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How to measure motivation to change risk behaviours in the self-determination perspective? The Polish adaptation of the Treatment Self-Regulation Questionnaire (TSRQ) among patients with chronic diseases.

Abstract: The aim of this study was to validate the Polish adaptation of the Treatment Self-Regulation Questionnaire (TSRQ; Ryan, Conell, 1989), which measures the degree of self-determination in risk behaviour changes (diet, exercise and smoking). The study comprised 219 patients (101 after acute coronary syndrome and 118 with type 2 diabetes), beginning to undergo treatment. The Global Motivation Scale was used to test a convergent validity. The confirmatory factor analysis (CFA) did not support the theoretical four-factor model, thus an exploratory analysis was conducted to determine an optimal model across risk behaviours. The adopted two-factor model matched original TSRQ subscales: autonomous motivation and external regulation (it did not contain the items from the introjected regulation and amotivation subscales). The internal consistency of factors (Cronbach's α) ranging from .78 to .89. Structural equation modeling revealed the impact of global motivation on contextual motivation, limited to the equivalent type of regulation. The action aimed at supporting patient's autonomy should consider the particular behaviour and the global motivation as a resource in disease.

Key words: Self-Determination Theory (SDT), autonomous motivation, risk behaviours, global and contextual motivation (level of generality), measurement

Introduction

Epidemiological research has documented the relationship between risk behaviour management and lower incidence of disease complications, predominantly of the long-term character (Alberti, Zimmet, Shaw, 2007; Boren, Gunlock, Schaefer, Albright, 2007; Khattab, Khader, Al-Khawaldeh, Ajlouni, 2010; Smith, Benjamin, Bonow *et al.*, 2011). However, research on cardiac rehabilitation has indicated the presence of at least one, and usually several, risk factors concerning cardiovascular diseases (e.g. tobacco smoking, sedentary lifestyle, or inadequate diet) in as many as 75% of the subjects (Bellow, Epstein, Parikh-Patel, 2011). A staggering 61% of the type 2 diabetes patients do not adhere to risk behaviour changes (Bezie, Molina, Hernandez, Batista, Niang, Huet, 2006; Morrato, Hill, Wyatt, Ghushchyan, Sullivan, 2007).

These negative phenomena result most probably from the specific psychological conditions of a risk behaviour change, once a chronic disease is diagnosed. They may include: following the physician's recommendations to, above all, change the preexisting habits (which often turned out to be predictors of the disease); the necessity to cooperate with the physician and with individuals closest to the patient during the course of treatment; maintaining, over many years, a regime of activities related to treatment and constant adaptation to the progress of the disease (e.g. Clarke, 2009). Therefore, it is essential, on the one hand, to

describe the interiorization of external contingencies (e.g. medical advice) leading to adequate risk assessment and self-management of behaviour and, on the other hand, to suggest possibilities through which individuals closest to the patient, including medical personnel, can support the patient's actions (see Bellow, Epstein, Parikh-Patel, 2011; Bundesmann, Kaplowitz, 2011; Robinson, Fox, Grandy, 2009; Whooley, de Jonge, Vittinghoff *et al.*, 2008).

The available studies have shown that the Deci and Ryan's self-determination theory (SDT; Deci & Ryan, 1985, 1991, 2000; Ryan & Deci, 2000) makes it possible to understand the situation of a patient suffering from a chronic disease, and provides the principles of psychological interventions. The effectiveness of the SDT, which considers the patient's autonomy to be a key predictor for risk behaviour changes, has been proven in the studies on giving up smoking (e.g. Williams, Gagne, Ryan, Deci, 2002), losing weight in case of obese patients (e.g. Webber, Tate, Ward, Bowling, 2010), undertaking regular physical activity (e.g. Sweet, Fortier, Guérin, Tulloch, Sigal, Kenny, Reid, 2009) or glycaemia management and lifestyle changes among patients with type 2 diabetes (e.g. Nouwen, Ford, Balan, Twisk, Ruggiero, White, 2011; Oftedal, Bru, Karlsen, B., 2011; Williams, McGregor, Zeldman, Freedman, Deci, 2004). It is worth noting here that supporting autonomy is promoted in practitioners' circles as an essential aspect of working with patients to facilitate healthy behaviour (e.g. ABIM Foundation, 2002).

The Treatment Self-Regulation Questionnaire (TSRQ, see Lavesque, Williams, Elliot, Pickering, Bodenhamer and Finley, 2007) is the most commonly used tool for evaluating the patient's degree of autonomy in undertaking changes in risk behaviours, in introducing medical treatment, assessing its maintenance, and in participating in a screening procedure for disease prevention purposes.

Motivation from the perspective of the Self-Determination Theory

According to the SDT (Deci & Ryan, 1985), two wide categories of activities motivated due to different degrees of self-determination can be identified. Autonomous motivation refers to behaviours regulated by internal self-determined (i.e., volitional) processes. In contrast, controlled motivation is related to activities regulated (i.e., governed) by external or internal pressures. The self-determination continuum explaining these two categories of motivated activities includes different types of behavioural regulation (in the order from most to least self-determind): intrinsic, integrated, identified, introjected and external (Deci and Gagne, 2005; Deci & Ryan, 1991, 2000; Ryan & Deci, 2000; Vaantenkiste, Scheldon, 2006; see Figure 1).

Intrinsic motivation, the central concept of SDT, refers to behaviours that people get engaged in for their own sake, simply for the interest and satisfaction of performing them. Its basic function is to organize human activity with regard to a problem selected by the person himself. The action related to the problem is more important here than its effects, because it is congruent with a person's values. The person understands that it makes sense to emotionally commit herself/himself to the action and identifies with the task or activity; the mechanism reflecting regulation is that of positive feedback. Such actions are typically accompanied by feelings of pleasure, joy, surprise, curiosity, as well as pride and satisfaction with one's own independent, long-term efforts.

The self-determination continuum contains four forms of regulation referred to as extrinsic motivation (Deci & Ryan, 1985, 1991, 2000; Ryan & Deci, 2000). Motivation fully controlled by external pressures is referred to as external regulation, the degree of autonomy being the lowest here. When an individual internalizes external contingencies or demands but does not accept them as her/
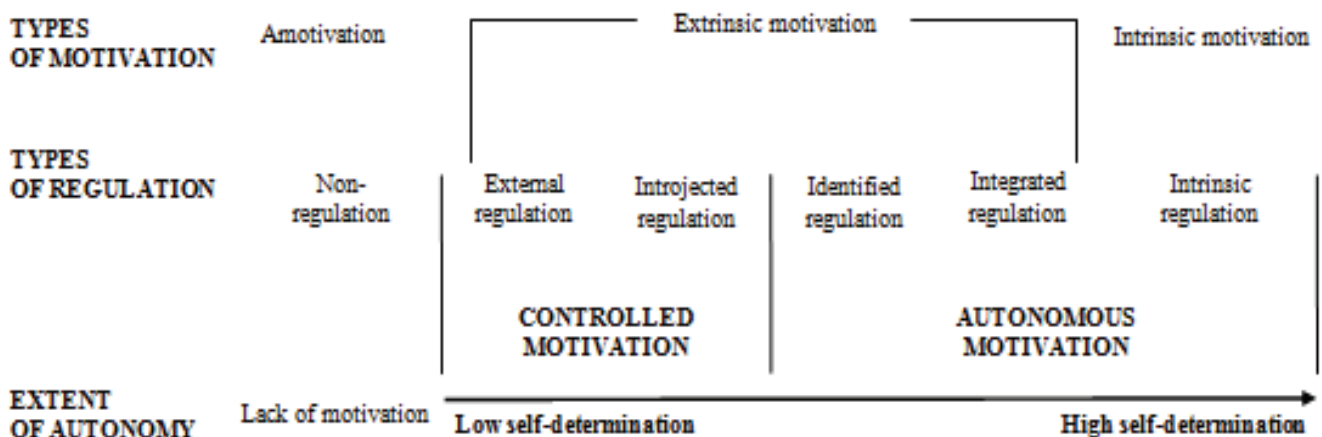

Figure 1 The self-determination continuum. (Based on: Deci i Gange, 2006; Deci i Ryan, 2008; Vaantenkiste, Scheldon, 2006).

his own, then motivation is moderately regulated externally and referred to as introjected regulation. Motivation is moderately autonomous when an individual carried out internalization of external requirements, identified herself/ himself with them and considers them to be partly her/his own. This process is commonly referred to as identified regulation. If an individual carried out internalization of external contingencies and their integration with the intrinsic norms, then the process taking place is referred to as autonomous motivation, and known as integrated regulation (Deci, Ryan, 2002). Thus, the successive types of regulation reflect interiorization, i.e. the development of processes that organize and direct a problem and the development of related competencies and skills (see Tokarz, 2005). Extrinsic motivation is not compared to intrinsic motivation; it is considered as a continuum depending on the degree of autonomy (the above mentioned types of regulation) reflected in behaviour changes.

As has been indicated above, intrinsic motivation as the most self-determined one, makes it possible to effect changes in behaviours with the highest level of effectiveness, simultaneously generating the highest level of satisfaction (Deci, Ryan, 2000). In some situations, however, e.g. in case of difficult, routine or monotonous tasks, such as risk behaviour changes, it is not possible to activate intrinsic regulation (Tokarz, 2005). Related research has indicated that in such cases integrated and identified regulations occur significantly more often than intrinsic regulation and make it possible to effectively carry out tasks (see Lavesque *et al.,* 2007; Vallerand, Koestner, Pelletier, 2008). This assumption was also made for the purpose of constructing the TSRQ, when the three forms of regulation, i.e. intrinsic, integrated and identified formed one factor - autonomous motivation. In contrast, external and introjected regulations are not self-determined and these types of extrinsic motivation have been considered controlled motivation.

The theory of self-determination also takes into account the state of amotivation, which lacks regulation of behaviour (Ryan, Deci, 2002). This state is tantamount to absence of competencies to undertake a task, extreme discouragement, and apathy. Autonomous motivation leads to adaptation (e.g. higher positive well-being or cognitive competencies - cf. Vansteenkiste, Zhou, Lens & Soenens, 2005), but controlled motivation and amotivation produce an opposite result: they relate to negative psychological consequences, e.g. occupational burnout (Lemyre, Treasure & Roberts, 2006), ineffective stress management, anxiety and depression (Mouratidis, Michou, 2011; Ryan, Connell, 1989).

Generality of motivation

The SDT, expanded by the Hierarchical Model of Intrinsic and Extrinsic Motivation (HMIEM, Vallerand, 1997, Vallerand & Ratelle, 2002) proposes that motivation can exist at different levels of generality. At a global level, motivation refers to the general motivation tendency of an individual (intrinsic or extrinsic one) to interact with the environment. Motivation processes assume a contextual level when they concern an individual's general motivation towards a specific life domain (in case of the TSRQ - risk behaviours). According to the HMIEM, there is an interaction between the levels of generality, which leads to two kinds of effect: top-down and bottom-up one. The top-down effect indicates that motivation at a higher level of generality may exert influence on a lower level, while the bottom-up one is a recursive effect in some related activities. Therefore, an assumption can be made that if the diagnosis of a chronic disease is a novel situation for the patient, then global motivation (a broad general tendency) will start to influence the next lower level of generality, e.g. the contextual level of motivation to change risk behaviours.

Previous versions of the Treatment Self-Regulation Questionnaire

The TSRQ was first developed by R.M. Ryan and J.P. Connel (1989), and it was then adapted to assess motivation for changing as well as maintaining various health behaviours (e.g. among patients with type 2 diabetes - Nouwen, Ford, Balan, Twisk, Ruggiero, White, 2011; for a weight-loss evaluation program, e.g. Mata, Silva, Vieira, Carraça, Andrade, Coutinho, Sardinha, Teixeira, 2011; or in case of oncological patients undertaking physical activity - Wilson, Blanchard, Nehl, Baker, 2006). The amotivation subscale was included only in selected studies on, for example, nicotine addiction, initiation of medical treatment, or participation in psychotherapy. Very rarely was intrinsic motivation assessed, due to the fact that few people perceive health-related behaviours as interesting or satisfying (as it has been mentioned above). The TSRQ versions included between 15 and 19 items (Lavesque *et al.,* 2007). The questionnaire version that was used to develop the Polish adaptation was recommended by the *Behavior Change Consortium* (BCC). It concerns self-regulation of three risk behaviours: adequate diet, regular physical activity, and giving up smoking. Within the BCC project these three parallel variants were validated among 2731 subjects at four different sites (Lavesque *et al.,* 2007). The obtained four-factor structure that included autonomous motivation, introjected regulation, external regulation and amotivation was used to evaluate the factor structure of the Polish adaptation.

Aims of the study

The basic aim of the study is to validate the four-factor structure of the TSRQ using exploratory and confirmatory factor analyses. The results of the confirmatory analysis will be used to present an optimal factor model across

three risk behaviours (diet, exercise, and smoking). The convergent validity will be tested based on the relation between measures of the global level and the contextual level of motivation.

Method

Subjects

The study comprised 219 patients, including 101 (46.1%) with first uncomplicated acute coronary syndrome (ACS) diagnosed, and 118 patients with type 2 diabetes as basic diseases, without coexisting chronic diseases, such as cardiac or renal insufficiency, chronic o*bturative* pulmonary disease, or tumours. The first group of patients was examined in hospital several days after the ACS occurrence, immediately before they were discharged, so as to insure the subjects were in good psycho-physical condition during the examination. The type 2 diabetes patients were examined during the first appointment at the diabetic clinic. The subjects were below the age of 66 (*Min.* = 28 years; *M* = 53.35; *SD* = 7.93), due to the different risk behaviour structure and the related recommendations among older patients, and due to the fact that older patients were less probable to strictly follow medical advice (e.g. as a result of a higher percentage of depressive disturbances, see Doggrell, 2010; Tseng, Lin, 2008). The majority of the examined subjects were males (61.2%), which is related to the increased ACS incidence among men (in this group of patients 81.2% were men). Most of the subjects had secondary education (42.9%), followed by elementary and vocational education (33.8%), and university education (23.3%).

Tools: global and contextual level of self-determination continuum assessment

The Treatment Self-Regulation Questionnaire

The Polish language version of the TSRQ was developed according to the principles adopted for the use in intercultural studies (Wild, Grove, Martin, Eremenco, McElroy, Verjee-Lorenz, Erikson, 2005). The English version of the TSRQ is a part of the Health-Care, SDT Questionnaire Packet (see www.selfdeterminationtheory.org).

The TSRQ is used for contextual assessment of motivation to change or maintaining a certain risk behaviour. The questionnaire consists of 15 items evaluated on a 7-point rating scale, ranging from 1 – not at all true, to 7 - absolutely true. The study utilized the instruction on motivation to change behaviour, since at this point, i.e. after the disease was diagnosed, the patients began to receive treatment. Three parallel TSRQ variants were used to measure the

reasons for change of the following risk behaviours: diet, exercise, and smoking. The stem was the same for each risk behaviour, but the test items were different, depending on the behaviour, e.g. '*Because I would feel bad about myself if I did not eat a healthy diet*' or '*Because I would feel bad about myself if I smoked*'. The TSRQ variant for smoking was filled out only by the patients that smoked at the time of the study or had given up smoking not earlier than two weeks prior to the study.

The Global Motivation Scale (GMS)

GMS is used to measure six types of global motivation (Deci and Ryan, 1985). Each of the 18 items had the stem '*In general, I do things …*', followed by various reasons, for which people take part in various life activities, such as, '*… for the pleasure of learning something new*' (intrinsic motivation), '*… because they represent who I am*' (integrated regulation), '*… in order to help myself become the person I aim to be*' (identified regulation), '*… because otherwise I would feel guilty for not doing them*' (introjected regulation), '*… because I do not want to disappoint certain people*' (external regulation) or '*… even though I do not see the benefit in what I am doing*' (amotivation). The response format was a 7-point rating scale, from 1 – not agree at all, to 7 – completely agree. In earlier studies, the six-factor structure of the scale was confirmed; the scale also obtained high reliability and validity (Pelletier, Dion, Slovinec-D'Angelo, Reid, 2004; Pelletier, Dion, Séguin-Lévesque, 2004; Pelletier, Dion, 2007). The Polish adaptation of the GMS (Życińska, Januszek, 2012) was tested in a group of 537 general population subjects. The resultant fit indices suggested that the four-factor model was the most adequate (it did not include the introjected regulation subscale, while one of the factors combined identified regulation and integrated regulation). The factor loadings for individual items in this model were very low, which resulted in a low reliability of all the subscales (in own studies Cronbach's α ranging from .50 to .70).

Results

The TSRQ factor analysis – in search of an optimal model

The first stage of the TSRQ structure validation consisted in confirming the four-factor structure, according to the results obtained by Lavesque *et al.* (2007). The hypothetical model tested separately for each risk behaviour (diet, exercise, and smoking) included the following subscales: autonomous motivation, introjected regulation, external regulation and amotivation. Unlike the US studies,

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[1] The following indices were assessed for three variants of the TSRQ (exercise, diet and smoking, respectively): χ^2 = 212.483; 212.015; 254.639 (*df* = 84; *p* < .001); the Bentler's Comparative Fit Index: *CFI* = .899; .877; .761; the Tucker-Lewis Index: *TLI* = .873; .846; .702; the Bentler-Bonett Normed Fit Index: *NFI* = .845; .815; .690; the Root Mean Square Error of Approximation: *RMSEA* = .089; .089; .155. In case of the listed fit indices it is assumed that (acceptable values in brackets): *CFI* > .95 (> .90); *TLI* > .95 (> .90); NFI > .95 (> .90); *RMSEA* < .05 (< .80) - see Bentler, 1990; Bentler and Bonett, 1980; Bollen and Stine, 1992; Browne and Cudeck, 1993; Hu and Bentler, 1998, 1999

the results of the confirmatory factor analysis (CFA) of the Polish TSRQ adaptation indicated insufficient fit of the four-factor model to the data, irrespectively of the kind of risk behaviour[1].

Since the four-factor model was found to misfit the data, a TSRQ exploratory factor analysis (EFA) was conducted for each variant of the questionnaire. The first to be determined was the number of the questionnaire items, which would be included in further analyses. The measure of sampling adequacy (MSA) for each item indicated that two items from the amotivation subscale (5 and 15), irrespectively of the TSRQ variant, did not achieve the rigorous criterion of above 0.6 (see Kaiser, 1970, based on: Dziuban, Shirkey, 1974), and so they were not included in the EFA.

The Kaiser-Guttman criterion (see Yeomans and Golder, 1982) used in this study indicated the appropriateness of identifying two factors for the TSRQ for smoking and exercise, and three factors in relation to diet. The analysis of the scree plot and the percentage of the variance explained by consecutive factors confirmed such a solution. The next EFA stage consisted in extracting factors using a maximum likelihood method with varimax rotation[2] (see Table 1). The results consistently confirmed the structure of the two factors obtained in earlier studies, i.e.: autonomous motivation and external regulation (Lavesque *et al.,*2007). The TSRQ for diet also uses a two-factor model, since in the three-factor model the items belonging to the last two factors (2 and 3) came from external regulation subscale and showed relatively high common loads (above 0.3). The levels of the explained variance had the following values in the tested models: diet: 52.19%; exercise: 52.47%; smoking: 57.17%.

Table 1 *Factor loadings from the EFA.*

		Factors						
		Exercise		Smoking		Diet		
		①	②	①	②	①	②	③
Autonomous motivation								
1	Because I feel that I want to take responsibility for my own health.	0.727		0.753				
3	Because I personally believe it is the best thing for my health.	0.726		0.802		0.713		
6	Because I have carefully thought about it and believe it is very important for many aspects of my life.	0.754		0.715		0.683		
8	Because it is an important choice I really want to make.	0.793		0.777		0.766		
11	Because it is consistent with my life goals	0.668		0.708		0.688		
13	Because it is very important for being as healthy as possible.	0.662		0.738		0.631		
Introjected motivation								
2	Because I would feel guilty or ashamed of myself if I / smoked/did not eat a healthy diet/did not exercise regularly.				0.619			
7	Because I would feel bad about myself if I /smoked/did not eat a healthy diet/did not exercise regularly.		0.535		0.586			
External regulation								
4	Because others would be upset with me if I /smoked/did not /did not.		0.681		0.674		0.740	
9	Because I feel pressure from others to /not smoke/do so/do so.		0.780		0.697		0.766	
12	Because I want others to approve of me.		0.798		0.790	0.380	0.803	
14	Because I want others to see I can do it.		0.769		0.781	0.324	0.758	
Amotivation								
10	Because it is easier to do what I am told than think about it.		0.544		0.734		0.570	
	Variance Explained (%)	**28.66**	**23.81**	**30.26**	**26.91**	**24.52**	**14.78**	**12.89**

[2] Oblimin factor analyses were also carried out, and produced very similar results as regards the item-factor match at relatively low correlated factors (TSRQ for diet and for exercise). If one takes into account the fact that the EFA was in this study the basis for the CFA, then the varimax rotation from this perspective is an optimal solution (see Fabrigar, Wegener, MacCallum, Strahan, 1999).

Table 2 *Summary of model fit for the two-factor common model.*

Variant	χ^2	df	p	χ^2/df	CFI	TLI	NFI	RMSEA		
								estimated	LO 90	HI 90
Exercise	52.377	32	0.013	1.637	0.977	0.968	0.944	0.057	0.027	0.085
Diet	49.442	32	0.025	1.545	0.976	0.966	0.935	0.053	0.019	0.081
Smoking	43.827	29	0.038	1.511	0.970	0.953	0.918	0.078	0.019	0.122

The two-factor models obtained in the EFA for each risk behaviour were verified using a CFA. The obtained fit indices of the models did not reach acceptable values. It is worth noting at this stage that the models had many common features: the layout of items in each model was similar, and the factors were polarized according to the original division into autonomous motivation and external regulation, with only some participation of the items included in introjected regulation and amotivation. Further CFA was conducted after the models were unified into one version, retaining only these items, which repeated themselves at least in two TSRQ variants. These turned out to be exactly the same items that in the studies by Lavesque *et al.* (2007), matching the two subscales – autonomous motivation and external regulation.

The common model underwent another CFA analysis, separately for each kind of risk behaviour. The obtained results indicated a good fit of models to data (see Table 2), but it is necessary to consider the following remarks: high fit indices were obtained only after significant correlations had been freed between the residuals (on the basis of modification indices); and that the RMSEA is only close to the rigorous limit of .05 - its lower limit is below this criterion.

In case of the TSRQ variants for diet and exercise, the model modification consisted in positive correlating of the residuals of two autonomous motivation subscale items (no. 1 and 3) and two external regulation subscale items (no. 4 and 9). In case of the model explaining motivation to give up smoking, apart from the positive correlations of the residuals between items within the factors, it was also necessary to consider the negative correlations between the factors themselves. Of interest is the fact that, irrespective of the kind of risk behaviour, the inter-correlations between

		λ_1	λ_2	λ_3	λ_4	λ_5	λ_6	λ_7	λ_8	λ_9	λ_{10}	φ
	Exercise	0.841	0.780	0.678	0.700	0.661	0.685	0.872	0.725	0.806	0.632	**0.373**
Variant	Diet	0.781	0.712	0.711	0.700	0.670	0.225	0.867	0.559	0.860	0.552	**0.344**
	Smoking	0.875	0.622	0.730	0.696	0.776	0.790	0.524	0.936	0.571	0.811	**0.516**

← Estimated parameters** →

* In order of EFA
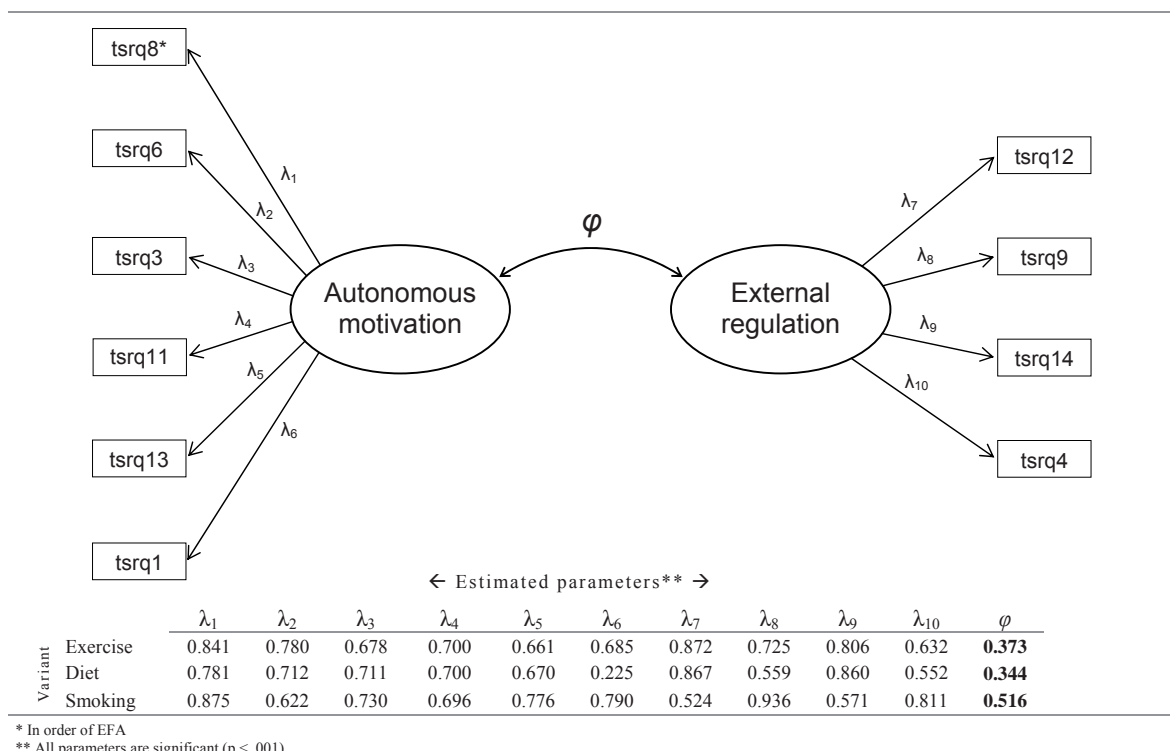** All parameters are significant (p < .001).

Figure 2 The final two-factor model.

autonomous motivation and external regulation were positive and equaled to: diet: .34; exercise: .37 smoking: .52 ($p > .001$) (see Figure 2).

The internal consistency (measured using Cronbach's alpha) of the factors was satisfactory: for autonomous motivation it ranged from .78 to .89, and for external regulation: from .83 to .85, depending on the kind of risk behaviour.

Convergent validity of the TSRQ: the relationships between the motivation to change risk behaviour and global motivation

The correlations between the subscales of the TSRQ and the subscales of the GMS were used to further examine the convergent validity of the TSRQ. During the analysis, the key to the Polish GMS adaptation was used (Życińska, Januszek, 2012), which includes: 1. Intrinsic motivation, 2. Amotivation, 3. External regulation and, 4. Identified and integrated regulation. In case of the TSRQ, the results of the common version were used (diet, exercise, and smoking), i.e.: 1. Autonomous motivation, 2. External regulation. It must be stressed that the TSRQ autonomous motivation was in theory equivalent to two GMS subscales: intrinsic motivation, as well as identified and integrated regulation. The mean value of statistically significant

correlation coefficients was low (.284), and the highest value of correlation (.415) was between the GMS subscale of identified and integrated regulation, and the TSRQ subscale of autonomous motivation (see Table 3).

The pattern of relations (particularly concerning the correlation between autonomous motivation of the TSRQ and the GMS subscales) was observed for each risk behaviour, but did not provide strong evidence of construct validity. Thus, a model of interaction between the global level and the contextual level of motivation was tested[3].

The verified model was based on the previous assumption that if the diagnosis of a chronic disease is a novel situation for the patient, then global motivation (the GMS factors) will influence the contextual level of motivation to change risk behaviours (the TSRQ factors for three risk behaviours). Consequently, the model used for the path analysis adopted a direct impact of the GMS factors on all of the endogenous variables, i.e. the six TSRQ factors (two factors per risk behaviour: diet, exercise, and smoking). The TSRQ measurements were introduced as correlated between risk behaviours, but it was also assumed that there were no relationships between various types of regulation. Such a model was not confirmed, since the fit indices did not reach acceptable values. After only a few steps, the exploration based on the indices of modification of the original model,

Table 3 *GMS vs. TSRQ: correlation matrix*.

		G M S			
		Intrinsic motivation	Amotivation	External regulation	Identified and integrated regulation
TSRQ	**Exercise (N = 151)**				
	Autonomous motivation	0,122	0,135	0,110	0,322**
	External regulation	0,168*	0,297**	0,322**	0,273**
	Diet (N= 151)				
	Autonomous motivation	0,142	0,227**	0,247**	0,415**
	External regulation	0,172*	0,260**	0,327**	0,340**
	Smoking (N= 75)				
	Autonomous motivation	0,207	0,158	0,162	0,286*
	External regulation	0,057	0,246*	0,355**	0,109

* Correlation is significant at the level of 0.01 (2-tailed)
** Correlation is significant at the level of 0.05 (2-tailed).

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[3] The relation at the level of the items from both questionnaires was examined as a part of those analyses. The EFA was used for this purpose (as before - the factors were identified using the maximum likelihood method with varimax rotation), from 8 factors (according to the $\lambda > 1$ criterion) to three- and four-factor analyses selected on the basis of the scree plot and the percentage of the explained variance. The outcome of such analysis was surprising in one respect: irrespective of the number of EFA factors, not a single item measuring motivation at the contextual level (TSRQ) found its way onto the GMS factor list, an essential fact when one considers the aim of the study. Consequently, the contextual motivation turned out to be completely separate from the global motivation assessed at the level of analysis of the questionnaire items that measured those constructs.
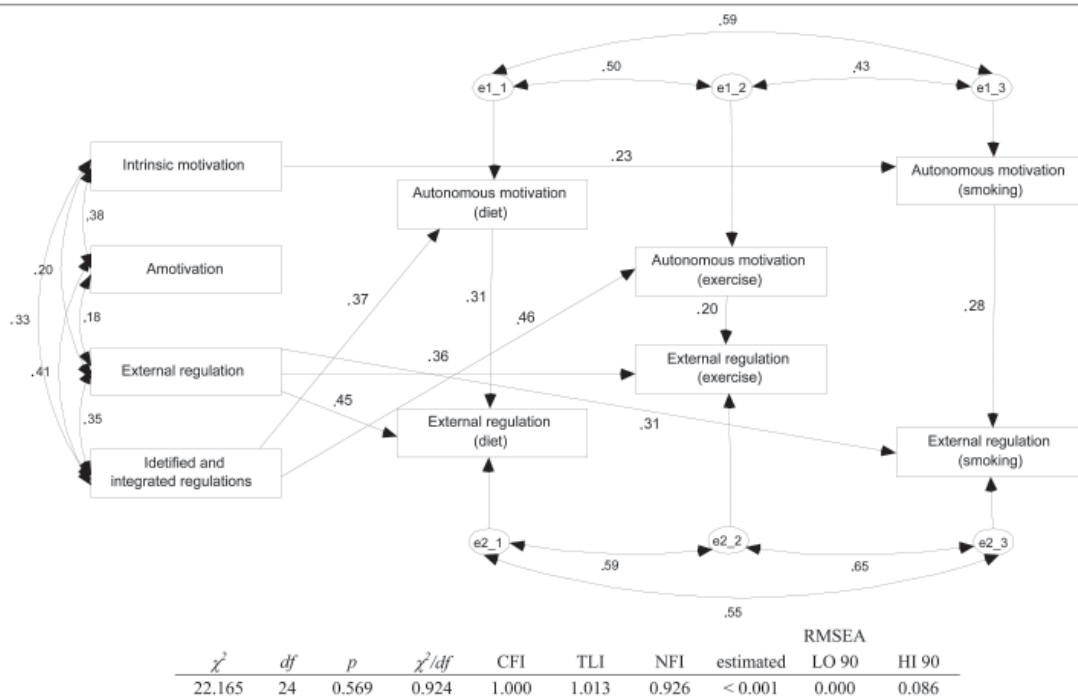
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Figure 3 *SEM(PA) model: The interaction between global motivation (GMS) and contextual motivation towards risk behaviours (TSRQ).*

produced a model with high fit indices (see Figure 3). The direct influence of the global motivation indicators on the motivation indicators concerning the three risk behaviours was limited to three forms of regulation. Global external regulation consistently influenced external regulation of each behaviour; the value of β ranged from .31 (smoking), to .36 (exercise) and .45 (diet), $p < .001$.

The paths leading to autonomous motivation of behaviours followed different patterns: global regulation based on identification and integration impacted autonomous motivation, but only for diet ($\beta = .37$; $p < .001$) and exercise ($\beta = .46$; $p < .001$); for smoking it was explained by global intrinsic motivation ($\beta = .23$; $p < .05$). This means that giving up smoking was to a larger degree based on self-determination, in comparison with the change of the remaining risk behaviours. The model indicated that there were no relationships between the TSRQ factors related to individual risk behaviours; only within the three behaviours did autonomous motivation influence external regulation. It must be borne in mind, however, that the direction of these relations resulted from the modification indices, which were higher for this particular direction and not vice versa (although in both variants the model fit indicators were high). The explained variance for the particular endogenous variables was low in the discussed model: from 5% to 21% for autonomous motivations, and from 18% to 33% for external regulations. The slightly higher percentage obtained for the latter group of variables resulted directly

from the influence of autonomous motivation (direct effects were still at a very low level: .07 – smoking, .09 - exercise, and .12 – diet).

Discussion

The TSRQ factor analyses (exploratory and confirmatory) showed that the four-factor model based on the self-determination theory, verified in earlier studies (Lavesque *et al,.* 2007) did not fit the data, irrespective of the kind of risk behaviour (diet, exercise, or smoking). The two-factor model, containing items of the autonomous motivation and external regulation subscales, distinguished by Lavesque and colleagues (ibidem), proved optimal for each risk behaviour. The model fit indices were adequate across a risk behaviour, while the high factor loads of individual items of both factors resulted in a satisfactory reliability, irrespective of the TSRQ subscales.

The use of the subscales for evaluation of introjected regulation and amotivation raises some doubts, at least in the group of patients with chronic diseases and starting to receive treatment. It is worth noting that the recommended TSRQ key consisting of four subscales was developed on the basis of studies conducted among a population of healthy people. Earlier studies carried out in groups of subjects with somatic diseases (e.g. type 2 diabetes, see Nouwen *et al.,* 2011) indicated low psychometric values, especially on the amotivation scale (also Lavesque *et al.,*

2007). As a result, many studies did not even include the amotivation scale (see Introduction). It must also be added here that the earlier TSRQ versions consisted only of three subscales: autonomous motivation, amotivation, and controlled motivation. Controlled motivation contained the TSRQ items that belonged to the four-factor version of two subscales: introjected regulation and external regulation. This leads to a conclusion that the Polish adaptation structure was heavily influenced by the situation of the chronically ill subjects.

Apart from the situation of the examined subjects, one must also consider more general reasons of failure in confirming the four-factor TSRQ structure. The results of empirical studies on the validation of tools for measuring the self-determination continuum according to the SDT (e.g. review of studies on *Sport Motivation Scale*, Mallet, Kawabata and Newcombe 2007) indicated that in most cases the structure could not be confirmed. As it was the case in the authors' own study, this resulted in a reduced number of the examined forms of regulation or in using the tools in selected groups of subjects (e.g. due to age, see Baldwin & Caldwell, 2003).

In addition to obtaining the motivation continuum structure, it is essential to confirm the assumption concerning interaction between the individual forms of motivation (the so-called simplex pattern, Vallerand, 1997). According to this interaction, intrinsic motivation as a form of motivation with the highest position on the theoretical self-determination continuum should be negatively correlated with the forms of regulation on lower positions, controlled by external demands. The results of own studies did not confirm the negative correlation between autonomous motivation and external regulation. Irrespective of the kind of risk behaviour, inter-correlations were positive, i.e. the higher the autonomous motivation, the higher the external regulation (and vice versa). A considerable part of the research, at least as regards the dependencies between selected forms of motivation, did not reflect the simplex pattern either (e.g., Cokley, 2000; Covington & Muëller, 2001; Smith, Davy, Rosenberg, 2010; Tsorbatzoudis, Alexandris, Zahariadis, Grouios, 2006), although that fact in itself did not indicate whether the activity undertaken by the subjects was effective or not (it could be both high or low). The authors of studies suggested that in such a situation it was necessary to refer to the sources of motivation (see Boiché, Sarrazin, Grouzet, Pelletier, 2008) and to the evaluation of the achieved effects (Guay, Vallerand, Blanchard, 2000). The SDT does not exclude a situation in which several kinds of motivation participate in pursuing one specific aim, such as giving up smoking (e.g. it is important to control the disease, and therefore to follow medical advice; similarly important may be a

better relationship with the family as a result of giving up an addiction; at the same time the subject feels proud and satisfied with her/his long-term efforts).

The results of own studies on the interaction between the levels of generalization according to the HMIEM (Vallerand, 1997; Vallerand & Ratelle, 2002) lead to two conclusions[4]. Firstly, the items measuring global motivation (GMS) and motivation to change risk behaviours (contextual motivation, TSRQ) were completely separate. On this basis it is justified to separately treat the levels of generalization of motivation processes, since the subjects themselves evaluate them separately. Secondly, the impact of global motivation on contextual motivation within the framework of selected forms of motivation was confirmed, thus the convergent validity of the TSRQ was supported. Global external regulation consistently explained external regulation in relation to three risk behaviours: inadequate diet, sedentary lifestyle, and smoking. Autonomous motivation to change risk behaviours depended on the kind of behaviour. Global regulation, based on identification and integration, influenced autonomous motivation to change diet and to take more exercise, while giving up smoking was explained by global intrinsic motivation.

The obtained results may lead to more general conclusions. First of all, it may be accepted that once a subject decided to start receiving treatment for a chronic disease, global motivation, being more stable than contextual motivation, is a basis for assessment of risk behaviour changes. Global motivation may therefore be considered a resource, which influences the subject's decisions in the disease situation. This remains in agreement with S. Hobfoll's conservation of resources theory (COR, Hobfoll, 1998), according to which the individuals with larger resources are more able to initiate the spiral of risk, even when they lose resources as a result of e.g. extreme stress.

The influence of global motivation on higher levels of the self-determination continuum depends on the kind of risk behaviour. Global intrinsic motivation as a pole of the continuum, it influences giving up smoking, while identified regulation and integrated regulation, not far off, influenced dietary modifications and stimulated regular physical activity. Consequently, giving up smoking calls for greater commitment of the self into the process of changes. The results of the studies also point out that the motivation to change a specific behaviour does not make it possible to predict the change of the remaining behaviours (e.g. the fact that the patient is motivated to change her/his diet does not mean that she/he will want to give up smoking). These conclusions may be useful in designing practical actions. The evaluation of a chronically ill patient's global motivation may be considered a basis for predicting motivation to change risk behaviours in general, irrespective

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[4] The results concerning relationships between global motivation and contextual motivation should be interpreted with certain caution, due to the low reliability indicators of the GMS subscales and low levels of the explained variance of contextual variables (TSRQ).

of the type of regulation (here: autonomous motivation and external regulation). The obtained results also promote the use of methods where the subject's environment supports autonomy (including professionals – physicians and psychologists, see ABIM Foundation, 2002). According to the assumptions, the knowledge concerning a disease, acquired on the basis of a partner-like relations with the physician allows the patient to feel competent and ready to control the disease. Competence itself will not suffice, however, to strictly follow medical advice, but because of competence the internalization of external requirements increases. This gives a definite support to autonomous motivation, which in turn enables patients to effectively change their behaviours (Ryan *et al.,* 2008).

Finally, it should be emphasized that the presented reasoning has been based on the previous assumption that if the diagnosis of a chronic disease is a novel situation for the patient, then global motivation will cause the contextual level of motivation to change risk behaviours (e.g. the top-down effect). However, authors have not directly tested the causal ordering and ruled out other possible explanations (e.g. the recursive effect). This issue requires further study with a bigger sample and more adequate measurement of the global level of motivation.

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