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Planning health behaviour change: Comparing the behavioural influence of two types of self-regulatory planning

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Objectives. Recent efforts in health psychology to bridge the gap between individuals' intentions and behaviour have centered on the influence of planning strategies. This study investigated the impact of two commonly used types of self-regulatory planning in the prediction of health promoting behaviour.

Design. This study employed a prospective longitudinal design. Three measurements were implemented in order to assess associations between various socio-cognitive determinants, planning, and health behaviour.

Methods. Structural equation modelling ($N = 572$) was used to compare the value of *preparatory planning*, i.e. the planning of strategies and preparatory actions towards a goal behaviour, and *implemental planning*, i.e. the planning of when, where, and how to perform a goal behaviour, in the prediction of fruit consumption.

Results. Both preparatory planning ($\beta = 0.21$; $p < .001$) and implemental planning ($\beta = 0.13$; $p < .01$) were significant predictors of fruit consumption, over and above the influence of motivational factors. Comparison of differences in explained variance (ΔR^2) indicated that the contribution of preparatory planning was larger than that of implemental planning ($z = 2.19$; $p < .05$). Implemental planning did not contribute to the prediction of fruit consumption over and above the influence of preparatory planning when tested simultaneously.

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Conclusions. The results provide a first indication that the planning of strategic preparatory actions may be more influential in predicting health behaviour than implemental planning, focusing on when, where, and how to enact goal-directed behaviour. Implications of the results and suggestions for future research are outlined.

Influential social cognition theories in the area of health psychology and health education have long considered intentions as the most proximal and powerful predictor of health behaviour performance (Ajzen, 1991; Bandura, 1986). Although these theories have been applied to a wide range of behaviours with moderate success, they do not elaborate on postintentional processes and thereby overlook the fact that people often fail to act on their intentions (Godin & Conner, 2008; Orbell & Sheeran, 1998). Recent theoretical efforts to narrow the 'intention – behaviour gap' yielded various cognitive processes and strategies that are of potential relevance in the post-intentional or volitional phase (e.g. Bagozzi, 1992; Kuhl, 1985). A number of theorists and models identify various planning or goal setting strategies and describe how cognitive representations of goals and actions influence behavioural performance (Bagozzi, 1992; Gollwitzer, 1999; Heckhausen, 1991; Schwarzer, 1992).

Planning is an important self-regulatory tool that enables efficient progress towards goal attainment and has been proposed as an influential strategy in the translation of intentions into behaviour. It can be defined as the process of generating a sequence of behaviours used to translate an individual's resources into actions aimed at goal achievement (Austin & Vancouver, 1996; Earley, Wojnaroski, & Prest, 1987). Planning is thought to enhance action control through the generation of ever more precise action instructions, or *action plans* (Abraham, Sheeran, & Johnston, 1998).

Gollwitzer (1996) stated that planning can help individuals overcome intellectual as well as volitional problems of goal achievement. The intellectual benefits of planning involve developing a strategy to achieve a goal; its volitional benefits involve increased persistence, decreased distractibility and a readiness to seize opportunities to act (Diefendorff & Lord, 2003). This differentiation of planning benefits can be discerned in two mainstreams in literature concerned with the operationalisation of action planning. These pertain to (a) the planning of a strategic course of preparatory actions, and (b) the planning of the implementation of actions in specified situations.

The former type of planning, which will be referred to in this paper as 'preparatory planning' implies the planning of specific preparatory or instrumental acts in the service of ultimate goal achievement. This type of planning is based on principles of goal setting theory (Latham & Locke, 1990; Locke, Shaw, Saari, & Latham, 1981), assuming that the setting of specific proximal goals or subgoals (e.g. daily consumption of sufficient amounts of fruit) benefits the achievement of a distal or longer-term goal (e.g. healthy living; Bandura & Schunk, 1981; Latham & Locke, 1990; Strecher *et al.*, 1995). When faced with specific goals, people tend to formulate plans and task strategies on how the goal can be reached (Bandura & Simon, 1977; Latham & Baldes, 1975; Latham & Locke, 1990). These strategies are deliberate action plans that are motivated by goals and can independently affect task performance. The development of these plans predetermines a consecutive course of action that is aimed at achieving the goal (e.g. buying fruit, taking fruit along when you go to work, substituting snacks by fruit, etcetera). In line with this reasoning, Bagozzi (1992) acknowledges that many intentions involve a commitment to a series of actions rather than a single act. He recognizes the role of planning in the translation of intention into behaviour and emphasizes the identification, coordination and monitoring of specific instrumental acts, or preparatory

actions in the striving for goals. Supported by the long-standing recognition of importance of preparatory actions in cognitive behaviour therapy and behaviour modification approaches (Clark & Fairburn, 1996; Gambrill, 1977), several studies have investigated the importance of the planning and performance of preparatory actions (e.g. Abraham *et al.*, 1999; Bagozzi & Edwards, 1998; de Vries, Kremers, Smeets, Brug, & Eijmael, 2008; de Vries, Mesters, van 't Riet, Willems, & Reubsaet, 2006; Hilberink, Jacobs, Schlösser, Grol, & de Vries, 2006; van Empelen & Kok, 2006; van Osch *et al.*, 2008). In their study on postdecisional cognitive processes with regard to condom use, Abraham and colleagues (1999) found that planning of specific preparatory actions (e.g. planning to buy condoms, suggest and negotiate condom use) may enhance the prediction of condom use among intenders. Similar results were found in one of our previous studies on parental sun protection behaviour (van Osch *et al.*, 2008), in which engagement in planning of specific preparatory actions, such a buying sunscreen and bringing along a bottle of sunscreen, significantly predicted sunscreen use over and above the influence of motivational variables.

The focus on the second type of planning, which will be referred to as 'implemental planning' or 'when, where, how planning' originated from research by Leventhal, Singer, and Jones (1965) in which they demonstrated that fear appeals were most likely to instigate action when they were accompanied by specific instructions or action plans on how to act (i.e. where and when to go, and what to do to get a tetanus shot). In some of their earliest work on the distinction between pre- and postdecisional cognitive processes, Gollwitzer and Heckhausen (Gollwitzer, Heckhausen, & Ratajczak, 1990; Heckhausen, 1987) point to the formation of so-called 'implemental intents' as an important process in the postdecisional state of mind. Implemental intents involve committing oneself to when, where and how to enact a desired goal, a strategy that is later elaborated by Gollwitzer and renamed as 'implementation intentions' (Gollwitzer, 1996, 1999). Implementation intentions are subordinate to and are to be distinguished from intentions and specify the when, where and how of responses that lead to goal attainment. The specific structure of implementation intentions ('If situation X is encountered, then I will initiate goal-directed behaviour Y'; Gollwitzer & Sheeran, 2006) connects good opportunities to act (i.e. when and where) with to-be-performed behavioural responses (i.e. how). By anticipating a critical situation and specifying how to act in this situation, the mental representation of this situation is assumed to become highly activated (Gollwitzer, 1999; Webb & Sheeran, 2008) and the control of behaviour is delegated from the self to the specified situational cues that rather automatically and effortlessly elicit the specified action (Gollwitzer, 1999; Gollwitzer & Sheeran, 2006).

Following ample experimental work demonstrating the efficacy of implementation intentions in the promotion of various (health) behaviours (Sheeran, 2002; Gollwitzer & Sheeran, 2006), attempts were made to investigate implementation intentions as a measured construct, as applied in correlational studies. Gollwitzer and Brandstätter (1997) adopted a global approach, in which respondents were presented with a description of the form and content of implementation intentions and were subsequently asked whether or not they had formed such implementation intentions with regard to certain goals. Rise, Thompson, and Verplanken (2003) and Sniehotta, Schwarzer, Scholz, and Schüz (2005) used a more specific approach, in which the main components of implementation intentions were attended to separately and respondents are asked whether or not (see Rise *et al.*, 2003) and to what extent (see Sniehotta, Schwarzer *et al.*, 2005) they had made detailed plans about when, where and how – sometimes complemented by other specifications, such as with whom

and how long – particular behaviours were to be implemented. Although the studies by Gollwitzer and Brandstätter (1997) and Rise and colleagues (2003) found strong associations between implementation intention formation and performance of respective goal behaviours, the operationalization as developed by Sniehotta, Schwarzer, and colleagues (2005) has been most widely used in recent publications and has been found to reliably predict health-related behaviour (e.g. Luszczynska & Schwarzer, 2003; Schwarzer *et al.*, 2007; Sniehotta, Scholz, & Schwarzer, 2005).

The main difference between preparatory planning and implemental planning is defined by the situational or contextual representation (i.e. the definition of when and where a goal-directed action will be performed) that is a fundamental characteristic of implemental planning but not of preparatory planning. Although various studies investigated the value of either preparatory or implemental planning in the prediction of health behaviours, by reason of theoretical insight and parsimony, it may be fruitful to distinguish between these planning strategies and investigate whether one type of action planning outperforms and/or complements the other in predicting health behaviour.

The present study therefore investigates the individual predictive value of preparatory planning and implemental planning with regard to fruit consumption, independent of the behavioural influences of intentions and self-efficacy. Since most health-related goals (e.g. adequate physical activity, healthy dietary intake) are relatively complex and comprise a number of sub-behaviours or preparatory behaviours, individuals may face numerous self-regulatory problems. In such complicated 'multi-component' behaviours, which are often performed in a multitude of settings, lack of preparation may pose a more significant problem in achieving the ultimate goal behaviour than common self-regulatory problems that have to do with implementation of the goal behaviour, such as failing to recognize and seize opportunities to act (Gollwitzer & Sheeran, 2006). Previous studies have indeed shown modest influences of implemental planning in physical activity behaviour, a rather complex behaviour (e.g. Sniehotta, Scholz *et al.*, 2005), and rather strong influences of implemental planning in relatively simple behaviours that are mostly performed in stable settings (e.g. seatbelt use or breast self-examination; Luszczynska & Schwarzer, 2003; Schwarzer *et al.*, 2007). In the present study, we therefore hypothesized that adequate fruit consumption would benefit most from breaking down the outcome behaviour in a set of feasible preparatory actions (e.g. buying fruit, taking fruit along with you) that facilitate the ultimate goal behaviour. The unique variance in fruit consumption explained by each of the two types of action planning will be compared and a combined model will be examined in which the influences of both types of action planning are tested simultaneously.

Methods

Procedure

The study sample consisted of Dutch adults (> 18 years) that were all registered members of an online survey panel of a private research company. A total of 806 participants were invited by e-mail to participate in a study on fruit consumption. A link provided in the e-mail lead participants to the online questionnaire. Participants were explained that the study would comprise three measurements, each one month apart, and that they would receive a small incentive (approximately € 3) after completing all three questionnaires. All participants signed for informed consent and were informed that they could withdraw from the study at any time.

At the baseline measurement (T1), 572 respondents (71.0%) filled out the questionnaire. In the first follow-up measurement four weeks later (T2), 498 respondents (87.1% of baseline) participated, whereas a total of 434 respondents (75.9% of baseline) had completed all three questionnaires at the second follow-up measurement 8 weeks after baseline (T3).

Questionnaires

In the baseline questionnaire relevant demographic variables, attitude, social influences, self-efficacy, intention and past behaviour (baseline fruit consumption) were measured. At T2, two types of action planning were measured, and at T3 fruit consumption was again assessed. The target behaviour that was mentioned in all questions was 'eating a sufficient amount of fruit each day', which was explained to participants as 'two pieces of fruit each day'.

Demographics (T1)

Gender, age, and highest completed educational level were inquired after. Educational level was categorized into 'low' (elementary education, medium general secondary education, preparatory vocational school, or lower vocational school), 'medium' (higher general secondary education, preparatory academic education, or medium vocational school) and 'high' (higher vocational school or university level).

Attitude (T1)

Attitude towards fruit consumption was measured by three perceived benefits and two perceived barriers of fruit consumption, adapted from previous research (Brug, Debie, van Assema, & Weijts, 1995; Cox, Anderson, & Lean, 1996). Respondents were asked to indicate on a four-point scale to what extent they thought eating fruit is, for instance, 'beneficial to their health', 'tasteful' and 'inconvenient' (e.g. 1 = not beneficial to 4 = very beneficial). Higher scores indicated a more positive attitude towards adequate fruit consumption. Reliability was satisfactory (Cronbach's $\alpha = .72$).

Social influences (T1)

Social influences with regard to fruit consumption were measured with three items, assessing, respectively, the norm, support and modeling that respondents perceived in their social environment (e.g. Kremers, Brug, de Vries, & Engels, 2003). Respondents were asked to indicate to what extent important people in their environment think that the respondent should eat a sufficient amount of fruit (1 = definitely not to 7 = definitely yes), to what extent important people in their environment support them to eat fruit (1 = never to 5 = (almost) always), and how many of the important people in their environment often eat fruit (1 = (practically) none to 5 = (practically) everyone; Cronbach's $\alpha = .52$).[1]

[1] *An anonymous reviewer indicated that, although reliability was not fully satisfactory, the inclusion of these items as three directly observed exogenous variables would imply the untenable assumption that their reliabilities are one, since no measurement component would be associated with these variables. The items were therefore forced into a factor model.*

Self-efficacy (T1)
Self-efficacy expectations were measured by four items that asked to what extent respondents thought they would be able to eat two pieces of fruit per day in various situations (e.g. Brug, Lechner, & de Vries, 1995), e.g. 'during the weekend' and 'during the winter months' (Cronbach's $\alpha = .91$). Answering options ranged from 'I will certainly not be able to' (1) to 'I will certainly be able to' (7).

Intention (T1)
Intention was measured by two items. The first item asked to what extent respondents intended to eat two pieces of fruit per day (e.g. de Nooijer, de Vet, Brug, & de Vries, 2006). In the second item a time-reference was added, asking respondents to what extent they intended to perform the target behaviour in the next month (e.g. de Bruijn *et al.*, 2007; Luszczynska, Tryburcy, & Schwarzer, 2007). For both questions, answering options ranged from 'I definitely do not intend to' (1) to 'I definitely intend to' (7). Reliability was high (Cronbach's $\alpha = .93$).

Preparatory planning (T2)
Preparatory planning was assessed by five items, adapted from literature review (e.g. Cullen, Baranowski, & Smith, 2001; de Vries *et al.*, 2008*;* Notwehr, Snetselaar, Yang, & Wu, 2006) and expert consulting, and using techniques based on van Osch *et al.* (2008) and de Vries *et al.* (2006). Respondents were asked to what extent they planned to perform several actions or preparatory behaviours in order to reach the target behaviour. The item stem, 'Have you made a plan to . . . ' was followed by the items (a) 'buy fruit', (b) 'eat fruit at a fixed time of day', (c) 'put a fruit basket on the table', (d) 'take fruit along with you when you go somewhere', and (e) 'replace unhealthy snacks by fruit'. Answering options ranged from 'definitely not' (1) to 'definitely yes' (7), and reliability was satisfactory (Cronbach's $\alpha = .75$).

Implemental planning (T2)
Implemental planning was assessed by five items, adapted from items used by Sniehotta, Schwarzer *et al.* (2005) and Schwarzer *et al.* (2007). The item stem 'I have made a detailed plan regarding . . . ' was followed by the items (a) 'when to eat fruit', (b) 'where to eat fruit', (c) 'how to eat fruit (e.g. by drinking fruit juice, or by processing fruit in meals)', (d) 'how often to eat fruit', and (e) 'which fruit to eat'. Answering options ranged from 'completely disagree' (1) to 'completely agree' (5), and reliability was high (Cronbach's $\alpha = .92$).

Fruit consumption (T1, T3)
Fruit consumption was assessed by means of a validated measure (van den Brink, Ocké, Houden, Van Nierop, & Droomers, 2005), comprising of two items, referring to (a) the amount of days a week at which the respondent normally eats fruit (0 to 7), and (b) the amount of fruit the respondent averagely consumes on each of these days. Multiplying the responses to these two questions gives a proper overview of the amount of fruit consumed during a week (Spearman correlation coefficients with two 24-hour consumption recalls = 0.68 for men, 0.75 for women; correct tertile classification = 52%; van den Brink *et al.*, 2005).

Statistical analysis

Covariance-based structural equation modeling with Mplus 4.1, using Maximum Likelihood (ML) estimation was used to test hypothesized associations between the various cognitive constructs. In order to maximize the information available in the data file, pairwise deletion was used for missing observations. The background variables (age, sex, and educational level) and the behavioural measure of fruit consumption were included as observed variables. Attitude, self-efficacy, social influence, intention, and both types of action planning were included as latent constructs, measured by their separate indicators (see 'Questionnaires' section).

In the basic model, attitude, social influence and self-efficacy were modeled as direct influences on intention. Furthermore, self-efficacy and intention directly influenced behaviour. Background variables were included as covariates with regard to behaviour. Pathways from self-efficacy and intention to each type of action planning and constrained pathways between the two types of action planning and the outcome behaviour were added to the basic models. In order to asses the individual contribution of both types of action planning, the latter relationships were subsequently freed.

As a result of the multifaceted nature of the behavioural influence of past behaviour, i.e. it may derive from both past beliefs and habitual aspects (e.g. Ouelette & Wood, 1998), the inclusion of past behaviour may suppress or overrule the influence of more proximal cognitive behavioural determinants. We therefore chose to first give an impression of the influences of cognitive factors, irrespective of previous actions, and to complement this view by incorporating any additional influences captured in the concept of past behaviour. Past behaviour was therefore subsequently added as a direct predictor of fruit consumption at T3 to correct for previously established fruit consumption patterns. An overview of the basic model and the subsequent additions is depicted in Figure 1.

Comparison of the influences of the two types of action planning was based on the difference in explained variance of fruit consumption (ΔR^2) after removing one of the planning types from a full model including both types of planning. Meng, Rosenthal, and

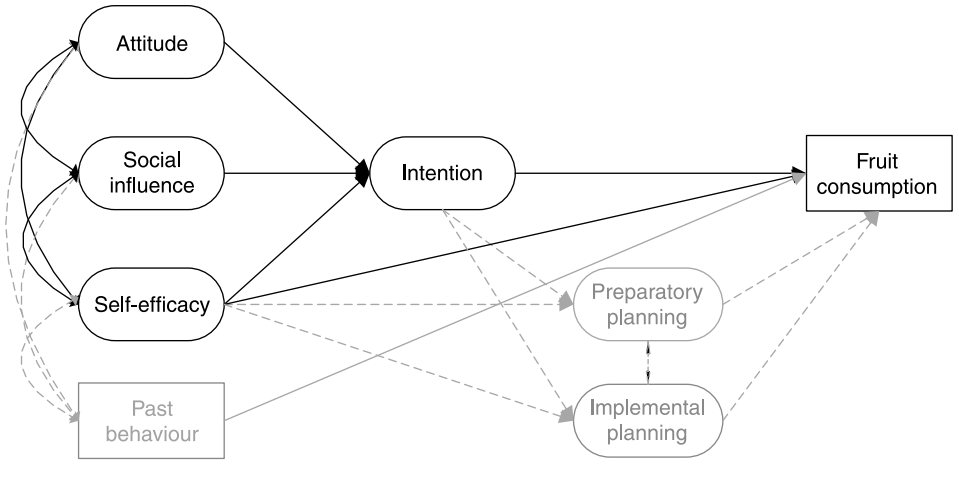

Figure 1. Structural equation model of associations between the various social cognitive predictors and the outcome behaviour. Rectangles represent observed variables; circles represent latent variables. The pathways of the basic model (uninterrupted black arrows) are gradually complemented with preparatory planning, implemental planning, and past behaviour, as indicated by the interrupted grey lines.

Rubin's (1992) formulas for comparing two correlated correlations were used to test the difference in ΔR^2 for significance. Model fit was primarily assessed by the Comparative Fit Index (CFI), Tucker–Lewis-Index (TLI), Root-Mean Square Error of Approximation (RMSEA) and Standardized Root Mean Square Residual (SRMR). For a satisfactory model fit, the CFI and the TLI should be high (> 0.90), whereas the RMSEA and SRMR should be low (preferably< 0.08) (Hu & Bentler, 1999; Tabachnick & Fidell, 2001).

Results

Sample description

Respondents' mean age was 47.8 years ($SD = 16.0$) and somewhat more than half of them were female (53.3%). Most respondents had a medium level of education (42.5%). Approximately one quarter of respondents was low educated (26.3%) and 31.2% had a high educational level. Respondents' mean fruit consumption at baseline was 8.3 servings per week ($SD = 6.7$).

With a mean score of 5.20 ($SD = 1.41$) the intention towards sufficient fruit consumption was moderate to high. The mean score for preparatory planning was 4.47 ($SD = 1.18$), with the highest score for planning to 'buy fruit' and the lowest score for planning to 'put a fruit basket on the table'. The mean score for implemental planning was 2.93 ($SD = 0.97$), with the highest score for planning 'how often to eat fruit', and the lowest score for planning 'when to eat fruit'. A full description of the sample is provided in Table 1.

Table 1. Description of the study sample ($N = 572$)

Variable and range	Mean (*SD*)
Gender (% female)	53.3%
Age (years)	47.8 (16.0)
Education (%)	
Low	26.3%
Medium	42.5%
High	31.2%
Attitude (1–4)	3.27 (0.53)
Social influence	
Norm (1–7)	4.48 (1.47)
Support (1–5)	2.31 (1.11)
Modeling (1–5)	3.60 (1.05)
Self-efficacy (1–7)	5.14 (1.37)
Intention (1–7)	5.20 (1.41)
Preparatory planning (1–7)	4.47 (1.18)
Implemental planning (1–5)	2.93 (0.97)
Fruit consumption T1 (0–28)	8.33 (6.71)
Fruit consumption T3 (0–28)	8.21 (6.22)

Attrition analyses

Logistic regression analysis demonstrated no significant differences between respondents that dropped out between T1 and T3 and completers with regard to demographics, attitude, social influences, self-efficacy, intention, and fruit consumption as measured at T1, nor on both types of action planning, as measured at T2.

Measurement models

Confirmatory factor analyses were performed to test the measurement model, which included 24 indicators measuring the six latent variables (attitude, social influence, self-efficacy, intention, and two types of action planning). All factor loadings were significant with values between 0.18 and 0.95 and model fit was satisfactory ($\chi^2 = 789.55$, $df = 237$, CFI = 0.92, TLI = 0.91, RMSEA = 0.06, SRMR = 0.06).[1,2]

Basic model

The basic model had satisfactory fit ($\chi^2 = 960.51$, $df = 324$, CFI = 0.91, TLI = 0.90, RMSEA = 0.06, SRMR = 0.06). Attitude (ß = 0.48; $p < .001$), social influence (ß = 0.37; $p < .001$), and self-efficacy (ß = 0.24; $p < .01$) were significant predictors of intention ($R^2 = 47.8\%$). Intention (ß = 0.10; $p < .05$) and self-efficacy (ß = 0.50; $p < .001$) significantly predicted fruit consumption at T3, with self-efficacy exerting the strongest influence. Age was the only background variable that influenced fruit consumption (ß = 0.14; $p < .001$). In total, 37.2% of the variance in fruit consumption was explained by these variables.

The influence of preparatory planning

To assess the influence of preparatory planning, the previously constrained pathway between preparatory planning and fruit consumption was freed (see Figure 2). The model fitted the data well ($\chi^2 = 946.98$, $df = 323$, CFI = 0.92, TLI = 0.90, RMSEA = 0.06, SRMR = 0.06) and preparatory planning significantly predicted fruit consumption (ß = 0.21; $p < .001$). Self-efficacy retained its strong behavioural impact (ß = 0.45; $p < .001$), whereas the influence of intention on fruit consumption was no longer significant (ß = 0.01; $p > .10$). Preparatory planning itself was positively predicted by both intention (ß = 0.44; $p < .001$) and self-efficacy (ß = 0.20; $p < .001$), yielding an explained variance of preparatory planning of 33.3%. The model accounted for 40.2% of the variance in fruit consumption.

When past behaviour (i.e. fruit consumption measured at T1) was added to the model as a direct predictor of current fruit consumption at T3, the explained variance increased to 59.7% ($\chi^2 = 1014.73$, $df = 347$, CFI = 0.92, TLI = 0.90, RMSEA = 0.06, SRMR = 0.06). Although past behaviour was the most powerful predictor of fruit consumption (ß = 0.65; $p < .001$) and reduced the influence of self-efficacy (ß = 0.12; $p < .05$) and preparatory planning (ß = 0.13; $p < .01$), both predictors remained significant.

The influence of implemental planning

To assess the influence of implemental planning, the previously constrained pathway between implemental planning and fruit consumption was freed, whereas the pathway between preparatory planning and fruit consumption was constrained to zero (see Figure 3). The model fitted the data well ($\chi^2 = 952.35$, $df = 323$, CFI = 0.92, TLI = 0.90, RMSEA = 0.06, SRMR = 0.06) and implemental planning also significantly

[2] *Exploratory factor analysis indicated that the preparatory planning item 'Have you made a plan to eat fruit at a fixed time of day?' also had a significant factor loading of 0.49 on implemental planning. Although its factor loading on preparatory planning was higher (0.63), we repeated all analyses without this item. The results did not change as a result of this adjustment.*

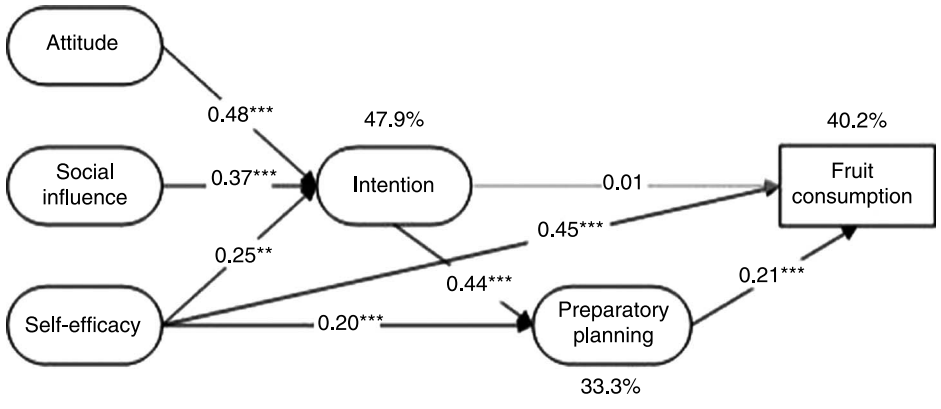

Figure 2. Structural equation model with standardized regression coefficients representing the influence of preparatory planning on fruit consumption. Rectangles represent observed variables; circles represent latent variables. *$p < .05$; **$p < .01$; ***$p < .001$.

predicted fruit consumption (ß = 0.13; $p < .01$). Again, self-efficacy was the most powerful behavioural predictor (ß = 0.49; $p < .001$), and once more the influence of intention, as demonstrated in the basic model, became insignificant (ß = 0.06; $p > .10$). Implemental planning itself was predicted by both intention (ß = 0.32; $p < .001$) and self-efficacy (ß = 0.11; $p < .05$), yielding a substantially lower explained variance of implemental planning ($R^2 = 15.0\%$) than of preparatory planning. The total model including implemental planning accounted for 38.5% of the variance in fruit consumption.

Adding past behaviour to the model resulted in an explained variance of 58.9% ($\chi^2 = 1021.78$, $df = 347$, CFI = 0.92, TLI = 0.90, RMSEA = 0.06, SRMR = 0.06). Past behaviour was the most powerful predictor of fruit consumption (ß = 0.66; $p < .001$). Although the influence of self-efficacy remained significant (ß = 0.14; $p < .01$), the impact of implemental planning was no longer significant (ß = 0.03; $p > .10$).

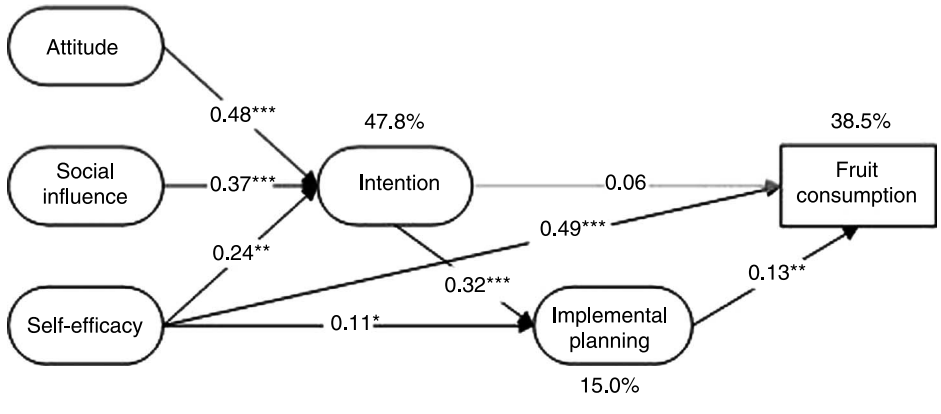

Figure 3. Structural equation model with standardized regression coefficients representing the influence of implemental planning on fruit consumption. Rectangles represent observed variables; circles represent latent variables. *$p < .05$; **$p < .01$; ***$p < .001$.

Comparing the influence of preparatory planning and implemental planning

Adding preparatory planning to the basic model added 3.0% of explained variance of fruit consumption, compared to 1.3% for implemental planning. Comparison of the differences in explained variance (ΔR^2), using the methods described by Meng and colleagues (1992) yielded a z-value of 2.19 ($p < .05$), indicating that the contribution of preparatory planning to the prediction of fruit consumption was significantly larger than that of implemental planning.

In order to examine potential complementariness of the two types of action planning a full model, simultaneously incorporating both types of action planning, was tested. Both types of action planning were assumed to be correlated. The model fitted the data well ($\chi^2 = 945.54$, $df = 322$, CFI = 0.92, TLI = 0.90, RMSEA = 0.06, SRMR = 0.06). Preparatory planning significantly predicted fruit consumption (ß = 0.17; $p = .01$), whereas the influence of implemental planning did not reach statistical significance (ß = 0.06; $p > .10$; see Figure 4), indicating that the influences of both types of planning are not complementary. Both types of action planning were moderately correlated ($r = 0.30$; $p < .001$). The explained variance of fruit consumption in the combined model was 40.2%, indicating that implemental planning did not contribute to the prediction of fruit consumption over and above the influence of preparatory planning.

When past behaviour was added to this full model ($\chi^2 = 1014.45$, $df = 346$, CFI = 0.92, TLI = 0.91, RMSEA = 0.06, SRMR = 0.06) the explained variance of fruit consumption was increased to 59.8%. Past behaviour was the most powerful predictor (ß = 0.65; $p < .001$), followed by preparatory planning (ß = 0.15; $p < .01$) and self-efficacy (ß = 0.12; $p < .05$). Implemental planning did not significantly contribute to the prediction of fruit consumption (ß = −0.02; $p > .10$).

Potential interaction between the two types of planning was tested by adding a preparatory planning × implemental planning interaction term to the predictive model

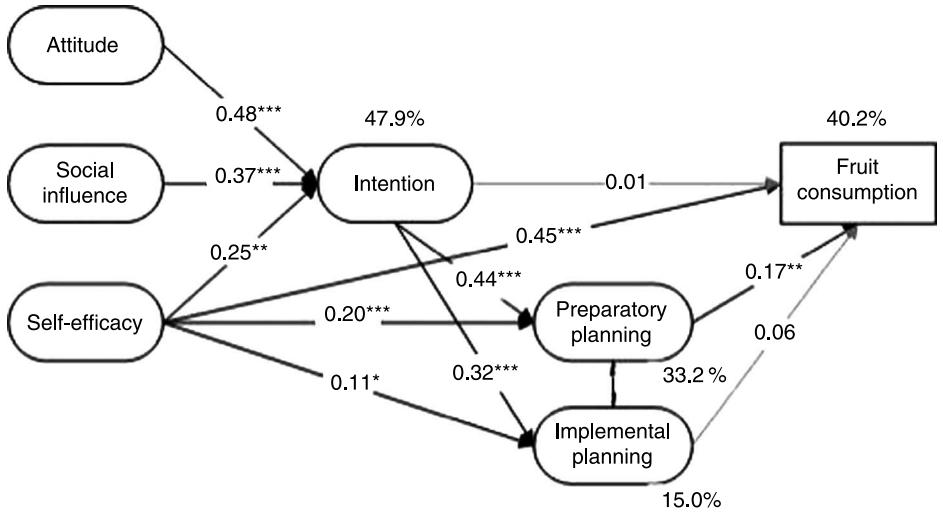

Figure 4. Structural equation model with standardized regression coefficients representing the influences of preparatory and implemental planning on fruit consumption. Rectangles represent observed variables; circles represent latent variables. *$p < .05$; **$p < .01$; ***$p < .001$.

using Robust Maximum Likelihood estimation. The interaction term was non-significant ($p > .10$), indicating that no moderation of either type of planning took place.

Lastly, post-hoc multigroup analyses were performed to investigate the potential moderating role of past behaviour in the planning – behaviour relationships. Although both types of planning failed to significantly predict future behaviour in individuals with high levels of past behaviour (highest tertile: ≧ 12 pieces of fruit per week; preparatory planning: ß = 0.04, $p > .10$; implemental planning: ß = −0.03, $p > .10$), preparatory planning positively influenced fruit consumption in all other individuals (middle tertile: 5–11 pieces of fruit per week: ß = 0.38, $p < .01$; lowest tertile: ≤ 4 pieces of fruit per week: ß = 0.27, $p < .05$), whereas implemental planning only predicted behaviour in individuals in the middle tertile (ß = 0.22, $p < .05$). Implemental planning did not significantly influence fruit consumption in those individuals with no or little experience with the goal behaviour (ß = 0.14, $p > .10$).

Discussion

To our knowledge, this is the first study to compare the value of specific types of planning in the prediction of health behaviour. Although replication of the present results is requisite for other health behaviours and other, preferably experimental settings, there are several findings that merit consideration and may provide fruitful directions for future research.

First, both types of planning significantly predicted the consumption of fruit over and above the influence of motivational variables, thereby replicating results from previous studies (e.g. Schwarzer *et al.*, 2007; van Osch *et al.*, 2008). Although the explained variance added by both types of planning was limited (1.3 and 3%), our findings nonetheless validate claims to include planning in existing social-psychological models, as part of the endeavor to bridge the gap between intention and behaviour. The influence of implemental planning was, however, annihilated when past behaviour was taken into account. A potential explanation may be that when past behaviour is low, implemental planning may be too specific. The unfamiliarity with the behaviour may prevent individuals from making, and benefiting from, detailed plans on when, where, and how to perform the behaviour. Breaking down the behaviour in multiple preparatory actions may simplify the behaviour and may therefore be better suited for the purpose of initiating behaviour. Post-hoc performed multigroup analyses with regard to past behaviour indeed indicated that, in contrast to preparatory planning, implemental planning did not influence fruit consumption in individuals with low levels of past behaviour. These results correspond with the supposition that implemental planning may be less suitable for individuals with no or little experience with the goal.

Second, the predictive value of preparatory planning was higher than that of implemental planning. These findings may tentatively be interpreted as a first indication that the planning of strategic goal-directed actions may be more influential than planning when, where, and how to enact goal-directed behaviour in predicting health behaviour, more specifically behaviours of a complexity that corresponds to fruit consumption. However, one may argue that different cognitive mechanisms underlie both types of planning, rendering comparison of their predictive values difficult. It may for instance be argued that both types of action planning are complementary or fully independent, thereby justifying the incorporation of both planning cognitions in

behaviour explaining models. Our results, however, suggest that the impacts of both types of planning are neither independent nor complementary. Both variables were moderately correlated and the inclusion of implemental planning did not result in any additional explained variance over and above the influence of preparatory planning. Further research is, however, warranted to substantiate these findings and investigate the possibility of other relationships between planning cognitions.

One possible explanation for our main finding may be that implemental planning has a strong impact when the to-be-performed behaviour is relatively simple, whereas for more complex behaviours, breaking down the goal-behaviour in a sequence of preparatory actions may be more beneficial. This explanation is tentatively supported by previous studies that showed modest influences of implemental planning (β's of .28 and .16) in physical exercise behaviour, a rather complex behaviour (Sniehotta, Scholz *et al.*, 2005), and rather strong influences of implemental planning in breast self-examination (β of .49) and seatbelt use (β of .44), relatively simple behaviours (Luszczynska & Schwarzer, 2003; Schwarzer *et al.*, 2007). In their study on fruit and vegetable consumption, Schwarzer and colleagues (2007; Study 3), nevertheless found a very strong relationship between implemental planning and behaviour (β of .63). An important limitation of this study was, however, that planning and behaviour were measured cross-sectionally, thereby precluding any causal inferences and possibly inflating their relationship.

When viewed in the light of the various self-regulatory problems that individuals may experience in goal striving (see Gollwitzer & Sheeran, 2006), the present results may indicate that lack of preparation with regard to the goal behaviour of fruit consumption (e.g. failing to buy fruit or to take fruit along) is a more prominent problem than failure to recognize and seize the opportunities to eat fruit. Relatively complex 'multi-component' behaviours, such as adequate fruit consumption, may benefit most from first breaking down the goal behaviour in several strategic preparatory actions, thereby creating good conditions for viability of the goal-directed response and goal attainment (i.e. eating fruit), and then formulating implemental plans to facilitate recognition and seizing of opportunities to perform the goal behaviour. Dewitte, Verguts, and Lens (2003) propose a similar rationale for their finding that difficult goals did not benefit from the formation of implementation intentions. They suggest that '. . . implementing a goal (i.e. specifying when and where it should be implemented) might be useless unless some preparatory actions have been performed.' (Dewitte *et al.*, 2003, p. 87). When an individual faces a difficult goal, he should first specify what exactly needs to be done, rather than specify the when and where of goal attainment. In these instances, specifying strategic preparatory actions might therefore be more beneficial than specifying when or where one wants to reach the goal. This hypothesized conditional character of the relationship between the two types of planning should, however, be explored in future research, examining both difficult and easy-to-reach goals.

Another interesting finding pertains to the prediction of both types of planning from motivational variables. With an explained variance of more than twice that of implemental planning, preparatory planning was relatively well predicted from self-efficacy and intention. Although there is still a need for consideration of additional predictors, this finding once more indicates that preparatory planning would be suitable for incorporation in motivation-based explanatory models. Only 15% of the variance in implemental planning could be explained by the perceived self-efficacy and intention measures. Some previous studies, however, demonstrated, higher explained variances of implemental planning by incorporating other types of self-efficacy

measures as predictors, such as maintenance self-efficacy (Sniehotta, Scholz *et al.*, 2005), coping self-efficacy (Luszczynska & Schwarzer, 2003) and recovery self-efficacy (Schwarzer *et al.*, 2007). These and potentially other factors may therefore be considered as additional predictors of action planning in future studies.

Some limitations of the present study need to be acknowledged. First, data were collected from a random sample of adults that were all members of an existing internet research panel. As these respondents voluntarily participate in surveys and receive incentives for their participation, the degree to which the findings generalize to the Dutch population at large may be limited. However, the demographic characteristics of the participants in the study sample corresponded rather well to demographic distributions within the Dutch adult population (Voedingscentrum, 1998), rendering substantial reduction of the external validity of our results unlikely.

Second, as both types of planning were assessed in the same questionnaire the possibility of influence cannot be excluded. Assessment of preparatory planning preceded implemental planning and may therefore have impacted scores on implemental planning, for instance by triggering participants to make specific plans with regard to fruit consumption. The moderate relationship between the two planning cognitions, however, does not indicate significant transfer. Furthermore, if both types of planning would have been assessed in separate samples, investigation of the issue of complementariness would not have been possible.

In conclusion, although replication of our results in future, preferably experimental research is required, this study indicates that, in order to initiate health behaviour it may be of particular concern to break down the goal behaviour in a sequence of preparatory actions and strategies. Future health promoting interventions may benefit from applying this technique and may focus on teaching individuals to engage in preparatory planning.

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