

Stages of change for perceived stress in a Swiss population sample: an explorative study

Summary

Objectives: Data from a cross-sectional survey of the Swiss general population were used in an explorative attempt to apply the transtheoretical model of behavioural change to perceived stress.

Methods: The sample comprised 575 respondents who reported having experienced stressful situations in the previous month. Other variables assessed included gender, age, education, reported symptoms, and three constructs representing stages and processes of change as well as self-efficacy.

Results: Findings indicated that (1) about one third of respondents appeared to cope successfully with the stressful situations they experienced, one third intended to do so, while one quarter appeared to have no intention of managing their stress more effectively. (2) There was no difference in stage of change distribution by gender or age, while those with higher education were more frequently represented in the latter stages than those with lower education. (3) Those in the maintenance stage reported significantly less symptoms than others.

Conclusions: We conclude that the assessment of readiness to change could be of valuable support in designing stage-specific interventions in the area of stress management.

Key-Words: Perceived stress – Transtheoretical model – Stages of change – Self-efficacy – Processes of change – Symptoms.

Consensus exists among professionals from various fields that stress and stress-related health problems constitute important issues facing today's society. The importance of stress as a public health issue is widely recognised, even in the absence of an agreed-upon definition and operationalisation of this construct. Stress is to be considered in the context of a more and more challenging society, where stressful situations are part of everyday life. People may have resources to cope with stressful situations; however, successful coping implies learning to activate these resources. In other words, going from overwhelming stress to stress management is an active process implying change. In this study, we attempted to apply the Transtheoretical Model of behavioural change (TTM) in the area of stress and stress management.

The TTM is a theoretical model of behavioural change developed in the 1980s¹⁻³. The key construct of the model is the stage construct; change is considered as a process involving progress through five successive stages. *Pre-contemplation* is the stage in which people are not intending to change their behaviour in the near future (usually measured as the next six months). *Contemplation* is the stage in which people are intending to change their behaviour within the next six months. *Preparation* is the stage in which people are intending to take action in the immediate future (usually measured as the next month). *Action* is the stage in which people have specifically modified their behaviour within the previous six months. *Maintenance* is the stage in which people have changed their behaviour for more than six months. A more detailed description of the five stages may be found in several publications^{2,4}. The stages of change construct is an approach to assessing readiness to change that can be useful in designing interventions, many of which traditionally target people who are already cognitively prepared to change, thereby

neglecting entire groups of the population who are not yet considering change.

For the TTM a decisional balance concept has been proposed as a general schema for representing both cognitive and motivational aspects of human decision-making⁵. This construct was operationalised in two scales measuring pros (advantages) and cons (disadvantages) for behavioural change.

The TTM also specifies a series of 10 mediating variables called processes of change^{2,6,7}. The processes of change represent activities involved in specific behaviour modification. They are grouped into two second-order factors – experiential and behavioural – which have differential impact across the stages of change. An example of an experiential process of change is increasing information about the problem behaviour (consciousness raising); an example of a behavioural process of change is having someone who listens and cares about the problem (helping relationships). One suspects that experiential processes of change are relatively high in the second and third stages of change and decrease in the two last stages of change, whereas behavioural processes of change are expected to be rather low in the first stages of change and increase with action and maintenance^{2,7}.

A self-efficacy construct has been integrated within the TTM, representing the situation-specific confidence that people have that they can cope with high-risk situations without relapsing to their unhealthy behaviour. This construct was adapted from Bandura's self-efficacy theory^{8,9}. Previous research showed that self-efficacy rises as people move from one stage of change to another^{4,9–11}.

The TTM has been extensively applied to smoking cessation^{1,4,10,12,13} or adoption of physical activity^{14–16}, as well as to several other health behaviours^{12,17–19}. In contrast, stress and stress management represent an area where the application of the TTM is currently under development. To our knowledge, only two studies have been published so far on this subject^{4,20}.

A major difficulty in population surveys on perceived stress is the understanding of the concept of stress. Coping with stress as a behaviour is not as concrete and measurable as other behaviours like smoking cessation. The research outcomes are likely to greatly depend on the individual perception of the word "stress". Furthermore, cultural differences between populations are likely to influence a stage classification for perceived stress²⁰. In this study, the definition of stress was based on that from Lazarus and Folkman, as "a relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources and endangering his or her well-being"²¹. Stress is viewed as a complex bi-directional relationship integrating

environmental and personal factors^{21,22}. A similar concept of stress can be found in Bandura's work, where "it is the perception of life events as overwhelming one's coping capabilities that becomes the stressful reality"⁹. Based on this concept, our approach was to interview people focusing on their perception of demands-resources configuration. In other words, we attempted to assess the perceived balance – or imbalance – between demands and resources. Participants who felt overwhelmed by stressful situations were further classified into either of the three groups precontemplation, contemplation, or preparation for perceived stress. On the other hand, participants who reported being able to manage stressful situations (and thus, not being overwhelmed by them) were thereafter classified into either action or maintenance for perceived stress. People reporting not to have experienced stressful situations were excluded from the five stages of change, a major difference with the other surveys, where all respondents were included in one stage of change for stress management^{4,20}.

The aim of this preliminary research was explorative. First, we examined the distribution of the five stages of change for perceived stress among Swiss people. Second, we attempted to further describe the five stages-of-change groups with respect to health-related variables (reported symptoms) as well as three constructs representing self-efficacy, experiential and behavioural processes of change.

Methods

The present study was part of a larger cross-sectional population survey of stress and health-related behaviours in Switzerland between April and May 1998. A random sample of 7505 addresses was drawn from the telephone directory. Within each household, the inhabitants were filtered according to age and gender in order to obtain an age- and gender-stratified sample representative of the Swiss general population aged 15 to 74 years. 3478 addresses were excluded due to fax, answering machine, commercial phone number, inability to establish contact, or language problems. In addition, 877 addresses were excluded because no one in the household was eligible to enter the sample. Of the 3150 remaining persons, 1200 agreed to take part in the survey, yielding a response rate of 38.1%. The main reasons for refusal reported were: no interest, no time, or excessive length of interview.

The telephone interview included questions on socio-economic status, health-related behaviours, perceived general health, reported symptoms, and a set of questions on perceived stress, resources, and coping strategies. The mean duration of the entire interview was 40 minutes. The present

research focuses on the relationship between stages of change in perceived stress and processes of change, self-efficacy, and reported symptoms.

Stages of change and socio-demographic groups

Participants were classified as either “not stressed” or in one stage of the TTM using a set of six questions (Fig. 1). The

distribution of the five stages was examined by gender, age, and education. Education was assessed by the highest degree attained, and thereafter grouped into three categories: those who finished only obligatory school (<11 years education), those who attended a vocational school (11–15 years), and those who attended higher institution such as university (>15 years education).

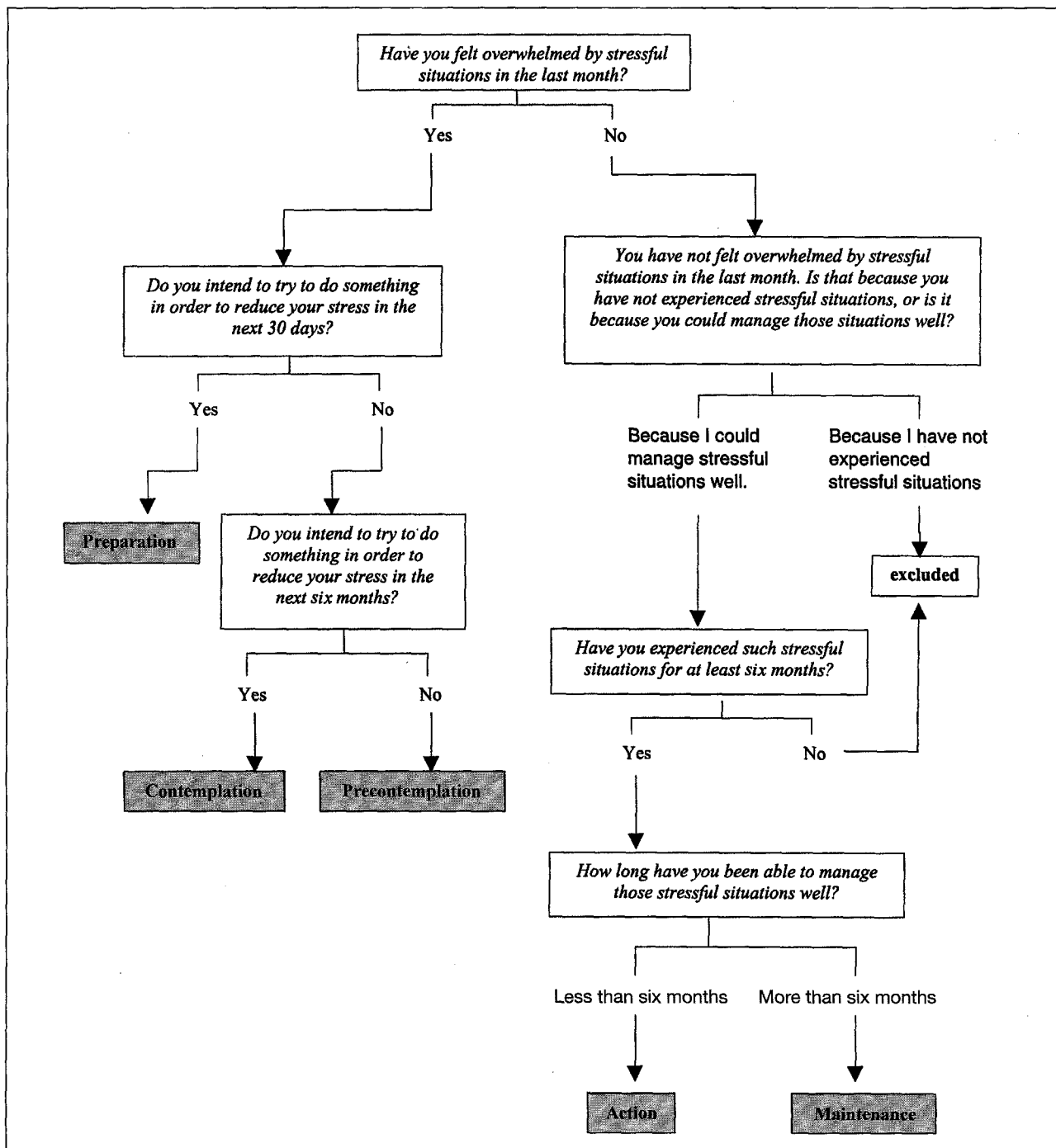


Figure 1 Operationalisation of the five stages of change for perceived stress

Reported symptoms

The list of 11 reported symptoms was the one used in the Swiss Health Survey from the Swiss Federal Statistical Office²³. Participants were asked whether they had experienced symptoms, such as insomnia or headache, over the previous four weeks. A symptom score was then obtained for each respondent as the sum of symptoms reported, ranging from 0 (no symptom) to 11 (all symptoms listed).

Processes of change

Processes of change for stress were assessed using 10 questions adapted from Prochaska et al.¹³. The questions were grouped in two groups of five items each, one group representing the experiential processes of change, the other group the behavioural processes of change. This part of the study was considered as exploratory, since only one question was asked for each process, and the items used have not been validated yet. Participants in any stage of change for stress had to answer on a three-points scale if the process considered (1) did not apply to them, (2) applied only partially to them, or (3) applied to them (Tab. 1). For each participant, a score for experiential processes (ranging from 1 to 3) was calculated as the mean of the five items. Similarly, a score for behavioural processes was calculated for each respondent. The Cronbach's alpha coefficient was 0.65 for the experiential processes and 0.60 for the behavioural processes respectively.

Experiential processes	
Consciousness raising	You find information about the subject "stress"
Self-reevaluation	You get angry with yourself about the fact that you are stressed
Dramatic relief	You feel worried when you think about the negative consequences of stress
Environmental re-evaluation	You realise that your stress could affect people who are close to you
Social liberation	You are aware that people often speak about stress
Behavioural processes	
Self-liberation	You are confident with yourself that you can cope with stressful situations
Counterconditioning	When you are stressed, you think about the positive side of life
Stimulus control	You have things which remind you to relax
Reinforcement management	People react positively when you relax
Helping relationships	You have someone who listens and cares when you speak about your stress

Table 1 Operationalisation of the processes of change

Are you confident to be able to manage stressful situations when ...	
1.	... you have personal problems?
2.	... you have insomnia?
3.	... you are frustrated (disappointed)?
4.	... you feel afraid?
5.	... you feel angry?
6.	... you are under time pressure?
7.	... you have difficulties to stop a habit (e.g., smoking)?
8.	... you feel sad?
9.	... you are tired?
10.	... you think about mistakes (things you did wrong)?

Table 2 Operationalisation of the self-efficacy score

Self-efficacy

Self-efficacy was assessed using a 10-item scale (Tab. 2) adapted to stress by Schwarzer²⁴. Participants had to answer on a three-point scale if they were (1) very confident, (2) a little confident, or (3) not at all confident to manage their stress in specific situations. The self-efficacy score for each respondent (ranging from 1 to 3) was calculated as the mean of the 10 items. The Cronbach's alpha coefficient was 0.81.

Data analysis

Differences in the stage of change distribution between population groups were examined using Pearson's chi square test. Differences in mean values for experiential processes of change, behavioural processes of change, self-efficacy scores, and symptom scores across stages of change were examined using the Kruskal-Wallis test for independent samples.

Results

From the original sample, 95 (7.9%) respondents could not be classified for perceived stress or stage of change because of missing data. 368 (30.7%) persons who reported that they had not felt stressed during the previous month were excluded from the analyses. Finally, 162 (13.5%) respondents, who experienced stressful situations for less than six months, but indicated that they could manage them well, were also excluded because they could not be clearly classified into one of the two last stages.

Thus, the final sample included the 575 persons reporting to feel overwhelmed by stress or to have experienced stressful situations for at least six months. The sample comprised 349 (60.7%) women and 226 (39.3%) men. 147 persons (25.6%) were between 15 and 29 years of age, 239 (41.6%) between 30 and 44 years, 156 (27.1%) between 45 and 64 years, and 33 (5.7%) were 65 years or older. In the entire sample (1200

	n ^b (100 %)	PC (%) n = 133	C (%) n = 60	P (%) n = 176	A (%) n = 23	M (%) n = 183	df	X ²	P ^c
Total	575	23.1	10.4	30.6	4.0	31.8			
Gender									
men	226	22.6	8.4	30.5	2.7	35.8	4	5.089	0.28
women	349	23.5	11.7	30.7	4.9	29.2			
Age									
15–29 years	147	27.9	14.3	31.3	2.0	24.5	12	17.907	0.12
30–44 years	239	22.2	8.8	28.9	2.9	37.2			
45–64 years	156	21.2	8.3	33.3	7.1	30.1			
65–74 years	33	18.2	15.2	27.3	6.1	33.3			
Education ^d									
< 11 years	79	32.9	13.9	31.6	3.8	17.7	8	16.252	0.04
11–15 years	311	23.5	10.9	28.3	4.8	32.5			
> 15 years	174	17.2	8.6	34.5	2.9	36.8			

^a PC: precontemplation; C: contemplation; P: preparation; A: action; M: maintenance.
^b Totals may not add up to 575 due to missing values.
^c Tested with Pearson's chi square test.
^d < 11 years: obligatory school; 11–15 years: vocational school; > 15 years: higher education/university.

Table 3 Stage-of-change^a distribution in socio-demographic groups

respondents), the proportion of women was slightly lower (56.4%) and there were less participants between 15 and 29 years (21.7%) and between 30 and 44 years (33.2%) than in the sub-sample used in these analyses.

Stages-of-change distribution

The proportion of participants in precontemplation, contemplation, preparation, action, and maintenance was 23.1%, 10.4%, 30.6%, 4.0%, and 31.8%, respectively. Table 3 shows that the stage-of-change distribution was not significantly different across age and gender categories. In contrast, there was a strong relation between stage of change and education level: a higher proportion of those with lower education were in precontemplation and contemplation, whereas a higher proportion of those with higher education were in maintenance (Tab. 3). For this relation, the Mantel-Haenszel test for linear-by-linear association was highly significant (11.447, $P = 0.001$).

Stages of change and reported symptoms

The mean symptom score was 3.20 (SD = 2.12) in the whole sample. As shown in Table 4, it did not vary from precontemplation to action, while it decreased significantly from action to maintenance ($P < 0.001$).

Stages of change and processes of change

The overall mean score for experiential processes of change was 2.06 (SD = 0.54). As shown in Table 4, the mean score increased significantly from precontemplation to contemplation ($P < 0.001$). It did not vary from contemplation to action, while it decreased significantly from action to maintenance ($P < 0.05$). The overall mean score for behavioural processes of change was 2.51 (SD = 0.40) and did not vary across stages of change (Tab. 4).

Stages of change and self-efficacy

The overall mean self-efficacy score was 2.08 (SD = 0.51). It did not vary from precontemplation to action, but showed a significant increase between action and maintenance ($P < 0.01$) (Tab. 4).

Discussion

Assessing individual readiness to change can provide important additional information about the population's potential receptiveness for specific stress management promotion interventions. This preliminary study was a first attempt to apply the TTM to the construct of stress in a sample of the Swiss population. The low response rate of under 40% represents a shortcoming in terms of the generalisation our data. However, our results show significant construct validity and are in line with those of the recent Swiss Health Survey conducted by the Swiss Federal Statistical Office²³.

Stages of change for stress management

These results showed that about two-thirds of those experiencing stressful situations were in the first three stages of change, thus not yet able to manage these situations successfully. Only 35.8% of participants were in action or maintenance, while results from other studies showed from 45% of respondents²⁰ to over 65%^{13,20} in the two last stages. This reflects a differentiated operationalisation of the stages of change: while all respondents were included in the analyses in other surveys, in this study participants who had not experienced stressful situations since at least six months were excluded from the analyses. If such respondents had been included, they would have been classified into one of the last stages, thereby increasing the proportions in action and

	PC		C		PC-C comparison ^d		P		C-P comparison ^d		A		P-A comparison ^d		M		A-M comparison ^d	
	mean	SD	mean	SD	X ²	P	mean	SD	X ²	P	mean	SD	X ²	P	mean	SD	X ²	P
Symptom score ^b	3.75	2.24	3.58	2.05	0.12	0.73	3.50	2.02	0.10	0.75	3.74	1.45	1.08	0.30	2.32	1.96	14.36	0.00**
Experiential processes of change ^c	1.90	0.51	2.21	0.48	13.29	0.00**	2.21	0.52	0.07	0.79	2.26	0.47	0.16	0.69	1.97	0.55	6.54	0.01*
Behavioural processes of change ^c	2.44	0.44	2.43	0.43	0.02	0.88	2.49	0.35	0.36	0.55	2.51	0.35	0.07	0.80	2.60	0.39	1.97	0.16
Self-efficacy ^c	1.99	0.53	2.04	0.50	0.22	0.64	2.02	0.49	0.05	0.83	1.92	0.41	1.31	0.25	2.24	0.49	10.06	0.00**

^a PC: precontemplation; C: contemplation; P: preparation; A: action; M: maintenance.
^b Minimal score 0, maximal score 11.
^c Minimal score 1, maximal score 3.
^d Kruskal-Wallis test for independent samples (df = 1).

Table 4 Processes of change, symptom score and self-efficacy across stages of change^a

maintenance. However, even without this major difference in operationalisation, it is not possible to make inferences about differences across studies with different source populations and cultural settings.

Stage-of-change distribution was strongly and linearly associated with education level: more educated persons were more likely to be in the action and maintenance stages than less educated people, who were more frequently represented in the first three stages. This finding compares to that found in some instances for smoking or exercise^{25,26}. In the case of stress management, the results support the hypothesis that people with a higher education may have more resources to deal with stressful situations – or may be more able to activate them – than persons of low education. Beyond these preliminary findings, further research will be necessary to explore the relation between perceived stress, stages of change, and education.

Stages of change and reported symptoms

Self-perceived stress has been found to relate to several health outcomes^{27–29}. Our hypothesis was that the association between perceived stress and health outcomes may become apparent as a difference in reported symptoms between stages of change groups. As expected, persons in maintenance reported significantly less symptoms than those in the first four stages, who all had a similarly high symptom score. The first four stages included persons who were overwhelmed with stress or who only recently started to manage their stress, whereas those in maintenance have supposedly been coping successfully with stressful situations for a longer time, thus likely to already benefit from better health conditions.

Validity of the stage-of-change classification

The decreased symptom score in respondents in maintenance indicates a certain validity of our stages-of-change classification. In addition, research comparing stage algorithms has found that the stage construct is generally robust across many classification methods^{20,30}. Nevertheless, examining the relation between our stage-of-change classification and standardised measures of stress and coping, such as the Rhode Island Stress and Coping Inventory³¹ would provide more clues on the validity of our classification. In addition, a longitudinal survey of a representative sample across the five stages of change for perceived stress would give more insight on the application of the TTM in the area of stress management.

Stages of change, processes of change, and self-efficacy

This part of the analyses aimed at further describing the five stages of change groups. It is important to note that our results only have an explorative value. First, the scales used for the processes of change and self-efficacy constructs have not yet been validated. Second, for economical reasons only one item was used to measure each of the ten processes of change. As a matter of fact, the behavioural processes of change showed no variation at all across stages of change. Based on our data we can not conclude whether our results are caused by suboptimal operationalisation or reflect an inherent phenomenon of the stress construct. However, the patterns obtained for the experiential processes of change and self-efficacy partially seem to support what is predicted by the TTM and thus shows construct validity. Accordingly, Rosen³² found in a meta-analysis that the relationship between processes and stages of change varies as a function of the dimension studied (e.g., smoking cessation or physical exercise). In smoking cessation, cognitive processes are used

in earlier stages than behavioural processes. Focusing on physical exercise, the use of behavioural and cognitive processes increased continuously and together. The fact that our results for the dimension of stress show that the experiential processes first increase and then decrease, whereas the behavioural processes do not vary across the five stages, provides further evidence that the relationship between processes and stages in the TTM depends on the dimension measured. Further research is needed to operationalise behavioural and cognitive dimensions in order to understand the complex mechanism of change in stress management.

Zusammenfassung

Veränderungsstufen für wahrgenommenen Stress in einer Schweizer Stichprobe: eine explorative Studie

Fragestellung: Diese explorative Querschnittstudie dient der Prüfung des Transtheoretischen Modells (TTM) für die Untersuchung von subjektiv wahrgenommenem Stress.

Methoden: Die verwendete Schweizer Stichprobe setzt sich aus 575 Probanden zusammen, welche angaben, während des letzten Monats Stress erlebt zu haben. Als weitere Variablen wurden Geschlecht, Alter, Bildung, berichtete Symptome und Stufen der Stresswahrnehmung gemäss TTM, kognitiv-emotionale Prozesse sowie Selbstwirksamkeit erfasst.

Ergebnisse: Es zeigte sich, dass (1) cirka ein Drittel der Probanden angab, subjektiv erlebten Stress erfolgreich zu bewältigen, ein Drittel gab an, dass sie die Absicht haben dieses Ziel zu erreichen, während die übrigen keine Absicht zeigten, ihren Stress effektiver zu bewältigen. (2) Bezüglich der Stufenverteilung gab es keine Alters- und Geschlechtseffekte, wobei Probanden mit höherem Bildungsstatus relativ häufig angaben, mit ihrem Stress gut umgehen zu können. (3) Probanden, welche sich als kompetent im Umgang mit Stress bezeichneten, gaben weniger Symptome an als die Anderen.

Schlussfolgerungen: Es darf davon ausgegangen werden, dass das TTM eine valable Grundlage bildet für die Planung und Evaluation von Interventionen zur Optimierung der Stressbewältigung im Bereich Public Health.

Conclusion

In a Swiss population sample, 34.8% of the persons experiencing stressful situations appeared to cope successfully with them, 30.6% intended to do so in the next month, 10.4% intended to do so in the next six months, and 23.1% appeared to have no intention to manage their stress more effectively. Our preliminary findings give some clues for stage-specific interventions in the area of stress. In addition, a better knowledge on the relation between readiness to change and education level, as well as on cognitive and behavioural dimensions facilitating change, would be of valuable support in designing interventions helping people to cope with stress.

Résumé

Stades de changement du stress perçu dans un échantillon de la population suisse: étude exploratoire

Objectifs: des données d'une enquête transversale de la population Suisse ont été utilisées dans une tentative exploratoire d'appliquer le modèle transthéorique au stress perçu.

Méthodes: l'échantillon analysé comprenait 575 personnes qui déclaraient avoir connu des situations stressantes au cours du mois précédent. Les autres variables considérées étaient le sexe, l'âge, l'éducation, une liste de symptômes physiques ainsi que deux éléments mesurant les processus de changement et la self-efficacy.

Résultats: les résultats ont montré que (1) un tiers environ des personnes interrogées semblaient gérer avec succès les situations stressantes rencontrées, un tiers en avait l'intention, alors qu'un quart ne manifestait aucune intention de mieux gérer le stress. (2) Il n'y avait aucune différence de répartition dans les étapes de changement entre les deux sexes ou suivant l'âge. Par contre, les personnes avec un niveau d'éducation plus élevé étaient plus souvent représentées dans les étapes tardives que les personnes avec un niveau d'éducation moins élevé. (3) Les personnes classées dans le niveau de maintenance indiquaient souffrir de moins de symptômes que les autres.

Conclusions: Nous concluons que la mesure de la disposition à changer au moyen d'un modèle comme le modèle transthéorique pourrait être une aide valable dans le design d'interventions dans le domaine de la gestion du stress.

References

- 1 Prochaska JO, DiClemente CC. Stages and processes of self-change of smoking: towards an integrative model of change. *J Consult Clin Psychol* 1983; 51: 390–5.
- 2 Prochaska JO, DiClemente CC, Norcross JC. In search of how people change: applications to addictive behaviours. *Am Psychol* 1992; 47: 1102–14.
- 3 Prochaska JO, Velicer WF. The Transtheoretical Model of health behaviour change. *Am J Health Promotion* 1997; 12: 38–48.
- 4 Velicer WF, Prochaska JO, Fava JL, Norman GJ, Redding CA. Smoking cessation and stress management: applications of the transtheoretical model of behaviour change. *Homeostasis* 1998; 38: 216–33.
- 5 Velicer WF, DiClemente CC, Prochaska JO, Brandenburg N. Decisional balance measure and predicting smoking status. *J Pers Soc Psychol* 1985; 48: 1279–89.
- 6 DiClemente, CC. Changing addictive behaviour: a process perspective. *Curr Directions Psychol Science* 1993; 2: 101–6.
- 7 Perz CA, DiClemente CC, Carbonari JP. Doing the right thing at the right time? The interaction of stages and processes of change in successful smoking cessation. *Health Psychol* 1996; 15: 462–8.
- 8 Bandura A. Self-efficacy: towards a unifying theory of behaviour change. *Psychol Rev* 1977; 84: 191–215.
- 9 Bandura A. Self-Efficacy: the exercise of control. New York: W.H. Freeman, 1997: 262–79.
- 10 DiClemente CC, Prochaska JO, Fairhurst SK, Velicer WF, Velasquez MM, Rossi JS. The process of smoking cessation: an analysis of precontemplation, contemplation, and preparation stages of change. *J Consulting Clin Psychol* 1991; 59: 295–304.
- 11 De Vries H, Backbier E. Self-efficacy as an important determinant of quitting among pregnant women who smoke: the F-Pattern. *Prev Med* 1994; 23: 167–74.
- 12 Pallonen UE, Leskinen L, Prochaska JO, Willey CJ, Kaariainen R, Salonen JT. A 2-year self-help smoking cessation manual intervention among middle-aged Finnish men: an application of the Transtheoretical model. *Prev Med* 1994; 23: 507–14.
- 13 Prochaska JO, Velicer WF, DiClemente CC, Fava J. Measuring processes of change: applications to the cessation of smoking. *J Consult Clin Psychol* 1988; 56: 520–8.
- 14 Marcus BH, Rossi JS, Selby VC, Niaura RS, Abrams DB. The stages and processes of exercise adoption and maintenance in a worksite sample. *Health Psychol* 1992; 11: 386–95.
- 15 Marcus BH, Banspach SW, Lefebvre RC, Rossi JS, Carleton RA, Abrams DB. Using the stage of change model to increase the adoption of physical activity among community participants. *Am J Health Promotion* 1992; 6: 424–9.
- 16 Nigg CR, Courneya KS. Transtheoretical model: examining adolescent exercise behaviour. *J Adolesc Health* 1998; 22: 214–24.
- 17 Greene GW, Rossi SR. Stages of change for reducing dietary fat intake over 18 months. *J Am Diet Assoc* 1998; 98: 529–34.
- 18 Harlow LL, Prochaska JO, Redding CA, et al. Stages of condom use in a high HIV-risk sample. *Psychol Health* 1999; 14: 143–57.
- 19 Snow MG, Prochaska JO, Rossi JS. Processes of change in alcoholic anonymous: maintenance factors in long-term sobriety. *J Stud Alcohol* 1994; 55: 362–71.
- 20 Laforge RG, Velicer WF, Richmond RL, Owen N. Stage distributions for five health behaviours in the United States and Australia. *Prev Med* 1999; 28: 61–74.
- 21 Lazarus RS, Folkman S. Stress, appraisal, and coping. New York: Springer, 1984.
- 22 Thoits PA. Stress, coping, and social support processes: Where are we? What next? *J Health Soc Behav* 1995; (Extra Issue): 53–79.
- 23 Swiss Federal Statistical Office. Swiss Health Survey. Health and health behaviours in Switzerland: detailed results of the Swiss Health Survey. Neuchâtel: SFSO, 1998.
- 24 Schwarzer R. Measurement of perceived self-efficacy: psychometric scales for cross-cultural research. Berlin: Free University Press, 1993.
- 25 Boyle RG, O'Connor PJ, Pronk NP, Tan A. Stages of change for physical activity, diet, and smoking among HMO members with chronic conditions. *Am J Health Promot* 1998; 12: 170–5.
- 26 Velicer WF, Fava JL, Prochaska JO, Abrams DB, Emmons KM, Pierce JP. Distribution of smokers by stage in three representative samples. *Prev Med* 1995; 24: 401–11.
- 27 Anda RF, Williamson DF, Escobedo LG, Remington PL, Mast EE, Madans JH. Self-perceived stress and the risk of peptic ulcer disease: a longitudinal study of US adults. *Arch Intern Med* 1992; 152: 829–33.
- 28 James GD. Race and perceived stress independently affect the diurnal variation of blood pressure in women. *Am J Hypertens* 1991; 4: 382–4.
- 29 Suter PM, Maire R, Holtz D, Vetter W. Relationship between self-perceived stress and blood pressure. *J Hum Hypertens* 1997; 11: 171–6.
- 30 Reed GR, Velicer WF, Prochaska JO, Rossi JS, Marcus BH. What makes a good staging algorithm: examples for regular exercise. *Am J Health Promotion* 1997; 12: 57–66.
- 31 Fava JL, Ruggiero L, Grimley DM. The development and structural confirmation of the Rhode Island Stress and Coping Inventory. *J Behav Med* 1998; 21: 601–11.
- 32 Rosen CS. Is the sequencing of change processes by stage consistent across health problems. *Health Psychol* 2000; 19: 593–606.

Address for correspondence

Oliver Padlina
University of Zurich
Institute for Social and Preventive Medicine
Sumatrastrasse 30
CH-8006 Zurich