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# Choosing an activity that suits: development and validation of a questionnaire on motivational competence in exercise and sport

## Supplementary Information

The online version of this article (<https://doi.org/10.1007/s12662-020-00698-z>) contains supplementary material, which is available to authorized users.

## Introduction

When inactive people (re-)start with exercise and sport activities, they are often advised to choose an activity they enjoy doing (American College of Sports Medicine, 2018). The underlying assumption is that an exercise and sport activity which suits one's preferences and, therefore, provides pleasure, is more likely to be maintained (Klusmann, Musculus, Sproesser, & Renner, 2016; Sudeck & Conzelmann, 2011). Maintaining the activity, in turn, is important to achieve various biopsychosocial health benefits, such as a reduced risk of obesity, cancer, cardiovascular disease, mental health conditions, and increased well-being and self-esteem (Eime, Young, Harvey, Charity, & Payne, 2013; Penedo & Dahn, 2005; Reiner, Niermann, Jekauc, & Woll, 2013; Warburton & Bredin, 2017).

However, finding the preferred exercise and sport activity is not a trivial matter. This is partly due to the wide variety of different possibilities and partly because it cannot be assumed that preferences, especially for inactive people, are known. Rather, a successful search necessitates so-called motivational competence. Rheinberg and Engeser (2010,

p. 532) define motivational competence as "a person's ability to reconcile current and future situations with his or her activity preferences such that he or she can function effectively, without the need for permanent volitional control". Namely, motivational competence consists of three different components (Rheinberg, 2002; Rheinberg & Engeser, 2010, 2018; Rheinberg & Vollmeyer, 2018):

(1) It is important for people to know their own motives. Explicit motives can be defined as self-attributed needs and conscious goals (Heckhausen & Heckhausen, 2018), in exercise and sport this indicates that a person is aware of what is important for him/her when active. For example, they may be looking to improve fitness, to be in contact with other people, or to reduce stress (Lehnert, Sudeck, & Conzelmann, 2011). (2) It is also important to correctly assess situations in terms of their incentives. This implies a person knows what to expect in specific exercise and sport activities. For instance, when fit boxing, you can experience how the heart is pumping and how you get out of breath. As a team member in a game-oriented sport activity, you can spend time with other people. Or while doing yoga, you can look inward and relax. (3) And finally, it is important to not only set your goals, but also manage your situation appropriately: this helps you realise your behaviour and ultimately result in joyful and efficient activity. Again when applying this to exercise and sport, the person is able to self-determinedly

choose an activity that corresponds to their own preferences or to arrange and realise the activity accordingly (e.g. jogging outdoors instead of on the treadmill to reduce stress).

In general, the term *competence* can be embedded in different competence approaches. In the present paper, a functional-pragmatic approach of competence is assumed (Klieme, Hartig, & Rauch, 2008). Competencies should be operationalised in a specific context (Klieme et al., 2008; Koeppen, Hartig, Klieme, & Leutner, 2008). In the following, motivational competence is seen in the context of maintaining exercise and sport on a long-term and regular basis. The three above-mentioned components of motivational competence are variously demanding and complex (Taxonomy of Educational Objectives; Kratwohl, 2002). Components (1) and (2) refer to the acquisition and reproduction of (domain-specific) knowledge (e.g. knowing one's own preferences in the context of exercise and sport or knowing the incentives of an activity). In contrast, component (3) is rather the application of one's preferences. This means being able to use the knowledge in a concrete situation (e.g. selecting a suitable activity and arranging appropriate situations).

Motivational competence is linked to several psychological constructs. For one, motivational competence is connected with self-concordance (Sheldon & Elliot, 1999), which is defined as the degree to which a chosen goal repre-

sents one's own interests and values. Self-concordance represents a continuum ranging from a person's intrinsic motivation mode, where the exercise and sport activity is inherently interesting, to an external motivation mode, where the person wants to be active owing to external pressure or positive consequences (Sheldon, 2009; Sheldon & Elliot, 1999). Research shows that intrinsic and identified motivation are positively associated with regular exercise and sport behaviour, whereas introjected and extrinsic motivation are mainly unrelated with behaviour (Teixeira, Carraca, Markland, Silva, & Ryan, 2012). Both motivational competence and self-concordance involve one's personal interests. For both constructs, it is assumed that experiencing an activity as satisfying is important for participating long-term in exercise and sport (Rheinberg & Engeser, 2018; Teixeira et al., 2012). However, the two constructs are different in that self-concordance describes the quality of a more or less self-concordant goal, whereas motivational competence describes the knowledge and abilities needed to create conditions to pursue goals efficiently and joyfully.

In addition, motivational competence is closely linked to physical activity-related health competence (PAHCO; Carl, Sudeck, & Pfeifer, 2020; Schmid, Haible, & Sudeck, 2020; Sudeck & Pfeifer, 2016). PAHCO refers to the competencies required to lead a healthy, physically active lifestyle. Of particular interest for the present study is physical activity (PA)-specific self-regulation. It contains the motivational and volitional basis for regular PA. Thereby motivation is relevant for creating intentions, whereas volition is essential for pursuing intentions (Heckhausen & Heckhausen, 2018). On the volitional side, self-control contains strategies to develop action and coping plans (Gollwitzer & Oettingen, 2016; Gollwitzer & Sheeran, 2006) and to suppress conflicting interests (Englert, 2016). PA-specific self-control is a key element for translating intentions into actual PA behaviour and building habits (Hagger, 2019). This volitional aspect as a subfacet of PA-specific self-regulation has already been empirically investigated

(e.g. Carl, Sudeck, Schultz, & Pfeifer, 2020; Lenartz, 2012; Sudeck & Pfeifer, 2016). For the motivational side of PA-specific self-regulation within the PAHCO approach, operationalisation is missing. This is where the construct of motivational competence could fill the gap.

## Purpose of the present investigation

In previous research motivational competence was viewed as a general psychological construct for explaining human behaviour (Rheinberg, 2002; Rheinberg & Engeser, 2010, 2018). However, it became clear that due to the various goals, the variety of activities and the different ways of arranging an activity, motivational competence might be important to maintain exercise and sport. Therefore, it could be beneficial to promote motivational competence by designing interventions and investigating their effectiveness. To do so, a well-validated questionnaire is needed. Hence, the overarching goal of this article is to develop and validate a theoretically underpinned and economical self-assessment scale in German for motivational competence. For this purpose, the following three research questions were posed:

1. Which items, that is, statements, are the most appropriate to measure motivational competence? To answer this question, items were developed based on theoretical considerations and communicative validation. Following this, factorial validity was checked with two independent samples.
2. How reliable is the scale? Factor, indicator and test-retest reliability were analysed.
3. How valid is the scale? To test further construct validity, we analysed how motivational competence is related to self-concordance. According to Sheldon and Elliot (1999), it can be hypothesised that motivational competence is positively related to self-concordant goals, such as intrinsic and identified motivation modes, whereas with non-self-concordant goals, such as introjected and extrin-

sic motivation mode, it is less or not at all related. To test criterion validity, we analysed how motivational competence is associated with PA-specific self-control and with the volume of exercise and sport. It can be assumed theoretically that motivational competence and PA-specific self-control are positively associated (Sudeck & Pfeifer, 2016). Furthermore, both constructs should make an independent contribution to explain the volume of exercise and sport, whereas PA-specific self-control may be more closely related, since it refers to the regularity of behaviour.

## Methods

### Item development

First, twelve items were developed in accordance with the construct of motivational competence (Rheinberg, 2002; Rheinberg & Engeser, 2010, 2018; Rheinberg & Vollmeyer, 2018). All Rheinberg and Vollmeyer's components (2018) were covered with at least one item. In addition, the items contained knowledge and application from Kratwohl's Taxonomy of Educational Objectives (2002) (see Electronic Supplementary Material 1). These initial items were developed by a focus group (Barbour, 2007) consisting of four sport scientists and one psychologist. These experts reviewed the items twice (Worthington & Whittaker, 2006).

Second, to test comprehensibility, five qualitative interviews with adults ( $M_{\text{age}} = 42.00$ , three women, two men) with the think-aloud technique (Presser et al., 2004) were conducted. This revealed that some items were problematic because they contained terms that were either incomprehensible or ambiguous (e.g. characterise, interests, or experiences). Consequently, these items<sup>1</sup>

<sup>1</sup> For example, the item "I can estimate very well what to expect in various exercise and sport activities" cannot be answered by inactive people, because they may not have previous experience. In the item "I find it very easy to estimate what characterises different exercise and sports activities" the expression *characterises* was interpreted differently.

were removed. Finally, seven items (see Electronic Supplementary Material 1) were selected for testing in the empirical study. Participants evaluated these seven items on a 5-point Likert scale ranging from *does not apply at all* (1) to *applies exactly* (5).

### Samples and data collection

The sample for this study was collected in two different ways. Firstly, participants were recruited via a health insurance's online (newsletter, posts in social media) and print media (magazine, flyer, media release). In all, 466 adults followed the request and filled out the online questionnaire. Secondly, participants were recruited via service companies' health management platforms. As a result, 201 adults completed the online or paper-pencil questionnaire. A subsample of 76 people accomplished the questionnaire again two weeks after and thus were used to check test-retest reliability. In total the overall sample contains 667 people (for details see [Table 1](#)).

### Measures for validation

#### Sport- and exercise-related self-concordance

Self-concordance was assessed using the self-concordance of the sport- and exercise-related goals-scale (Seelig & Fuchs, 2006). This well-validated scale measures four modes of motivation (intrinsic, identified, introjected and extrinsic) with 12 items. Based on the sentence "I intend to exercise regularly within the next few weeks and months because ..." statements such as, "it's just fun for me" (intrinsic) or "other people tell me to be physically active" (extrinsic) had to be evaluated. Participants answered the statements on a 6-point Likert scale ranging from *does not apply at all* (1) to *applies exactly* (6). Cronbach's  $\alpha$  was acceptable to good ( $0.75 \leq \alpha \leq 0.87$ ).

#### PA-specific self-control

PA-specific self-control was measured with the 3-item scale developed and validated by Sudeck and Pfeifer (2016). Participants had to rate statements such as "when I decide to exercise more, I am

very disciplined in implementing this plan" on a 5-point Likert scale ranging from *does not apply at all* (1) to *applies exactly* (5). Cronbach's  $\alpha$  was good ( $\alpha = 0.88$ ).

#### Exercise and sport behaviour

Exercise and sport behaviour was recorded with the Physical Activity, Exercise, and Sport Questionnaire (Fuchs, Klaperski, Gerber, & Seelig, 2015). Participants could indicate up to three different activities. Furthermore, they specified how often and how long they had performed each activity in the four weeks before data collection. A weekly volume of exercise and sport activity was calculated, based on frequency and duration of each specified activity given.

#### Data preparation and analysis

The entire sample was checked for multivariate outliers using Mahalanobis distance ( $\chi^2$  at  $p < 0.001$ ) (Tabachnick & Fidell, 2013). A total of 22 individuals were removed from the data set. Missing values (0.62%) were estimated with the full information maximum likelihood procedure (Little & Rubin, 2020). For the seven items of motivational competence, the percentage of missing value was 0.04%, which corresponds to two missing values. The data were analyzed with MPlus Version 8.4 (Muthén & Muthén, 2017).

#### Factorial validity

To examine factorial structure (research question 1), the total sample of 645 was randomly split half into halves: sample A and sample B (see Electronic Supplementary Material 2). Exploratory structural equation modeling (ESEM) (Asparouhov & Muthén, 2009) with the robust maximum likelihood (MLR) estimator method and target rotation was used to check the initial factor structure of the item pool with sample A. Thereby, only factor loadings with  $> 0.50$  were considered. According to Schermelleh-Engel, Moosbrugger, and Müller (2003), a good and acceptable model fit is given if the comparative fit index (CFI)  $\geq 0.97$  and  $\leq 0.95$ , the Tucker-Lewis Index (TLI)  $\geq 0.97$  and  $\leq 0.95$ , the standardised root mean square resid-

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#### Abstract

The current study presents the development and validation of a questionnaire on motivational competence in exercise and sport. Motivational competence characterises the self-determined ability to choose a suitable exercise and sport activity. Knowing one's own preferences and what to expect in different activities helps people to make this choice, which, in turn, supports them in maintaining their physical activity (PA) on a long-term and regular basis. The developed items cover the following three components of motivational competence: 1) knowing one's own preferences, 2) knowing what to expect in different exercise and sport activities, and 3) choosing and arranging an exercise and sport activity. Psychometric properties were checked using a sample with  $N = 667$  adults ( $M_{age} = 42.49$ ,  $SD = 14.71$ , 62% female). The final one-dimensional scale consists of four items. Construct validity showed positive relationships to intrinsic and identified motivation modes of self-concordance and conversely no relationship to introjected and low negative to extrinsic motivation. For criterion validity, the structural equation modeling demonstrated that motivational competence and PA-specific self-control are independently and positively associated with exercise and sport behaviour. Overall, the newly developed scale is a psychometrically sound and economical instrument to be used in exercise and sport promotion (e.g. counselling) and research.

#### Keywords

Scale development · Competence · Motivation · Exploratory structural equation modeling · Physical activity

ual (SRMR)  $\leq 0.05$  and  $\leq 0.10$ , and the root mean square error of approximation (RMSEA)  $\leq 0.05$  and  $\leq 0.08$ , respectively. To cross-validate the factorial structure, metric measurement invariance tests across samples A and B were conducted. As a precondition, configural

**Table 1** Overview and characteristics of the sample ( $n = 667$ )

Variables	% or Mean (SD)
Sex	62% female, 38% male
Age	42.49 years (14.71 years)
<i>Level of education</i>	
First-level education (e.g. primary school)	2%
Second-level education (e.g. apprenticeship)	41%
Third-level education (e.g. university)	55%
Others	2%
<i>Weekly volume of exercise and sport (last 4 weeks)</i>	130.02 min (212.65 min)
Inactive	31%
1–74 min	11%
≥ 75 min	58%

measurement invariance was examined, whereby a separate ESEM was conducted for each sample. According to Chen (2007), measurement invariance is given if  $\Delta\text{CFI} \leq 0.010$  and  $\Delta\text{RMSEA} \leq 0.015$ .

### Reliability

Composite reliability (CR) (Bagozzi & Yi, 2012) and the average variance extracted (AVE) (Fornell & Larcker, 1981) were calculated to determine the reliability of the factors (research question 2). In addition, Cronbach's  $\alpha$  was calculated. To estimate the reliability of the indicators, squared multiple correlations (SMC) were computed.  $\text{CR} \geq 0.70$ ,  $\text{AVE} \geq 0.50$ , Cronbach's  $\alpha \geq 0.80$ , and  $\text{SMC} \geq 0.40$  were used as cut-offs for good reliabilities. To consider test-retest reliability ( $r_{\text{tt}}$ ) in the subsample, the Pearson coefficient was used over a period of 14 days ( $M = 14.45$  days,  $SD = 1.53$ ). If  $r_{\text{tt}}$  is  $\geq 0.70$ , it is satisfactory.

### Construct validity and criterion validity

To assess construct and criterion validity (research question 3), two different analyses were made. Firstly, based on a structural equation modeling, latent correlation coefficients between motivational competence and intrinsic, identified, introjected, and extrinsic modes of motivation of self-concordance (Seelig &

Fuchs, 2006) were calculated. According to Cohen (1988), effect sizes with 0.10 were classified as small, 0.30 as medium and 0.50 as large. The level of significance was set at  $p < 0.05$ , except when testing the null hypotheses, where it was set at  $p < 0.10$ . Secondly, a structural equation modeling with motivational competence and PA-specific self-control was conducted to see how these constructs are associated with the weekly volume of exercise and sport. The same cut-offs for a good and acceptable model fit apply as listed above. Significance level was set at  $p < 0.05$ . In addition, the Fornell-Larcker criterion (Fornell & Larcker, 1981) for motivational competence and PA-specific self-control was calculated, which is given when AVE of a factor is greater than the square variance between the factors.

## Results

### Factorial validity

To start, one- to three-factor models were examined. However, when two and three factors were targeted, no clearly distinguishable factor structure (e.g. high cross-loadings) can be identified. That is why the following analysis refers to a one-factor solution only. We started with a 7-item model in sample A. There it became clear that MC6 should be dropped out due to relatively low factor loading, worse kurtosis and low item difficulty (Table 2).

From a statistical perspective, the remaining items can be classified as comparably good when considering the 6-item model. Nevertheless, two more items were deleted because of the economy of the measurement tool and based on theoretical and content-related assumptions. Thus, MC5 was removed, since MC5 is quite similar in content to MC3 (see Electronic Supplementary Material 1). Both items are about people knowing their own preferences and thus establishing a fit with a suitable exercise and sport activity. Despite this similarity, MC3 covers the competence category *knowledge* (i.e. "I know exactly ...") more appropriately (Kratwohl, 2002). Finally, MC7 was excluded. Both, MC7

and MC4 aim at identifying different incentives, whereby the wording of MC7 "... what to expect in various exercise and sport activities" is broader than the wording of MC4 "... what characterises different exercise and sport activities". Thus, MC4 is closer in content to the original theoretical construct. The final 4-item version displayed the best model fit ( $\text{CFI} = 1.000$ ,  $\text{SRMR} = 0.006$ ,  $\text{TLI} = 1.000$ , and  $\text{RMSEA} = 0.000$ ) in comparison to the other models (see Electronic Supplementary Material 3). In addition, all items had satisfactory high factor loadings (Table 2). Only the factor loading of MC4 was slightly lower. It should be noted that the 3-item model did not cover the whole facet of motivational competence, which is why it was not pursued in detail.

Furthermore, configural measurement invariance was independently demonstrated in sample A and sample B (Table 3). In addition, both samples combined met the cut-off values ( $\Delta\text{CFI} \leq 0.010$  and  $\Delta\text{RMSEA} \leq 0.015$ ) for metric measurement invariance.

Therefore, the metric measurement invariance of the final 4-item model means that equal factor loadings in these two samples can be assumed and that statements about correlations with other constructs are allowed. Thus, the two samples were merged for further analysis.

### Reliability

The reliability tests showed satisfactory results. All coefficients exceed the cut-off values with  $\text{CR} = 0.86$ , Cronbach's  $\alpha = 0.86$  and  $\text{AVE} = 0.62$ . All items showed good values for SMC (0.49–0.69). In addition, test-retest reliability ( $r_{\text{tt}}$ ) over a period of two weeks displayed a positive correlation of  $r_{\text{tt}} = 0.79$  ( $p < 0.001$ ,  $n = 76$ ), which is satisfactory.

### Construct validity and criterion validity

As expected, motivational competence correlated with the constructs included to test the scale's construct validity. A large positive correlation was found for the intrinsic motivation mode ( $r = 0.63$ ,  $p < 0.001$ ), whereas a medium-sized cor-

**Table 2** Factor loadings and descriptive statistics of samples A and B

Items	Factor loadings								Descriptive statistics of samples A and B							
	7-item model		6-item model		5-item model		4-item model		M		SD		Skewness		Kurtosis	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
MC1	0.84	0.81	0.84	0.81	0.84	0.82	0.83	0.82	3.67	3.78	1.06	1.01	-0.67	-0.70	-0.17	-0.01
MC2	0.79	0.80	0.78	0.78	0.78	0.79	0.80	0.82	3.90	3.89	0.93	0.91	-0.70	-0.73	0.10	0.23
MC3	0.81	0.77	0.80	0.77	0.81	0.76	0.83	0.79	3.74	3.80	1.04	0.96	-0.52	-0.65	-0.55	0.14
MC4	0.73	0.73	0.73	0.75	0.73	0.74	0.70	0.68	3.20	3.28	1.01	0.99	-0.22	-0.09	-0.56	-0.54
MC5	0.78	0.72	0.79	0.72	–	–	–	–	3.94	3.87	1.03	0.98	-0.85	-0.73	-0.01	0.08
MC6	0.57	0.63	–	–	–	–	–	–	4.10	4.11	0.78	0.79	-0.85	-0.90	1.18	1.34
MC7	0.76	0.79	0.77	0.79	0.76	0.79	–	–	3.42	3.50	0.90	0.93	-0.31	-0.41	-0.08	-0.05

A sample A ( $n = 323$ ), B sample B ( $n = 322$ )

**Table 3** Measurement invariance of the final 4-item model

	MLR- $\chi^2$	df	CFI	TLI	SRMR	RMSEA [90% CI]	$\Delta$ CFI	$\Delta$ RMSEA
Sample A ( $n = 323$ )	1.05	2	1.000	1.000	0.006	0.000 [0.000–0.091]	–	–
Sample B ( $n = 322$ )	2.45	2	0.999	0.997	0.010	0.027 [0.000–0.117]	–	–
Configural invariance	3.48	4	1.000	1.000	0.008	0.000 [0.000–0.079]	–	–
Metric invariance	5.11	7	1.000	1.000	0.026	0.000 [0.000–0.056]	0.000	0.000

MLR- $\chi^2$  robust maximum likelihood estimation, CFI comparative fit index, TLI Tucker–Lewis Index, SRMR standardised root mean square residual, RMSEA root mean square error of approximation, 90% CI confidence interval for RMSEA

relation was manifested for the identified motivation mode ( $r = 0.44$ ,  $p < 0.001$ ). Furthermore, as hypothesised, no correlation with the introjected motivation mode ( $r = -0.00$ ,  $p = 0.970$ ) was found, whereas the extrinsic motivation showed a small and negative correlation ( $r = -0.11$ ,  $p = 0.062$ ).

For criterion validity, both factors—motivational competence and PA-specific self-control—met the Fornell–Larcker criterion ( $AVE_{MC} = 0.62 > (0.65)^2 = 0.42$ ;  $AVE_{SC} = 0.71 > (0.65)^2 = 0.42$ ). In addition, the structural equation model fitted the data well (CFI = 0.999, SRMR = 0.010, TLI = 0.998, and RMSEA = 0.014). Motivational competence ( $\beta = 0.13$ ,  $p = 0.008$ ) and PA-specific self-control ( $\beta = 0.48$ ,  $p > 0.001$ ) were positively associated with the weekly volume of exercise and sport (■ Fig. 1). The model explains 33% of the variance of weekly volume of exercise and sport. Furthermore, a positive correlation between motivational competence and PA-specific self-control ( $\beta = 0.65$ ,  $p > 0.001$ ) occurred.

## Discussion

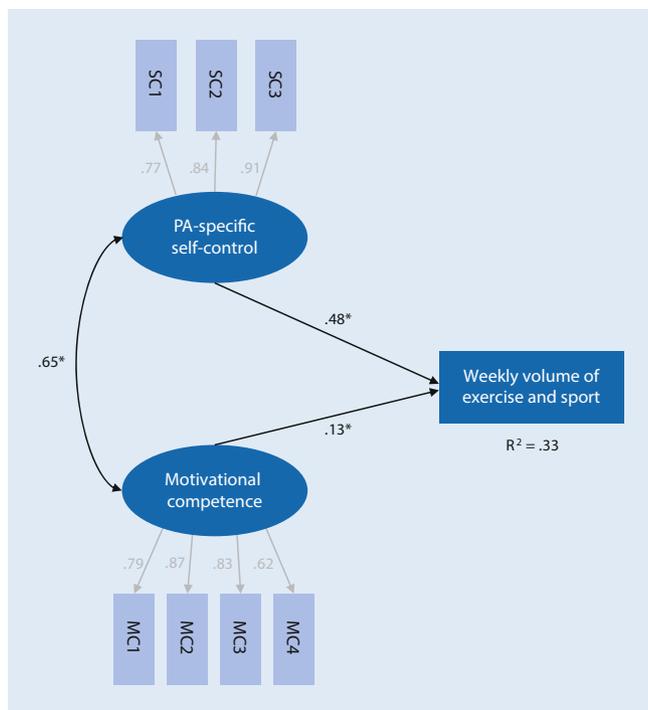
The aim of this current study was to develop and validate a German self-as-

essment scale to measure motivational competence. We have shown that motivational competence can be measured on a one-dimensional scale. This scale covers three components by Rheinberg and Vollmeyer (2018), namely, (1) awareness of one's own preferences, (2) knowledge of the incentives of various exercise and sports activities, and (3) corresponding selection and arrangement of a suitable exercise and sport activity.

This newly developed instrument on motivational competence meets the quality criteria for psychometric properties. The analysis displays favourable values for the reliability of the factor, the indicators and the test–retest. Likewise, the positive relationships to intrinsic and identified motivation of self-concordance (Seelig & Fuchs, 2006) indicate good validity. The results may assume that people with a high level of motivational competence do exercise and sport activities which are rather congruent to their motives. In addition, they need less volitional control for execution (Rheinberg, 2002; Rheinberg & Engeser, 2018). This increases the chance of engaging intentionally in motive-fitting situations. Conversely, no relationship to introjected and a low negative relationship to extrinsic motivation is revealed, which underlines the state-

ment above. The results of the structural equation model provide additional evidence for validity. Both PA-specific self-control and motivational competence are independently associated with the volume of exercise and sport, whereby the association with PA-specific self-control is strongest. These findings are consistent with previous research (Sniehotta, Scholz, & Schwarzer, 2005), where both motivation and volition are related to exercise and sport behaviour; however the correlation to volition is comparably higher. To sum up, the theoretical expectations and validation hypotheses posed have been confirmed and a satisfactory validity is indicated.

The present findings support the two-sidedness of PA-specific self-regulation, which is the basis for regular PA. Motivational competence as the motivational side of PA-specific self-regulation represents the self-determined ability to choose a suitable exercise and sport activity and arrange it efficiently and joyfully. In contrast, self-control—as the volitional side—represents the planning of this exercise and sport activity. Thus, motivational competence and PA-specific self-control are two substantial and discriminant determinants of exercise and sport behaviour which complement



**Fig. 1** ◀ Structural equation modeling for the association between motivational competence, PA-specific self-control and weekly volume of exercise and sport ( $N = 645$ ) (Reported coefficients and factor loadings are standardized. For more clarity, cross-loadings  $< 0.20$  are not displayed. MC motivational competence, SC PA-specific self-control; \* $p < 0.05$ )

each other. In the future, how the two constructs interact could be investigated in more detail, for example, whether there is a compensation mechanism as assumed by Rheinberg and Vollmeyer (2018).

Although the questionnaire demonstrates good psychometric properties, four limitations need to be pointed out. The first limitation concerns the one-dimensionality of the scale. This implies that specific changes in a component (e.g. knowing one's own motives) cannot be analysed separately. To its credit, however, a short scale is economical. The second limitation concerns the sample. Due to the absence of a random selection, the representativeness of the sample is slightly limited. Women (62%), people with a higher education (e.g. university degree; 55%), and people with a high activity level ( $\geq 75$  min/week; 58%) are overrepresented, which might influence the results. The third limitation concerns the assessment of exercise and sport behaviour. The volume of exercise and sport was assessed using self-reports. Consequently, it could be that people overestimate themselves in declaring their PA. This potential bias of memory and social desirability must be taken into account (Nigg et al., 2020). Here, the use

of an accelerometer would provide objective data of PA. The fourth limitation concerns the study design. The relationships examined in this study are cross-sectional. When it comes to the maintenance of PA, however, longitudinal data are particularly important.

Future research should examine how motivational competence can be promoted. A possible intervention could be in the form of an exercise and sport counselling (Schmid, Conzelmann, & Sudeck, 2013; Schmid, Schorno, Gut, Sudeck, & Conzelmann, *in press*), in which the three components from motivational competence are addressed. For example, people could become more aware of their preferences (component 1) through the assessment of their motives and the discussion of the individual motive profile (e.g. Sudeck, Lehnert, & Conzelmann, 2011). Various exercise and sport sessions could help people gain experiences and understand the incentives of different activities (component 2). Finally, a guided reflection with a counsellor about the experienced activities (e.g. what did you like? Why did you (not) like it?) could help people to find an exercise and sport activity that suits them (component 3). In addition to motivational competence, such

a counselling also ideally promotes PA-specific self-control, by planning actions (e.g. how to implement the activity in everyday life) or addressing barrier management, for example. A promotion from motivational and volitional aspects should contribute to the fact that no intention-behaviour gap arises, and thus people are regularly and for a long-term active (Fuchs, Göhner, & Seelig, 2011; Milne, Orbell, & Sheeran, 2002). Such an intervention can be implemented in a non-clinical or clinical setting (e.g. at the end of a rehabilitation program). Future research should investigate the effectiveness of a counselling on motivational competence using a longitudinal design, whereby the newly developed questionnaire may be used to measure the impact. Further studies should additionally examine general factors influencing motivational competence (e.g. implicit associations) and the effect on exercise and sport behaviour (e.g. Brand & Ekkekakis, 2018).

In the present study motivational competence as a general construct was examined in the domain of exercise and sport. Overall, results show that motivational competence is a relevant domain-specific construct that should be given more attention both in research and practice. Furthermore, the questionnaire is a useful tool for the assessment of motivational competence and to check the effectiveness over time, especially for the planning of interventions that promote motivational competence.

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## Compliance with ethical guidelines

**Conflict of interest.** N. Schorno, G. Sudeck, V. Gut, A. Conzelmann and J. Schmid declare that they have no competing interests.

All procedures performed in studies involving human participants or on human tissue were in accordance with the ethical standards of the institutional and/or national research committee and with the 1975 Helsinki declaration and its later amendments or comparable ethical standards. The Ethics Committee of the Faculty of Human Sciences of the University of Bern's Faculty of Human Science approved the study design and procedures (number: 2018-11-00004). Informed consent was obtained from all individual participants included in the study.

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