First publ. in: Journal of Behavioral Medicine 33 (2010), 5, pp. 415-422
The original publication is available at www.springerlink.com

What is setting the stage for abdominal obesity reduction? A comparison between personality and health-related social cognitions

N. Hankonen · M. Vollmann · B. Renner · P. Absetz

Abstract The present longitudinal study examines whether changes in waist circumference are best predicted by relatively stable and broad personality traits (dispositional optimism and pessimism), by modifiable and domain-specific social cognitions (health-related self-efficacy), or a combination of these. Altogether 385 participants (74% women; 50–65 years) attended the GOAL Implementation Trial, a lifestyle counseling intervention to improve diet and physical activity. Measurements were conducted prior to the intervention (Time 1), and 3 months (Time 2) and 12 months (Time 3) after Time 1. Three different models of the potential interplay between dispositional optimism and pessimism and health-related self-efficacy were tested. The analyses showed that the change in health-related self-efficacy during the intervention (Time 1–Time 2) was negatively related with waist circumference change between Time 1 and Time 3, indicating that increases in self-efficacy during the intervention resulted in reduction in waist circumference over 12 months. However, optimism and pessimism were unrelated to waist circumference change either directly or indirectly through changes in self-efficacy. Interventions enhancing participants' positive health-related expectancies such as self-efficacy are likely to be effective even when participants' dispositional expectancies are pessimistic.

N. Hankonen (✉) · P. Absetz
Division of Welfare and Health Promotion, National Institute for Health and Welfare, P.O. Box 30, 00271 Helsinki, Finland
e-mail: nelli.hankonen@helsinki.fi

M. Vollmann · B. Renner
Department of Psychology, University of Konstanz, Konstanz, Germany

Keywords Dispositional optimism · Personality · Self-efficacy · Lifestyle intervention · Waist circumference

Introduction

Psychological determinants of health behavior and its consequences have been investigated mainly in two different research fields. Within the personality framework, stable and generalized personality traits such as optimism and pessimism are seen as the driving forces behind health behavior outcomes (Scheier and Carver 2003; Vollrath 2006), whereas within the social-cognitive framework, health behavior outcomes are considered to be mainly determined by domain-specific social cognitions such as self-efficacy (Bandura 1997; Renner and Schwarzer 2003). Interestingly, although previous studies detected substantial intercorrelations between personality traits and domain-specific social cognitions (e.g., Benyamini and Raz 2007; Cozzarelli 1993; Majer et al. 2004; Waldrop et al. 2001), there is a lack of research assessing relative impact and the interplay of these factors in facilitating favorable health outcomes.

Theoretically, generalized personality traits and domain-specific social cognitions may cooperate in various ways to impact health behavior outcomes. One possibility is that both personality traits and social cognitions have direct and cumulative effects on health behavior outcomes. In such an *additive model*, each of the factors would contribute uniquely to the variance in the outcome. Shnek et al. (2001) showed for example that optimism and self-efficacy have independent, additive effects on depression. An alternative model proposes that personality traits are not directly related to health behavior outcomes, but contribute indirectly through their impact on domain-specific social cognitions.

This theoretical conception can be represented by a *static mediation model*, where the impact of personality traits on health outcomes is mediated by domain-specific social cognitions. Cozzarelli (1993) suggested such a mediation model of dispositional optimism and self-efficacy in the context of coping with abortion. A third possibility is a *dynamic mediation model* which assumes that personality variables are related to the magnitude of change in domain-specific social cognitions. Thus, personality would promote positive health behavior outcomes through facilitating *changes* in domain-specific social cognitions. Within both mediation models, personality is conceptualized as distal variable that sets the stage for positive behavior outcomes through domain-specific social cognitions.

In the present paper, we will investigate the interplay of personality and domain-specific social cognitions in the context of a lifestyle intervention. From the vast range of personality traits, dispositional optimism and pessimism (Scheier and Carver 1985) were examined in this study since it has been demonstrated that both traits are associated with a healthier lifestyle (Steptoe et al. 2006) and a wide range of health-related outcomes (e.g., Rasmussen et al. 2006). However, the evidence regarding the impact of dispositional optimism on weight loss and obesity reduction has been mixed (Benyamini and Raz 2007; Fontaine and Cheskin 1999; Shepperd et al. 1996), and therefore needs further examination. Similarly, from the array of social cognitions, health-related self-efficacy was selected since numerous empirical studies have shown that it has an important impact on health behavior (e.g., Bandura 1997; Hankonen et al. 2009; Linde et al. 2006; Renner et al. 2007).

How then might dispositional optimism/pessimism and health-related self-efficacy influence success in weight loss attempts? Based on previous research findings, possible mechanisms for dispositional optimism are more adaptive coping, more effort in goal striving process and higher engagement for important goals (Geers et al. 2009; Segerstrom and Solberg Nes 2006; Solberg Nes and Segerstrom 2006), all applicable also to the process of pursuing a weight loss goal. These might apply inversely to pessimism. The mechanisms for self-efficacy include selecting more challenging goals, sustained effort in difficult tasks, and longer persistence in the face of obstacles (Bandura 1997). In summary, both generalized and domain-specific expectancies might facilitate weight loss through their impact on motivational and volitional processes (e.g., intention formation, goal striving, and engagement).

The purpose of the present paper is to test the three different models proposed for the interplay between personality traits, i.e., dispositional optimism/pessimism and domain-specific social cognitions, i.e., health-related self-efficacy in predicting waist circumference reduction in the context of a 3-month lifestyle intervention program (see Fig. 1 for all three models). The "additive model" (Model 1) tests whether optimism and pessimism as well as health-related self-efficacy had an independent effect on waist circumference reduction. The "static mediation model" (Model 2) tests whether optimism and pessimism were indirectly related to waist circumference reduction through an increased level of health-related self-efficacy after the intervention. Finally, in the "dynamic mediation model" (Model 3) it is tested whether optimism and pessimism determined the magnitude of change in health-related self-efficacy during the intervention, and whether these changes in turn predicted waist circumference reduction. To our knowledge, this is the first study evaluating alternative theoretical models outlining the possible interplay between dispositional optimism, pessimism and health-related self-efficacy, and their associations with waist circumference reduction over 12 months.

Method

Participants and study design

In total, 385 participants (74% women) aged 50–65 years who were at elevated risk for type 2 diabetes indicated by the FINDRISC score (The Finnish Diabetes Risk Score) (Lindstrom and Tuomilehto 2003) were recruited at nurses' appointments in the primary health care centers in Päijät-Häme province, Finland. Exclusion criteria were mental health problem or substance abuse likely to interfere with participation, acute cancer, and myocardial infarction during the past 6 months. At the baseline, 95.5% of the participants were overweight or obese. The GOAL (GOod Ageing in Lahti Region) Lifestyle Implementation Trial aimed at healthy lifestyle changes and reduction of obesity, with objectives shown to be effective in delaying and preventing the onset of type 2 diabetes (Tuomilehto et al. 2001).

The intervention program consisted of six structured two-hour small-group counseling sessions, which were planned based on social cognitive and self-regulation theories, with five sessions during the 3-month intervention period and one booster session at 8 months. The program targeted central determinants of health behavior change such as health-related self-efficacy through theory-suggested strategies, such as modeling, reattribution of previous experiences, and verbal feedback (for a detailed description of program content, objectives, sample and design, see Absetz et al. 2007; Hankonen et al. 2010; Uutela et al. 2004). Measurements took place before the intervention (Time 1), at 3 months (Time 2) and at 12 months (Time 3) after Time 1.

The ethical commission in Päijät-Häme central hospital and the Ethical Committee of the National Public Health

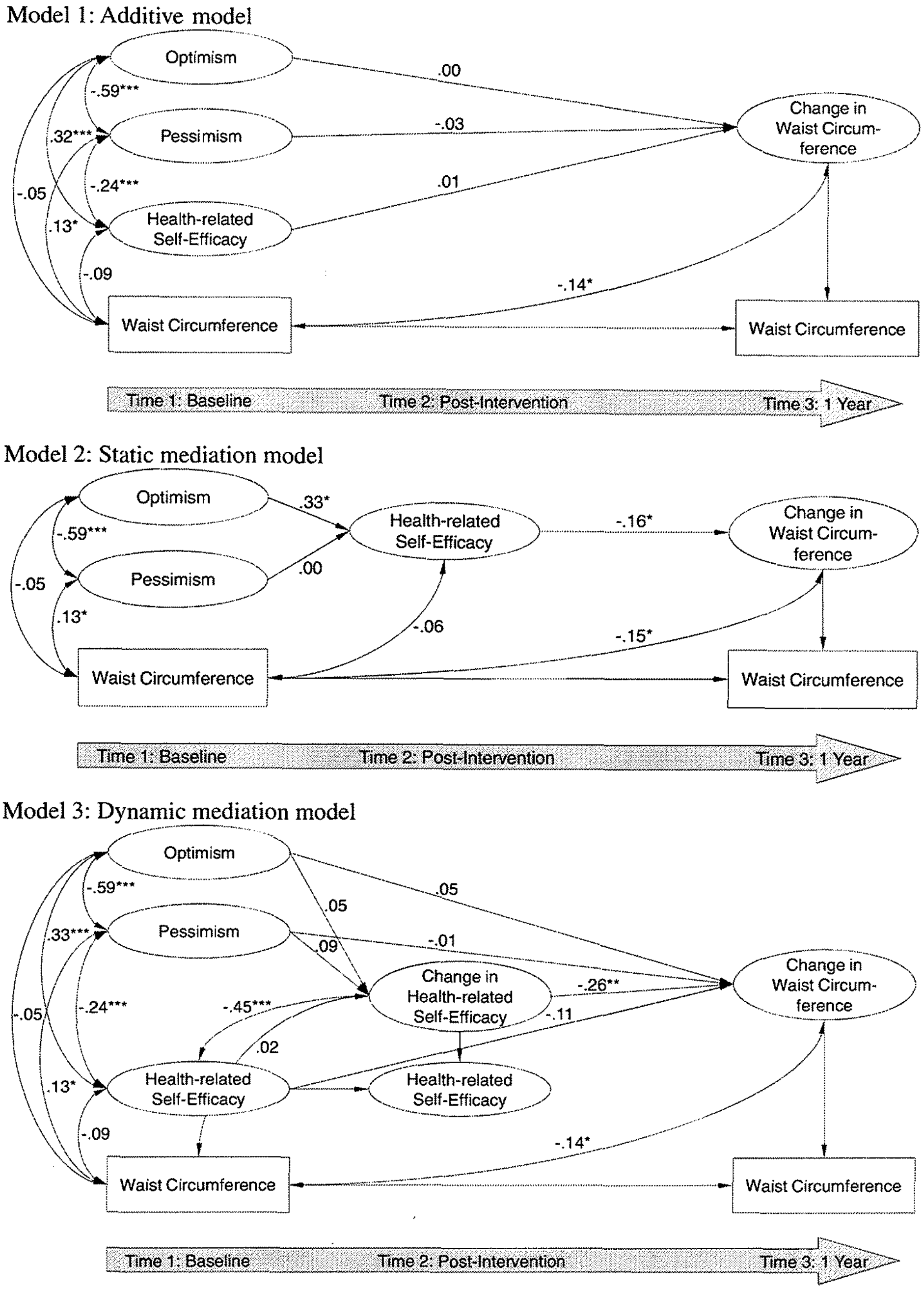

Fig. 1 The three models tested. For simplicity, some parameters (e.g., the factor indicators) are omitted from the Figure. * $P < .05$, ** $P < .01$, *** $P < .001$

Institute gave their approval of the project. Participants provided a written informed consent, and they were treated according to the American Psychological Association (APA) ethical standards.

Measures

Optimism and pessimism were measured at Time 1 with the Life Orientation Test revised (LOT-R; Scheier et al. 1994). Cronbach's alpha was .67 for the total LOT-R scale (6 items), .47 for optimism subscale (3 items) and .71 for pessimism subscale (3 items). Confirmatory factor analyses indicated a two-factor structure for the LOT-R, in line with many other previous studies (e.g., Robinson-Whelen et al. 1997). Optimism and pessimism were significantly inversely correlated ($r = -.60$, $P < .001$).

Health-related self-efficacy was measured at Time 1 and Time 2 with six items referring to one's confidence in dealing with the difficulties, temptations, and barriers of health-related lifestyle (Time 1/Time 2 $\alpha = .78$). Thus, the

Table 1 Parameter estimates for means, (standard deviations), and correlation coefficients at Time 1

	Mean (SD)	1	2	3	4
1. Optimism	2.7 (.39)	1			
2. Pessimism	2.0 (.63)	−.60***	1		
3. Health-related self-efficacy	3.0 (.36)	.32***	−.24***	1	
4. Waist circumference (cm)	105.8 (12.58)	−.03	.15*	−.09	1

*** $P < .001$, ** $P < .01$, * $P < .05$

health-related self-efficacy items were designed to assess self-beliefs about coping with a variety of difficult demands in the context of lifestyle change and were created on the basis of similar, but behavior specific self-efficacy measures which have been used in previous studies (Gutiérrez-Doña et al. 2009; Renner et al. 2007, 2008; Schwarzer and Renner 2000). The items retained the common semantic structure: "I am certain that I can do X, even if Y (barrier)" (cf., Schwarzer and Luszczynska 2007), to ensure sound psychometric properties and validity. Items were for example "I can resist temptations when I know they are bad for my health", "I can take health considerations into account, even when it causes discomfort or a need to give up other important things", "I can lead a healthy lifestyle, even when people around me are indifferent about health").

All answers were given on a 4-point rating scale [1] completely disagree to [4] completely agree.

Anthropometric measurements were conducted at Time 1 and Time 3. Trained study nurses measured height, weight and waist circumference which is a highly valid indicator of abdominal obesity. Waist circumference was used as major outcome variable as abdominal obesity has been shown to be the major predictor of many lifestyle related chronic diseases (Janiszewski et al. 2007; Pi-Sunyer 1991) and an even stronger predictor for diabetes than fitness and Body Mass Index (BMI; Racette 2006). Additional control analyses were calculated with BMI as outcome variable. Since BMI and waist circumference were strongly correlated ($r = .78$) and resulted in highly similar results, only results for waist circumference are reported.

See Table 1 for basic descriptive statistics.

Statistical analyses

Structural equation modeling (SEM) with full information maximum likelihood (FIML) for estimating missing data was used to test the three proposed models (Mplus software 5.2). Model 1 ("additive model") specified Time 1 optimism, pessimism, and health-related self-efficacy as predictors for waist circumference change between Time 1 and Time 3. Model 2 ("static mediation model") specified Time 1 optimism and pessimism as predictors of Time 2 health-related self-efficacy, which predicted waist circumference change between Time 1 and Time 3. Model 3 ("dynamic mediation model") specified Time 1 optimism and pessimism as predictors of health-related self-efficacy change between Time 1 and Time 2, and the observed change in health-related self-efficacy between Time 1 and Time 2 as well as baseline health-related self-efficacy at Time 1 were then specified as predictors for waist circumference change between Time 1 and Time 3. Changes in health-related self-efficacy were modeled by applying latent change score (LCS) models (McArdle 2009; McArdle and Nesselroade 1994). Moreover, for health-related self-efficacy three parcels were created in order to create more reliable indicators (Bandalos and Finney 2001) and factor loading invariance across time was enforced, assuring that the measurement model was the same across both time points.

The comparative fit index (CFI), the Tucker-Lewis index (TLI), and the root mean square error of approximation (RMSEA) were used as model fit indices. For testing the hypothesized regression paths, a series of nested models were run and regression effects were constrained to be 0, in order to determine the statistical significance. Statistically nested models (i.e., those with and without constraints on parameters of interest) were compared by determining the difference between their χ^2-values. A non-significant difference indicates a better fit for the more parsimonious (constrained) model.

Results

Waist circumference change: the three models test

Additive model

In a first step, Model 1 tested whether optimism and pessimism and health-related self-efficacy measured at baseline (Time 1) predicted changes in waist circumference between Time 1–Time 3 directly and independently (see Fig. 1). The fit of the "additive model" allowing the three regression effects to be estimated, was adequate with χ^2 (42) = 123.108, $P < .001$; CFI = .94, TLI = .92, RMSEA = .071. However, all three predictors had negligible effects. Consequently, comparing the additive model with a null-effect model (setting the regression effects for these three predictors to zero), did not yield a significant drop in the χ^2-value ($\Delta\chi^2(3) = .23$, ns.). Thus, the "additive model" was not supported.

Static mediation model

In a next step, Model 2 tested whether personality may facilitate or hinder health-related social cognitions, which then in turn facilitate health. The results indicated that optimism at Time 1 (but not pessimism) affected health-related self-efficacy measured 3 months later (see Fig. 1). Moreover, health-related self-efficacy at Time 2 predicted the amount of observed change in waist circumference at one-year. Securing the mediation assumption, optimism and pessimism did not directly predict waist change. However, the estimate of the indirect effect from optimism on waist circumference change through health-related self-efficacy was only marginally significant ($-.05$; $P = .07$). The overall fit of the static mediation model was good with $\chi^2(42) = 110.30$, $P < .001$; CFI = .95; TLI = .93; RMSEA = .065. In a modification of this model, we added the Time 1 health-related self-efficacy as a predictor of Time 2 health-related self-efficacy. This modification rendered the effect between optimism and Time 2 health-related self-efficacy non-significant.

Dynamic mediation model

Model 3 (see Fig. 1) tested whether optimism and pessimism were affecting the amount of observed change in health-related self-efficacy occurring during the intervention (Time 1–Time 2). The overall model fit was good with $\chi^2(71) = 165.43$, $P < .001$; CFI = .95; TLI = .93; RMSEA = .059. Importantly, changes in health-related self-efficacy (Time 1–Time 2) predicted changes in waist circumference (Time 1–Time 3). The more health-related self-efficacy increased during the first 3 months, the larger was the observed waist circumference reduction after 1 year. Turning to the impact of the personality traits shows that optimism and pessimism (Time 1) had no direct impact on waist circumference change. Moreover, they neither facilitated nor hindered increases in health-related self-efficacy (Time 1–Time 2).

Discussion

The present study examined the interplay of personality and domain-specific cognitions in facilitating positive health outcomes. Specifically, we investigated whether abdominal weight loss is best predicted by dispositional optimism/pessimism or by (acquired) health-related self-efficacy or by a combination of these variables. Three different models, varying in their focus on dynamic change, were tested.

The additive model did not receive support since neither optimism, pessimism nor health-related self-efficacy at baseline were directly predictive of waist circumference reduction after 1 year. The static mediation model did get partial support since optimism predicted higher levels of health-related self-efficacy at Time 2 (post-intervention) which in turn predicted waist circumference reduction after 1 year. The results from this model suggest a distal effect of optimism (but not of pessimism) on obesity reduction. However, the indirect effect of optimism on waist circumference change was only marginally statistically significant, and was attenuated when controlling for the Time 1 health-related self-efficacy. The dynamic mediation model showed that changes in health-related self-efficacy predicted waist circumference change. The results are in line with other intervention studies reporting that an increase in self-efficacy is associated with an improvement in health behaviors such as exercise (Hankonen et al. 2010) and its outcomes such as weight loss (Linde et al. 2006). Interestingly, the level of health-related self-efficacy at baseline had no effect on waist circumference change. Hence, the "take-off" level of self-regulation resources does not appear to determine who will manage to successfully reduce her or his waist circumference but rather the amount of change induced by the intervention in these resources appears to be the crucial ingredient. Optimism did not systematically facilitate these changes in health-related self-efficacy nor did pessimism hinder it.

Dispositional optimism and pessimism were not predictive of changes in waist circumference. This result contradicts former findings indicating that optimism is related to health behavior and health behavior outcomes, such as successful completion of interventions (e.g., Milam et al. 2004; Strack et al. 1987), healthy dietary habits (e.g., Kelloniemi et al. 2005; Schroder and Schwarzer 2005), and weight loss (Shepperd et al. 1996). However, other studies comparing generalized cognitive variables and more behavior-specific cognitions, such as situated optimism or situation-specific control beliefs, found that the latter predict health behavior change and health behavior outcomes better than the trait or individual-difference variables (Armitage 2003; Benyamini and Raz 2007; Taylor et al. 1992). Our results are in line with these findings and support the assumption that behavior outcomes are best predicted by cognitions or expectancies that match the specific behavior.

Our findings raise the question why dispositional expectancies had no effect on abdominal obesity reduction. One might argue that *changes in general* might be predictive for waist circumference change. However, additional control analyses showed no significant effect of changes in optimism and pessimism over time (Time 1–Time 2) on waist circumference change. Thus, the dynamic perspective applies for domain-specific social cognitions but not for the personality traits. Following a different line of thinking, generalized expectancies such as dispositional optimism might enfold their impact particularly when people are confronted with novel or ambiguous challenges and situations (Scheier and Carver 1985). Attempting a lifestyle change might not represent a novel behavior for our participants, thus attenuating the effects of the generalized expectancies. Such moderators might explain earlier discrepant findings regarding the effect of dispositional optimism on weight loss (Benyamini and Raz 2007; Fontaine and Cheskin 1999; Shepperd et al. 1996).

Practical implications for interventions underline the role of self-efficacy enhancement early on in the program. The negligible role of dispositional optimism and pessimism point out that improving the domain-specific cognitions even among dispositional pessimists is sufficient to help them lose weight. Hence, this aspect of personality does not seem to impact chances of success—even indirectly. However, still other personality factors related to health behaviors (de Bruijn et al. 2005) might have important effects also on dynamic weight change or mediating factors such as self-efficacy change, and these should be examined in a dynamic design.

Some limitations of the present study need to be noted. Firstly, Time 1–Time 2 health-related self-efficacy change is overlapping with the Time 1–Time 3 waist change that it is predicting, hence, the causal sequence cannot be reliably established: Part of the waist circumference change might have happened simultaneously or preceding the three-month self-efficacy change. Thus, statistically extracting the "pure" change effect in waist change after the changes in self-efficacy already occurred is not possible with the present data. However, so far many studies with prospective longitudinal designs have used simultaneous changes in predictors and outcomes (Hankonen et al. 2010; Scholz et al. 2009). In our study, by contrast, there is a nine-month lag in between the self-efficacy change endpoint and the waist circumference change endpoint, rendering reverse causation unlikely. Moreover, despite the possibility that success experiences influence self-efficacy, there is also ample experimental evidence for the causal effects of self-efficacy on various outcomes (Bandura 1997; Luszczynska et al. 2006). However, in further studies, an even more consequent change perspective encompassing multiple measurement points should be pursued. Specifically, the entire process might be understood as a dynamic reciprocal relationship as stated by Bandura in his social cognitive learning theory (Bandura 1986): Changes in self-efficacy might help people to set and pursue goals and this facilitates positive progress which in turn is feeding back into self-efficacy beliefs and so forth. In the context of complex and continuous health behaviors such as healthy nutrition, this might resemble a continuous process and a great challenge will be to model these reciprocal processes in the future, e.g., by using autoregressive models.

Secondly, we do not have information on the personality measures of those who declined the offer to participate in the intervention: Hence, we cannot rule out self-selection of participants, such as that pessimists might be less likely to enter the intervention. Third, the alpha reliability of the optimism subscale was comparably low. However, we used confirmatory factor analysis to reduce the error in measurement. And finally, the measure of health-related self-efficacy has been newly created for this study. Considering that health-related self-efficacy showed substantial predictive validity in the present study, the effect size was similar to previous studies using self-efficacy measures (Gutiérrez-Doña et al. 2009; Renner et al. 2007; Schwarzer and Renner 2000), and health-related self-efficacy showed clear divergent validity to dispositional optimism and pessimism, it appears reasonable to assume that the current measure explicitly refers to personal agency in lifestyle change.

This study allowed the examination of relationships beyond what previous studies have done. To our knowledge, this is the first study in this area applying a rigorous dynamic perspective tracking actual changes in the outcomes and predictors while adjusting for errors in the measurements and systematic drop-outs. Thus, methodological differences may partly explain the lack of effects of optimism and pessimism on health outcomes as it was observed in previous studies (Milam et al. 2004; Steptoe et al. 2006; Strack et al. 1987). More specifically, cross-sectionally we first replicated the relationships between optimism, pessimism and health-related self-efficacy on the one hand, and pessimism and waist circumference on the other hand. Thus, for the "as-is-state", personality does matter. However, we then showed that this does not necessarily imply that optimism or pessimism energize changes in health outcomes. Future studies need to address the interplay of other personality factors and domain-specific social cognitions by extending the common static perspective to a dynamic mediation perspective.

Funding This work was supported by the Social Insurance Institution of Finland, the Finnish Doctoral Program in Social Sciences (SOVAKO) and the German Academic Exchange Service (DAAD).

References

Absetz, P., Valve, R., Oldenburg, B., Heinonen, H., Nissinen, A., Fogelholm, M., et al. (2007). Type 2 diabetes prevention in the "real world": One-year results of the GOAL implementation trial. *Diabetes Care, 30*(10), 2465–2470.

Armitage, C. (2003). The relationship between multidimensional health locus of control and perceived behavioural control: How are distal perceptions of control related to proximal perceptions of control? *Psychology & Health, 18*, 723–738.

Bandalos, D. L., & Finney, S. J. (2001). Item parcelling issues in structural equation modelling. In G. A. Marcoulides & R. E. Shumaker (Eds.), *Advanced structural equation modelling: New developments and techniques* (pp. 269–296). Mahwah, NJ: Erlbaum.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Upper Saddle River, NJ: Prentice-Hall.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: Freeman & Co.

Benyamini, Y., & Raz, O. (2007). 'I Can Tell You If I'll Really Lose All That Weight': Dispositional and situated optimism as predictors of weight loss following a group intervention. *Journal of Applied Social Psychology, 37*(4), 844–861.

Cozzarelli, C. (1993). Personality and self-efficacy as predictors of coping with abortion. *Journal of Personality and Social Psychology, 65*, 1224–1236.

de Bruijn, G.-J., Kremers, S. P. J., van Mechelen, W., & Brug, J. (2005). Is personality related to fruit and vegetable intake and physical activity in adolescents? *Health Education Research, 20*(6), 635–644.

Fontaine, K. R., & Cheskin, L. J. (1999). Optimism and obesity treatment outcomes. *Journal of Clinical Psychology, 55*(1), 141–143.

Geers, A. L., Wellman, J. A., & Lassiter, G. D. (2009). Dispositional optimism and engagement: The moderating influence of goal prioritization. *Journal of Personality and Social Psychology, 96*, 913–932.

Gutiérrez-Doña, B., Lippke, S., Renner, B., Kwon, S., & Schwarzer, R. (2009). Self-efficacy and planning predict dietary behaviors in Costa Rican and South Korean women: Two moderated mediation analyses. *Applied Psychology Health & Well-Being, 1*(1), 91–104.

Hankonen, N., Absetz, P., Ghisletta, P., Renner, B., & Uutela, A. (2010). Gender differences in social cognitive determinants of exercise adoption. *Psychology & Health, 25*(1), 55–69.

Hankonen, N., Absetz, P., Haukkala, A., & Uutela, A. (2009). Socioeconomic status and psychosocial mechanisms of lifestyle change in a type 2 diabetes prevention trial. *Annals of Behavioral Medicine, 38*(2), 160–165.

Janiszewski, P. M., Janssen, I., & Ross, R. (2007). Does waist circumference predict diabetes and cardiovascular disease beyond commonly evaluated cardiometabolic risk factors? *Diabetes Care, 30*(12), 3105–3109.

Kelloniemi, H., Ek, E., & Laitinen, J. (2005). Optimism, dietary habits, body mass index and smoking among young Finnish adults. *Appetite, 45*(2), 169–176.

Linde, J. A., Rothman, A. J., Baldwin, A. S., & Jeffery, R. W. (2006). The impact of self-efficacy on behavior change and weight change among overweight participants in a weight loss trial. *Health Psychology, 25*(3), 282–291.

Lindstrom, J., & Tuomilehto, J. (2003). The diabetes risk score. *Diabetes Care, 26*(3), 725–731.

Luszczynska, A., Tryburcy, M., & Schwarzer, R. (2006). Improving fruit and vegetable consumption: A self-efficacy intervention compared with a combined self-efficacy and planning intervention. *Health Education Research, 22*(5), 630–638.

Majer, J., Jason, L., & Olson, B. (2004). Optimism, abstinence self-efficacy, and self-mastery: A comparative analysis of cognitive resources. *Assessment, 11*, 57–63.

McArdle, J. J. (2009). Latent variable modeling of differences and changes with longitudinal data. *Annual Review of Psychology, 60*(1), 577–605.

McArdle, J. J., & Nesselroade, J. R. (1994). Using multivariate data to structure developmental change. In S. H. Cohen & H. W. Reese (Eds.), *Life-span developmental psychology: Methodological contributions* (pp. 223–267). Hillsdale, NJ: Lawrence Erlbaum Associates.

Milam, J. E., Richardson, J. L., Marks, G., Kemper, C. A., & McCutchan, A. J. (2004). The roles of dispositional optimism and pessimism in HIV disease progression. *Psychology and Health, 19*, 167–181.

Pi-Sunyer, F. X. (1991). Health implications of obesity. *American Journal of Clinical Nutrition, 53*(6), 1595S–1603S.

Racette, S. B., Evans, E. M., Weiss, E. P., Hagberg, J. M., & Holloszy, J. O. (2006). Abdominal adiposity is a stronger predictor of insulin resistance than fitness among 50–95 year olds. *Diabetes Care, 29*(3), 673–678.

Rasmussen, H. N., Wrosch, C., Scheier, M. F., & Carver, C. S. (2006). Self-regulation processes and health: The importance of optimism and goal adjustment. *Journal of Personality, 74*(6), 1721–1748.

Renner, B., Kwon, S., Yang, B.-H., Paik, K.-C., Kim, S. H., Roh, S., et al. (2008). Social-cognitive predictors of dietary behaviors in South Korean men and women. *International Journal of Behavioral Medicine, 15*(1), 4–13.

Renner, B., & Schwarzer, R. (2003). Social-cognitive factors in health behavior change. In J. Suls & K. Wallston (Eds.), *Social psychological foundations of health and illness* (pp. 169–196). Oxford: Blackwell Publishing.

Renner, B., Spivak, Y., Kwon, S., & Schwarzer, R. (2007). Does age make a difference? Predicting physical activity of South Koreans. *Psychology and Aging, 22*(3), 482–493.

Robinson-Whelen, S., Kim, C., MacCallum, R. C., & Kiecolt-Glaser, J. K. (1997). Distinguishing optimism from pessimism in older adults: Is it more important to be optimistic or not to be pessimistic? *Journal of Personality and Social Psychology, 73*(6), 1345–1353.

Scheier, M. F., & Carver, C. S. (1985). Optimism, coping, and health: assessment and implications of generalized outcome expectancies. *Health Psychology, 4*(3), 219–247.

Scheier, M. F., & Carver, C. S. (2003). Self-regulatory processes and responses to health threats: Effects of optimism on well-being. In J. Suls & K. Wallston (Eds.), *Social psychological foundations of health and illness*. Malden, MA: Blackwell Publishing.

Scheier, M. F., Carver, C. S., & Bridges, M. W. (1994). Distinguishing optimism from neuroticism (and trait anxiety, self-mastery, and self-esteem): A reevaluation of the Life Orientation Test. *Journal of Personality and Social Psychology, 67*, 1063–1078.

Scholz, U., Nagy, G., Göhner, W., Luszczynska, A., & Kliegel, M. (2009). Changes in self-regulatory cognitions as predictors of changes in smoking and nutrition behaviour. *Psychology & Health, 24*(5), 1–17.

Schroder, K. E. E., & Schwarzer, R. (2005). Habitual self-control and the management of health behavior among heart patients. *Social Science and Medicine, 60*(4), 859–875.

Schwarzer, R., & Luszczynska, A. (2007). Self-efficacy. In M. Gerrard & K. D. McCaul (Eds.), *Health behavior constructs: Theory, measurement, and research*: National Cancer Institute Website. http://dccps.cancer.gov/brp/constructs/self-efficacy/index.html.

Schwarzer, R., & Renner, B. (2000). Social-cognitive predictors of health behavior: Action self-efficacy and coping self-efficacy. *Health Psychology, 19*(5), 487–495.

Segerstrom, S. C., & Solberg Nes, L. (2006). When goals conflict but people prosper: The case of dispositional optimism. *Journal of Research in Personality, 40*, 675–693.

Shepperd, J. A., Maroto, J. J., & Pbert, L. A. (1996). Dispositional optimism as a predictor of health changes among cardiac patients. *Journal of Research in Personality, 30*(4), 517–534.

Shnek, Z. M., Irvine, J., Stewart, D., & Abbey, S. (2001). Psychological factors and depressive symptoms in ischemic heart disease. *Health Psychology, 20*(2), 141–145.

Solberg Nes, L., & Segerstrom, S. C. (2006). Dispositional optimism and coping: A meta-analytic review. *Personality and Social Psychology Review, 10*, 235–251.

Steptoe, A., Wright, C., Kunz-Ebrecht, S. R., & Iliffe, S. (2006). Dispositional optimism and health behaviour in community-dwelling older people: Associations with healthy ageing. *British Journal of Health Psychology, 11*(Pt 1), 71–84.

Strack, S., Carver, C. S., & Blaney, P. H. (1987). Predicting successful completion of an aftercare program following treatment for alcoholism: The role of dispositional optimism. *Journal of Personality and Social Psychology, 53*(3), 579–584.

Taylor, S., Kemeny, M., Aspinwall, L., Schneider, S., Rodriguez, R., & Herbert, M. (1992). Optimism, coping, psychological distress, and high-risk sexual behavior among men at risk for acquired immunodeficiency syndrome (AIDS). *Journal of Personality and Social Psychology, 63*, 460–473.

Tuomilehto, J., Lindstrom, J., Eriksson, J. G., Valle, T. T., Hamalainen, H., Ilanne-Parikka, P., et al. (2001). Prevention of type 2 diabetes mellitus by changes in lifestyle among subjects with impaired glucose tolerance. *New England Journal of Medicine, 344*(18), 1343–1350.

Uutela, A., Absetz, P., Nissinen, A., Valve, R., Talja, M., & Fogelholm, M. (2004). Health psychological theory in promoting population health in Päijät-Häme, Finland: First steps toward a type 2 diabetes prevention study. *Journal of Health Psychology, 9*(1), 73–84.

Vollrath, M. (2006). *Handbook of personality and health*. New York, NY US: Wiley.

Waldrop, D., Lightsey, O., Ethington, C., Woemmel, C., & Coke, A. (2001). Self-efficacy, optimism, health competence, and recovery from orthopedic surgery. *Journal of Counseling Psychology, 48*, 233–238.