate validity and reliability of the PSRS. Internal consistency was reasonably high (Cronbach's $\alpha = .72-.79$). Item means were medium and item-total-correlations were high. Validity of the scale was demonstrated such that it correlated negatively with body-mass-index (BMI), concern for dieting, rigid dietary control, food cravings, food addiction symptoms, and binge eating. Flexible dietary control was positively associated with the PSRS. We conclude that the PSRS constitutes a valid and reliable measure to efficiently assess dieting success.

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Introduction

The prevalence of overweight and obesity has reached its highest level ever and the prevalence of morbid obesity continues to rise (Bessesen, 2008; Yanovski & Yanovski, 2011). Although there are inconsistent findings about a possible stabilization or leveling off of the obesity epidemic (Finucane et al., 2011; Rokholm, Baker, & Sorensen, 2010; Yanovski & Yanovski, 2011), there is a consensus that this high obesity prevalence is a worldwide health and economic burden (Wang, McPherson, Marsh, Gortmaker, & Brown, 2011). In the U.S. population, for example, some 30% of adults are currently obese (Bessesen, 2008; Yanovski & Yanovski, 2011). At the same time, approximately 30–50% of adults are currently trying to lose weight or tried to control weight within the past year (Bish, Blanck, Serdula, Kohl, & Khan, 2004; Kruger, Galuska, Serdula, & Jones, 2004; Laska, Pasch, Lust, Story, & Ehlinger, 2011; Weiss, Galuska, Khan, & Serdula, 2006). Women are 1.5 times more likely to attempt weight loss than men (Andreyeva, Long, Henderson, & Grode, 2010; Laska et al., 2011) and they start doing so at a lower body-mass-index (BMI) than men do (Andreyeva et al., 2010; Bish et al., 2004). However, successful weight loss and especially the long-term maintenance of the achieved lower body weight after weight loss is difficult, and many dieters fail to maintain their weight and even regain more weight than they lost on their diets (Mann et al., 2007).

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To get a better understanding of the psychological processes underlying dieting behavior and potential factors leading to dieting failures or success, several instruments have been developed to assess people's dieting motivation and behavior. Herman and Polivy, 1980 (see also Herman & Mack, 1975) originally proposed the *Restraint Scale* (RS), which has later been suggested to primarily identify rather unsuccessful dieters (Heatherton, Herman, Polivy, King, & McGree, 1988; Williamson et al., 2007). Indeed, so-called restrained eaters can be seen as chronic dieters who are constantly concerned with their weight and want to restrict caloric intake. However, they are only temporarily able to maintain their cognitive restriction over their eating behavior and often indulge in attractive food and overeat. In particular, restrained eaters have been found to show disinhibited food intake in a variety of experimental situations involving the exposure to attractive food or manipulations that limit self-regulatory resources (see Stroebe, 2008, or Stroebe, Papies, & Aarts, 2008, for a review).

Subsequently, other instruments have been proposed to measure dieting motivation and behavior, such as the *Eating Inventory* (EI, formerly *Three-Factor Eating Questionnaire*; Stunkard & Messick, 1985) and the *Dutch Eating Behavior Questionnaire* (DEBQ; Van Strien, Frijters, Bergers, & Defares, 1986). These measures focus more on actual dieting behavior and as such assess the tendency to be a successful dieter, nevertheless there is often no or only a small association with actual caloric intake or body weight (Stice, Cooper, Schoeller, Tappe, & Lowe, 2007; Stice, Fisher, & Lowe, 2004; Stice, Sysko, Roberto, & Allison, 2010). Accordingly, restraint scales do seem to capture dieting success to some degree,

but they do not assess self-regulatory success in dieting and cannot clearly differentiate between the two subpopulations of successful and unsuccessful dieters (Van Strien, 1997; Van Strien, 1999).

Most recently, there have been attempts to differentiate between successful and unsuccessful dieters (Meule, Lutz, Vögele, & Kübler, 2012; Papiés, Stroebe, & Aarts, 2008; Van Koningsbruggen, Stroebe, & Aarts, 2011; Van Koningsbruggen, Stroebe, Papiés, & Aarts, 2011). In those studies, the *Perceived Self-Regulatory Success in Dieting Scale* (PSRS; Fishbach, Friedman, & Kruglanski, 2003) is used to differentiate between successful and unsuccessful dieters. Such a measure is important because it allows researchers to systematically examine differences between these groups and thus to identify the psychological processes contributing to dieting success. Indeed, recent research in this area has already provided initial promising results, showing that success or failure in dieting is differentially related to activation and inhibition of dieting goals in response to attractive food cues (Papiés et al., 2008; Stroebe, Mensink, Aarts, Schut, & Kruglanski, 2008; Van Koningsbruggen et al., 2011; Van Koningsbruggen et al., 2011), to experiences of food craving (Meule, Lutz, et al., 2012), and to the use of dietary control strategies (Meule, Westenhöfer, & Kübler, 2011). In addition, two recent studies have provided first empirical evidence demonstrating that experimentally creating the mechanisms of dieting success by a planning manipulation has the same effect on diet-goal activation and eating behavior as perceived dieting success assessed by the PSRS, therefore suggesting further confirmation for its validity (Van Koningsbruggen, Stroebe, Papiés et al., 2011).

Although the PSRS has thus proved to be a useful tool for the investigation of mechanisms underlying successful and unsuccessful dieting, psychometric properties have not yet been reported. To date, one study used an English version (Fishbach et al., 2003), three studies used a Dutch version (Papiés et al., 2008; Van Koningsbruggen, Stroebe, & Aarts, 2011; Van Koningsbruggen, Stroebe, Papiés et al., 2011), and three studies used a German version of the PSRS (see Appendix; Meule, Lutz, et al., 2012; Meule, Vögele, & Kübler, 2012; Meule, Westenhöfer et al., 2011). In the current paper, we calculated internal consistency and item statistics from several studies in which a German version of the PSRS was applied. To evaluate convergent validity, we present associations between the PSRS and other constructs relevant for eating and dieting behavior. Rather unsuccessful dieting behavior and disinhibited eating behavior have previously been associated with higher BMI (e.g. Ruderman, 1986), stronger concern for dieting (Lowe, 1984), the use of rigid dieting strategies (Westenhöfer, Stunkard, & Pudel, 1999), frequent experiences of food craving (Cepeda-Benito, Gleaves, Williams, & Erath, 2000), more food addiction symptoms (Gearhardt, Corbin, & Brownell, 2009), and binge eating frequency (Womble et al., 2001). On the other hand, the use of flexible dieting strategies has been associated with rather successful dieting (Westenhöfer et al., 1999). Hence, we expected negative relationships between the PSRS and BMI, concern for dieting, rigid dietary control, food cravings, food addiction symptoms, and binge eating frequency, but a positive relationship between the PSRS and flexible dietary control. A relevant, but not directly eating-related construct which is associated with self-regulatory failure in eating behavior is impulsivity (Guerrieri, Nederkoorn, & Jansen, 2008). For instance, total scores on the short form of the *Barratt Impulsiveness Scale* (BIS-15) have been found to correlate positively, but weakly, with BMI (Meule, Vögele, & Kübler, 2011). Therefore, we expected small negative or no correlations between the PSRS and BIS-15 subscales as an indication for discriminant validity.

Materials and methods

We re-analyzed data sets from four studies that used a German version of the PSRS (Table 1). In three of these studies, the PSRS

was administered to female students as part of different behavioral and physiological testing (Table 1, Studies 1–3). Study 4 was an online study to validate a food craving questionnaire which also included the PSRS (Table 1, Study 4 and Table 2). In that study, student councils of several German universities were contacted by e-mail and asked to distribute the internet address of the online study using their mailing lists. As an incentive, five × 50 Euro were raffled among participants who completed the entire set of questions. Questionnaire completion took approximately 25 min. There was no experimental manipulation to increase or decrease self-perceived dieting success preceding completion of the PSRS in any of those studies. Participant characteristics of all studies are presented in Table 1.

Instruments

Perceived Self-Regulatory Success in Dieting Scale (PSRS)

This three-item scale was developed by Fishbach and colleagues (2003). Participants have to rate on 7-point scales how successful they are in watching their weight, in losing weight, and how difficult it is for them to stay in shape (Appendix A). Internal consistency has previously been reported to range between $\alpha = .65$ – $.72$ (Fishbach et al., 2003; Van Koningsbruggen, Stroebe, & Aarts, 2011; Van Koningsbruggen, Stroebe, Papiés et al., 2011). It might be possible that the item wording of the PSRS renders it less applicable to participants who are not concerned with their weight. Therefore, we addressed this issue by modifying instructions which could possibly result in an increase of internal consistency. In one of our studies, participants were instructed to mark the middle of the scale (i.e. 4) if an item was not applicable (Table 1, Study 3). In the online study (Study 4), participants were able to choose an option *not applicable* if they were not concerned with their weight (see Table 1, Study 4). If this option was chosen in at least one question, participants were excluded from analysis ($n = 136$)¹. All data are reported for the remaining $n = 480$ participants.

Restraint Scale-subscale concern for dieting (RS-CD)

The RS (Herman & Polivy, 1980) consists of two subscales that measure *concern for dieting* (RS-CD) and *weight fluctuations* (RS-WF; Dinkel, Berth, Exner, Rief, & Balck, 2005). However, it has been suggested to disregard RS-WF due to confounding with BMI and overweight (Stroebe, 2008). Furthermore, RS-CD has been found to have higher internal consistency than RS-WF ($\alpha = .82$ vs. $.69$, Dinkel et al., 2005). For these reasons we used the RS-CD only. The scale contains 6 items, such as “How often are you dieting?”.

Rigid and flexible control of eating behavior

These scales were originally developed by Westenhöfer (1991) who found that the *cognitive restraint* subscale of the EI (Stunkard & Messick, 1985) could be further divided into flexible and rigid control strategies of dietary restraint. Later, additional items were added to increase internal consistencies (Westenhöfer et al., 1999). Flexible control is now assessed with 12 items (FC12; Cronbach's $\alpha = .83$; e.g., “If I eat a little bit more during one meal, I make up for it at the next meal.”), whereas the rigid control scale consists of 16 items (RC16; Cronbach's $\alpha = .81$; e.g., “I would rather skip a meal than stop eating in the middle of one.”).

Food Cravings Questionnaire-Trait (FCQ-T)

¹ Not applicable was chosen by $n = 51$ participants for question one, $n = 123$ participants for question two, and $n = 14$ participants for question three.

Table 1
Reliability and item statistics of the PSRS in four studies with different instructions.

Study	Sample size	Gender	Age		BMI		$r_{(BMI-PSRS)}$	Instruction	Cronbach's α	Item 1		Item 2		Item 3	
			M (SD)	M (SD)	M (SD)	r_{itc}				M (SD)	r_{itc}	M (SD)	r_{itc}		
(1)	50	Female	22.3 (3.0)	21.5 (2.7)	–.67 ^b	–	.79		4.4 (1.5)	.67	3.5 (1.6)	.65	4.2 (1.7)	.57	
(2)	47	Female	23.7 (3.4)	22.4 (2.8) ^a	–.61 ^b	–	.75		4.6 (1.4)	.68	3.7 (1.4)	.49	3.9 (1.6)	.60	
(3)	55	Female	23.0 (2.7)	22.6 (5.3)	–.46 ^b	4 = not applicable	.73		4.5 (1.7)	.65	4.1 (1.7)	.45	4.4 (1.8)	.55	
(4)	382	Female	24.3 (3.9)	22.3 (3.4) ^a	–.44 ^b	Option to choose	.73		4.5 (1.6)	.66	3.6 (1.7)	.54	3.9 (1.7)	.48	
	98	Male	24.5 (4.4)	24.3 (3.0) ^a	–.42 ^b	not applicable	.72		4.9 (1.5)	.68	4.3 (1.7)	.47	4.4 (1.8)	.50	

Note: Data of studies (1) and (3) are from unpublished studies. Data of study (2) are from Meule, Vögele, et al. (2012). Data of study (4) are from Meule, Lutz, et al. (2012).

^a calculation of BMI was based on self-reported height and weight.

^b all p 's <.001.

Table 2
Validity coefficients of the PSRS.

$N = 480$	r	p
<i>Convergent validity</i>		
Restraint Scale – Concern for Dieting	–.27	<.001
Rigid Control	–.22	<.001
Flexible Control	.26	<.001
Food Cravings Questionnaire – Trait	–.44	<.001
Yale Food Addiction Scale ^a	–.32	<.001
Binge Eating ^b	–.25	<.001
<i>Discriminant validity</i>		
Barratt Impulsiveness Scale – attention	–.20	<.001
Barratt Impulsiveness Scale – motor	.01	ns
Barratt Impulsiveness Scale – non-planning	.04	ns

^a Questionnaire scores represent the amount of food addiction symptoms.

^b Binge eating refers to the number of days within the last 28 days when binge eating occurred as measured with the Eating Disorder Examination – Questionnaire.

Food cravings were assessed with the trait version of the Food Cravings Questionnaires (Cepeda-Benito et al., 2000). This 39-item instrument asks participants to indicate on a 6-point scale how frequently they experience food cravings (ranging from *never to always*). An example is “When I crave certain foods, I usually try to eat them as soon as I can.”. The FCQ-T consists of nine subscales measuring food cravings in relation to (1) intentions to consume food, (2) anticipation of positive reinforcement, (3) relief from negative states, (4) lack of control over eating, (5) preoccupation with food, (6) hunger, (7) emotions, (8) cues that trigger cravings, and (9) guilt. Only the total score was used in the current study. Internal consistency of the FCQ-T is $\alpha = .96$ (Meule, Lutz, et al., 2012).

Yale Food Addiction Scale (YFAS)

The YFAS measures addictive eating behavior and consists of 27 items (e.g., “Over time, I have found that I need to eat more and more to get the feeling I want, such as reduced negative emotions or increased pleasure.”). The questionnaire is based on the diagnostic criteria for substance dependence of the DSM-IV (Gearhardt et al., 2009). Scoring of the YFAS enables the calculation of a symptom count and a diagnosis of food addiction. Internal consistency is $\alpha = .81$ (Meule, Vögele, & Kübler, in press).

Eating Disorder Examination-Questionnaire (EDE-Q)

The EDE-Q (Fairburn & Beglin, 1994; Hilbert & Tuschen-Caffier, 2006) measures specific eating pathologies with 22 items. In addition, six items assess essential behavioral patterns like binge eating and compensatory behaviors. For the current study, we included only three of these six items which assess binge eating frequencies within the last 28 days (e.g., “Over the past 28 days, on how many days have such episodes of overeating occurred (i.e. you have eaten an unusually large amount of food and have had a sense of loss of

control at the time)?”). The first two items acted as primers for the third item.

Barratt Impulsiveness Scale (BIS-15)

The BIS-15 was proposed by Spinella (2007) as short version of the BIS-11 (Patton, Stanford, & Barratt, 1995) for the measurement of impulsivity. It consists of 15 items only compared to the 30-item long version and contains items such as “I act on the spur of the moment.”. The three-factor solution on the dimension *motor*, *attentional*, and *non-planning impulsivity* could also be confirmed for the German version with internal consistencies between $\alpha = .68$ –.82 (Meule, Vögele et al., 2011).

Data analysis

Psychometric properties of the PSRS were evaluated separately for every study. Internal consistency (Cronbach's alpha) was calculated to evaluate reliability. Item means and item-total-correlations (part-whole-corrected) were calculated as item statistics. Correlations of the PSRS with BMI were calculated to evaluate validity. Additional indicators of validity were obtained from correlations with the instruments described above which were used in the online study.

Results

Reliability and item statistics

In all four studies, items of the PSRS were moderately or highly intercorrelated, (1) $r = .51$ –.64, (2) $r = .40$ –.63, (3) $r = .35$ –.60, (4) $r = .36$ –.59. All items showed medium item means and high item-total-correlations (Table 1). In all four studies, internal consistency was $\alpha > .70$ (Table 1)².

Validity

As hypothesized, the PSRS showed medium-to-high negative correlations with BMI in all four studies (Table 1). Furthermore, small-to-medium negative correlations were found with concern for dieting, rigid dietary control strategies, food addiction symptoms, food cravings, and binge eating frequencies (Table 2). Flexible dietary control strategies were positively correlated with the PSRS (Table 2). Attentional impulsivity was negatively correlated with the PSRS while there were no correlations with non-planning or motor impulsivity (Table 2).

² For Study 4, we also transformed not applicable answers to the middle of the scale (i.e. four) and calculated internal consistency for the total sample ($n = 616$). This left the internal consistency almost unchanged (Cronbach's $\alpha = .70$).

Discussion

The aim of the current article was to evaluate the psychometric properties of the PSRS. We argue that the PSRS has reasonable reliability and validity and is therefore a useful instrument for an economic assessment of dieting success.

In all four studies, the PSRS showed good internal consistency. This result corresponds to internal consistencies of the English ($\alpha = .72$; Fishbach et al., 2003) and Dutch version ($\alpha = .72$; Van Koningsbruggen, Stroebe, Papies, et al., 2011, Study 2; however, see Van Koningsbruggen, Stroebe, & Aarts, 2011; Van Koningsbruggen, Stroebe, Papies, et al., 2011, Study 1, for slightly lower values). One concern regarding the scale could be that the item wording renders it less applicable to participants who are not concerned with their weight or do not try lose weight. This could result in a decrease of reliability. Therefore, taking this into account, in two of our studies participants were instructed to tick the middle of the scale if they felt that the item was not applicable to them (Table 1, Study 3), or they were given the extra option to tick *not applicable* (Table 1, Study 4). Our results showed that internal consistency was reasonably high in all four studies regardless of the instruction given. Possibly, participants intuitively choose the middle of the scale if they found an item not applicable to them (see footnote 2), which would render the PSRS suitable for a broad population.

In addition, we found that when given the option to explicitly report that a question was not applicable to them, participants did not often make use of this option. This choice was most often made for question two (see footnote 1), which is the only question referring directly to dieting for weight loss (“How successful are you in losing extra weight?”). In contrast, the other two questions more generally refer to preventing weight gain and overall fitness. These findings suggest that almost all our participants had at least some experience with trying to watch their weight or trying to stay in shape, which they could recall in order to rate their self-regulatory success in this domain. In addition, including participants who had indicated “not applicable” on one of the questions into the analysis by substituting the missing value with the mean value of the scale, did not notably lower internal consistency (Footnote 2). Therefore, we propose that the PSRS is a reliable instrument to assess self-regulatory success regardless of the intensity and frequency with which participants actually pursue the dieting goal.

Demonstrating its convergent validity, the PSRS was negatively related to questionnaires that are associated with self-regulatory failure in eating behavior, as well as with participants' BMI. High self-regulatory success was associated with lower concern for dieting and a lower BMI. Similar associations have also been reported

for the Dutch version (Papies, et al., 2008; Van Koningsbruggen, Stroebe, & Aarts, 2011; Van Koningsbruggen, Stroebe, Papies et al., 2011). In addition, more successful dieters experienced less food cravings, less symptoms of food addiction, and fewer episodes of binge eating, and relied less on rigid control strategies (cf. Meule, Westenhöfer et al., 2011). Conversely, the PSRS was positively related to flexible dietary control strategies, which have previously been found to be related to successful weight loss or -maintenance (Westenhöfer, 1991; Westenhöfer, von Falck, Stellfeldt, & Fintelmann, 2004; Westenhöfer et al., 1999). It has to be noted, however, that most validity coefficients were rather weak. Future investigations should include measures that are more closely related to dieting success for establishing convergent validity, such as the restraint scales of the EI or the DEBQ. Discriminant validity was demonstrated by no or small negative correlations with impulsivity. This finding is in line with impulsivity being associated with self-regulatory failure in eating behavior (Guerrieri et al., 2008), but that this relationship is rather weak (Meule, Vögele et al., 2011, in press).

Interpretations of our results are limited because our samples were mostly restricted to young female students. However, these participants are well suited for the investigation of mechanisms of dieting success as they are particularly concerned with their weight (Dinkel et al., 2005; Heatherton, Mahamedi, Striepe, Field, & Keel, 1997). Moreover, psychometric properties in male participants were comparable to female participants (Table 1, Study 4). Nonetheless, future studies which apply the PSRS to obese patients or other samples are warranted. Another limitation is that we only evaluated the German version of the PSRS. Similar investigation could be conducted with the English and Dutch version. However, reliability and validity coefficients were comparable to studies that used those versions. Finally, we only analyzed correlational support for validity of the scale. Future research could include the PSRS in experimental paradigms, such as preload-studies, to further explore if the PSRS is associated with actual caloric restriction.

To summarize, the PSRS has good psychometric properties. Its reliability is consistent throughout studies using different instructions or versions in different languages. In order to systematically examine the psychological processes associated with dieting success, it is of crucial importance to have a brief but effective measure to reliably identify successful and unsuccessful self-regulators in this domain. In addition, such a measure of dieting success can also serve as the dependent variable in research testing the effects of manipulations or interventions designed to enhance self-regulation in dieting behavior. Based on the current findings, we conclude that the PSRS is well-suited for such research as it

Appendix A. English, Dutch, and German version of the PSRS

Item		Response categories							
English version									
1. How successful are you in watching your weight?	Not successful	1	2	3	4	5	6	7	Very successful
2. How successful are you in losing extra weight?	Not successful	1	2	3	4	5	6	7	Very successful
3. How difficult do you find it to stay in shape? ^a	Not difficult	1	2	3	4	5	6	7	Very difficult
Dutch version									
1. Hoe goed lukt het je om op je gewicht te letten?	Helemaal niet goed	1	2	3	4	5	6	7	Heel goed
2. Hoe goed lukt het je om af te vallen?	Helemaal niet goed	1	2	3	4	5	6	7	Heel goed
3. Hoe moeilijk vind je het om in vorm te blijven? ^a	Helemaal niet moeilijk	1	2	3	4	5	6	7	Heel moeilijk
German version									
1. Wie gut gelingt es dir auf Dein Gewicht zu achten?	Überhaupt nicht gut	1	2	3	4	5	6	7	Sehr gut
2. Wie gut gelingt es dir abzunehmen?	Überhaupt nicht gut	1	2	3	4	5	6	7	Sehr gut
3. Wie schwierig findest du es in Form zu bleiben? ^a	Überhaupt nicht schwierig	1	2	3	4	5	6	7	Sehr schwierig

^a Item is reversed coded.

represents an efficient and valid self-report measure of dieting success.

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