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How stable are stages of change for nutrition behaviors in the Netherlands?

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SUMMARY

This paper describes the stability of the stages of change concept of the Transtheoretical Model for three different nutrition behaviors (fat, fruit and vegetable intake) among adult individuals who are unexposed to planned interventions. Secondary analyses were conducted on data collected in control groups (n = 386 and n = 739) of two intervention studies in the Netherlands. Data on dietary intakes and stages of change was collected at baseline and follow up, either 1 year (study 1) or 3 months (study 2) post-baseline. Higher levels of agreement between baseline and follow-up measures of stage of change were found for pre-contemplation and maintenance than for the other stages. However, many forward as well as backward stage

transitions occurred between baseline and follow-up also among respondents in pre-contemplation and maintenance at baseline. The results indicate that many stage transitions may occur in individuals, also when they are not exposed to planned interventions. An additional explanation for the stage instability may be low reliability of the staging algorithm. The results imply that if classification into stages of change is used to tailor interventions, these interventions may be tailored to the wrong stage, at least with longer time intervals between stage assessment and intervention. Further research is needed to assess 'spontaneous' stage-transitions in shorter time intervals.

Key words: nutrition behaviors; stages of change; stage stability; stage transitions

INTRODUCTION

In health education interventions, the concept of stages of change of the Transtheoretical Model (TTM) (Prochaska *et al.*, 1988) is often used as a variable to tailor interventions or as a measure for intervention success. In this paper we describe the stability in stages of change related to dietary change among individuals who were not exposed to planned interventions.

Prochaska *et al.* TTM (Prochaska *et al.*, 1988) is the most widely used stages of behavior change theory in the field of health promotion. The model has been successfully applied to a variety

of health-related behaviors, including smoking, physical activity and nutrition habits (Prochaska, 1994). The concept of stage of change regards behavioral change not as a dichotomized process, but as a cyclical staged process through which people may move backward and forward through different stages of motivational and behavioral change. People are regarded as *pre-contemplators* when they do not think about changing their behavior; *contemplators* when they intend to make a change within the next 6 months; and *preparators* when they intend to make a change

within the next 30 days. People are in *action* when they actively attempt to change and in *maintenance* when they have changed their behavior for >6 months. The progression between these stages is regarded as neither inevitable nor irreversible, since people may attempt and relapse between different stages. They may move backward and forward across the different stages several times before they may reach the final endpoint (Weinstein *et al.*, 1998). According to the theory it is likely that people in pre-contemplation and maintenance do not have intentions to change their behavior, nor are they actively involved in making changes, and thus stage transitions may be less likely to occur. On the contrary, stage transitions in contemplation, preparation and action are likely, since people in these stages indicate that they would like to change or are already active in making behavioral changes.

In planned development, implementation and evaluation of health education interventions, the stages of change construct is used to serve two different goals. First, classification into stages of change enables us to tailor interventions to stage of change. This is based on studies that showed that people in different stages can be distinguished from people in other stages since they apply different processes of change and may differ in cognitions that are regarded as important determinants of behavior (change) (De Vries and Backbier, 1994; Brug *et al.*, 1997a; Brug *et al.*, 1997b; Prochaska, 1997; Lechner *et al.*, 1998).

Secondly, the stages of change construct is often used as an indicator of intervention effects, indicating success if subjects exposed to an intervention indeed show more forward stage transition than subjects in a control condition (Prochaska, 1994; Brug and van Assema, 2000). However, stage transitions may also occur in the absence of known interventions, which may reflect 'real' motivational and/or behavioral changes, or lack of reliable ways to assess stages of change.

The present study investigates test-re-test stage-stability for three different nutrition behaviors (fat, fruit and vegetable intake) that may occur in the absence of planned interventions. This reveals the following research questions: to what extent are stages stable for different nutrition behaviors at an individual level in an unexposed group within different consecutive time periods (for fat intake for a

3-month and a 1-year time interval, and for fruit and vegetable intake for a 3-month time interval)?

METHODS

Respondents and procedures

Data were derived from control groups of two intervention studies. Study 1 was the evaluation of The Hartsлаг Limburg project (Heartbeat Limburg) aimed at encouraging the general population of the experimental community to increase levels of physical activity, reduce fat intake and quit smoking (Ronda *et al.*, 2004). Two regions were selected, the Maastricht region in the south of the Netherlands was the experimental region, and the control region was situated near Doetinchem, ~220 km north of Maastricht. Respondents were selected by means of a stratified, random sample of 1450 inhabitants (aged ≥ 14 years) of the Maastricht region, and a similar sample of 1200 inhabitants of the Doetinchem region. For the present study a cohort sample was available from the control (no intervention) region. Respondents were included in the analysis when they completed two questionnaires: at T1 (2000, $n = 483$) and at T2, 1 year after T1 (2001, $n = 392$). A total of 386 respondents were included in the sample for fat intake. Mean age of the study sample was 49 years, 34% were males, 38% had a lower education, 41% had a medium education and 21% had a higher education.

Study 2 evaluated a health education intervention in supermarkets, focused on eating less fat, eating more fruits and vegetables, and making healthy choices easy recognizable and visible (Steenhuis *et al.*, 2004). Thirteen supermarkets of different supermarket chains were selected through their headquarters and randomly assigned to a no intervention control condition, an educational program without labeling, or an educational program extended with a labeling programme. The control group of this study consisted of a cohort of regular clients of supermarkets who completed two questionnaires with respect to their nutrition behaviors with a 3-month time interval ($n = 739$) (response rates 48.4 and 79.5% at baseline and after 3 months, respectively). Mean age of the study sample was 46 years, 20% were males, 21% had a lower education, 61% had a medium education and 18% had a higher education.

Questionnaire

In both studies, structured questionnaires were used to assess dietary behavior and stages of change. In studies 1 and 2, fat intakes were assessed by means of a 35-item validated Food Frequency Questionnaire (FFQ) covering 19 (groups of) food products. This resulted in a fat consumption score ranging from 0 to 80 points (Van Assema *et al.*, 2001). A fat score <23 for men and <18 for women is approximately similar to a diet that contains <30% of its energy from fat. In study 2, fruit and vegetable intake in servings of fruit and grams of vegetables per day was assessed with a 10-item validated FFQ (Van Assema *et al.*, 2002).

The algorithm used to classify respondents into stages of change for fruit, vegetable and fat intake was similar to the one used in previous studies (Brug *et al.*, 1997b; Lechner *et al.*, 1998). For instance, stage of change for fruit consumption was measured with the following questions: do you intend to increase your fruit consumption within the next 6 months (yes/no), and if so, do you intend to increase your fruit consumption within the next 30 days (yes/no). Furthermore, respondents were asked whether they changed their fruit consumption in the past 6 months (increase/decrease/no change). Respondents who met the Dutch recommended consumption target of at least two pieces of fruits a day and who indicated that they increased their fruit consumption during the last 6 months were classified as actors; otherwise they were classified as in maintenance. Respondents who did not meet the recommended target were classified as pre-contemplators if they had no intention at all to increase their fruit consumption, as contemplators if they intended to increase fruit consumption within the next 6 months and as preparators if they intended to increase their fruit consumption within the next 30 days.

Data analysis

Analyses were conducted for each sample and behavior (fat intake, fruit and vegetable consumption). First, descriptive statistics were used to describe the stages of change. *t*-tests for paired samples were used to assess differences in behavior (fat intake, fruit and vegetable consumption) between pre- and post-tests. Cross tabulations were used to describe the congruence of the stages of change between both measurements. First, Spearman correlations between stages at different time-points were computed to assess the degree of association between the two measurements. Then, Cohen's Kappas (κ 's) were computed to assess the level of agreement and misclassification between the two measurements.

RESULTS

Fat intake

In study 1, no significant differences were found for mean fat intake between T1 and T2. Table 1 shows the level of agreement between stages of change at T1 and T2 for fat intake in study 1. A relatively high level of congruence was found for pre-contemplation (72%), but lower levels of congruence were found for maintenance (55%), contemplation (10%), preparation (39%) and action (26%). A total of 64% of the respondents were classified in the same stage at both measurements, 20% were in lower stage at T2 compared with T1 and 17% were in a higher stage at T2. The Spearman correlation between both assessments was 0.50 and the K was 0.35.

In study 2, no significant differences in mean fat intake were present between T1 and T2. In Table 2, levels of agreement in stages of change between T1 and T2 are presented for fat intake in study 2. Moderate levels of congruence were found

Table 1: The level of agreement in stages of change between T1 and T2 for fat intake (study 1)

T2	T1				
	PC	CO	PR	AC	MN
PC	152 (71.7%)	6 (28.6%)	14 (28.6%)	6 (22.2%)	13 (16.9%)
CO	4 (1.9%)	2 (9.5%)	4 (8.2%)	1 (3.7%)	6 (7.8%)
PR	21 (9.9%)	7 (33.3%)	19 (38.8%)	3 (11.1%)	6 (7.8%)
AC	5 (2.4%)	5 (23.8%)	5 (10.2%)	7 (25.9%)	10 (13.0%)
MN	30 (14.2%)	1 (4.8%)	7 (14.3%)	10 (37.0%)	42 (54.5%)
Total	212 (100%)	21 (100%)	49 (100%)	27 (100%)	77 (100%)

Note: The bold numbers refer to agreement in stages of change between T1 and T2. PC, pre-contemplation; CO, contemplation; PR, preparation; AC, action; MN, maintenance.

Table 2: The level of agreement in stages of change between T1 and T2 for fat intake (study 2)

T2	T1				
	PC	CO	PR	AC	MN
PC	138 (64.5%)	11 (44.0%)	19 (17.9%)	10 (6.6%)	35 (19.1%)
CO	10 (4.7%)	8 (32.0%)	10 (9.4%)	4 (2.6%)	2 (5.0%)
PR	21 (9.8%)	1 (4.0%)	50 (47.2%)	9 (5.9%)	16 (8.7%)
AC	12 (5.6%)	2 (8.0%)	21 (19.8%)	86 (56.6%)	24 (13.1%)
MN	33 (15.4%)	3 (12.0%)	6 (5.7%)	43 (28.3%)	106 (57.9%)
Total	214 (100%)	25 (100%)	106 (100%)	152 (100%)	183 (100%)

Note: The bold numbers refer to agreement in stages of change between T1 and T2. PC, pre-contemplation; CO, contemplation; PR, preparation; AC, action; MN, maintenance.

Table 3: The level of agreement in stages of change between T1 and T2 for fruit intake (study 2)

T2	T1				
	PC	CO	PR	AC	MN
PC	112 (63.6%)	8 (20.0%)	21 (16.2%)	6 (5.4%)	46 (18.9%)
CO	10 (5.7%)	9 (22.5%)	4 (3.1%)	4 (3.6%)	3 (1.2%)
PR	25 (14.2%)	18 (45.0%)	79 (60.8%)	15 (13.5%)	20 (8.2%)
AC	6 (3.4%)	2 (5.0%)	10 (7.7%)	51 (45.9%)	25 (10.3%)
MN	23 (13.1%)	3 (7.5%)	16 (12.3%)	35 (31.5%)	149 (61.3%)
Total	176 (100%)	40 (100%)	130 (100%)	111 (100%)	243 (100%)

Note: The bold numbers refer to agreement in stages of change between T1 and T2. PC, pre-contemplation; CO, contemplation; PR, preparation; AC, action; MN, maintenance.

Table 4: The level of agreement in stages of change between T1 and T2 for vegetable intake (study 2)

T2	T1				
	PC	CO	PR	AC	MN
PC	272 (78.6%)	16 (55.2%)	30 (22.6%)	12 (18.2%)	35 (30.7%)
CO	12 (3.5%)	5 (17.2%)	4 (3.0%)	4 (6.1%)	1 (0.9%)
PR	28 (8.1%)	7 (24.1%)	81 (60.9%)	11 (16.7%)	4 (3.5%)
AC	7 (2.0%)	1 (3.4%)	10 (7.5%)	22 (33.3%)	15 (13.2%)
MN	27 (7.8%)	–	8 (6.0%)	17 (25.8%)	59 (51.8%)
Total	346 (100%)	29 (100%)	133 (100%)	66 (100%)	114 (100%)

Note: The bold numbers refer to agreement in stages of change between T1 and T2. PC, pre-contemplation; CO, contemplation; PR, preparation; AC, action; MN, maintenance.

for pre-contemplation (65%), action (57%) and maintenance (58%), but not for the preparation (47%) and contemplation stage (32%). Overall, 57% of the respondents were classified in the same stage on the two occasions, 21% moved to a lower stage and 23% moved to a higher stage at T2. The Spearman correlation between the two measurements was 0.51 and the K was 0.43.

Fruit intake

In study 2, the total mean fruit consumption significantly reduced from 1.66 to 1.42 servings

per day between T1 and T2 ($t = 4.59, p < 0.001$). Table 3 presents the results of the level of agreement in stages of change between T1 and T2 for fruit intake. Moderate levels of congruence between the stages were found for pre-contemplation (64%), preparation (61%) and maintenance (61%). Lower levels of congruence were found for contemplation (23%) and action (46%). A total of 57% of the respondents were classified in the same stage at both occasions, 22% moved to a lower stage and 21% moved to a higher stage. Of the respondents in preparation at T1, 61% were again classified in preparation at T2.

The Spearman correlation between both assessments was 0.51 and the K was 0.43.

Vegetable intake

The mean vegetable consumption did not change between the two occasions in study 2. Table 4 shows the level of agreement in stages of change between T1 and T2 for vegetable intake. The highest congruence was found for pre-contemplation (79%), preparation (61%) and maintenance (52%). Contemplation and action showed lower levels of congruence—17 and 33%, respectively. About two-thirds (64%) were classified in the same stage at both measurements, 19% moved to a lower stage and 17% moved to a higher stage. The Spearman correlation was 0.53 and the K was 0.45.

DISCUSSION

The aim of the present study was to obtain insight into stage stability between two occasions and whether this was different for different behaviors (fat, fruit and vegetable intake) and different time spans (3 months for fat, fruit and vegetables and 1 year also for fat) in a group not exposed to planned interventions. For fat, fruit and vegetable intake, more than half of the respondents were classified in the same stage for a 3-month time interval. For fat intake in the 1-year study period, a majority of respondents also remained stable in their baseline stage of change. Furthermore, the prevalence of stage instability for fat intake proved to be similar for both time intervals. As expected, the most stable stages appeared to be pre-contemplation and maintenance. This finding is in line with the model, since pre-contemplators and maintainers are defined as those respondents that do not intend to change their behavior. However, even in these stages, relevant proportions of respondents shifted to other stages. Except for fruit intake, we found that these stage transitions were not due to a change in time in behavior at the group level. Further, for fat intake the prevalence of stage instability proved to be similar for time intervals of 3 months and 1 year. Two explanations can be given for the relatively low stability in stages of change. First, spontaneous transitions in stages of change may occur, even when no documented health education interventions are planned, probably due to exposure to other interventions,

such as (but certainly not restricted to) ongoing national campaigns, exposure to health nutrition information in the popular press, social influences or environmental changes that may influence motivation to change dietary behaviors, or to seasonal differences (e.g. in the case of fruit consumption).

A second reason for the lack of stability in stages of change may be that the measurement of stages of change is not reliable enough. Some evidence for this was found in the present study, since a sizeable percentage of respondents reported to be progressed from pre-action stages to the maintenance stage for fat, fruit and vegetable intake. In order to be in the maintenance stage, according to the definition, respondents have to adhere to the healthy behavior for >6 months. So far, only one study was found that assessed the reliability of the measure of the stages of change concept (Marcus *et al.*, 1992). In this study, aimed at stages of change for exercise behavior, a relatively high K of 0.78 for a five-items measure of stages of change for exercise using a test-re-test analysis with a 2-week time interval was found. This indicates that there was strong agreement about the stages of change between the two measurements. However, the study group was very small ($n = 20$). In our studies the time intervals between both measurements were much longer, and therefore 'spontaneous' stage transitions may be responsible for the greater lack of agreement reported in the present paper. In order to derive further insight into stability of stages of change in unexposed groups, test-re-test studies with different time-intervals are needed. Nevertheless, based on the evidence presented, there are indications for stage instability. Regardless of whether this is due to spontaneous transition or an unreliable measure, it implies that if classification into stages of change is used to tailor interventions, nutrition education may be tailored to a wrong stage, especially when there is a delay between the time of measurement and the intervention. A delay of several weeks is common practice in computer-tailored nutrition education interventions that have been evaluated to date (Brug *et al.*, 2003).

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