



Intentions, planning, and self-efficacy predict physical activity in Chinese and Polish adolescents: Two moderated mediation analyses¹

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ABSTRACT. Planning is assumed to translate intentions into health behaviors. However, this may fail due to a lack of perceived self-efficacy. People do not tackle challenging tasks if they harbor self-doubts, even if they have made a good action plan. The present two descriptive longitudinal studies are designed to examine the putative moderating role of self-efficacy in the planning-behavior relationship. In Study I ($N = 534$ Chinese adolescents), intentions were assessed at baseline, whereas planning, self-efficacy, and physical activity were measured four weeks later. In Study II, 620 Polish adolescents filled out questionnaires assessing physical activity, intentions, planning, and self-efficacy with a 10-week follow-up assessment of physical activity. A moderated mediation model was examined. Planning was specified as a mediator between intentions and behavior, whereas self-efficacy was specified as a moderator of the planning-behavior relationship. Results confirm that levels of self-efficacy moderate the mediation process. The strength of the mediated effect (intention via planning on behavior) increased along with levels of self-efficacy. These results remained valid after accounting for baseline physical activity. For planning to mediate the intention-behavior relation, adolescents must have sufficiently high levels of self-efficacy. Otherwise, planning

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might be in vain. Implications for theory advancement and intervention development are discussed.

KEYWORDS. Physical activity. Self-efficacy. Intentions. Planning. Adolescents. Descriptive study.

RESUMEN. Se cree que la planificación traslada las intenciones en conductas saludables. Sin embargo, esto puede fallar debido a la falta de autoeficacia percibida. Las personas no afrontan tareas difíciles si guardan auto-dudas, incluso si han hecho un buen plan de acción. Los presentes dos estudios longitudinales descriptivos se diseñaron para examinar el supuesto rol moderador de la autoeficacia en relación planificación-conducta. En el Estudio I ($N = 534$ adolescentes chinos), se evaluaron las intenciones en la línea base, mientras que la autoeficacia y la actividad física fueron medidas cuatro semanas más tarde. En el Estudio II, 620 adolescentes polacos rellenaron cuestionarios que evaluaban la actividad física, intenciones, planificación y la autoeficacia en un seguimiento de la actividad física de 10 semanas. Un modelo de mediación moderada fue estudiado. Se especificó la planificación como mediadora entre las intenciones y el comportamiento, mientras que la autoeficacia se especificó como mediadora de la relación planificación-conducta. Los resultados confirman que los niveles de autoeficacia moderan el proceso de mediación. La fuerza del efecto mediado (intención vía planificación del comportamiento) se incrementó junto con los niveles de autoeficacia. Estos resultados permanecieron válidos después de haber contabilizado la actividad física de la línea base. Para que la planificación sea mediadora de la relación intención-conducta es necesario que los adolescentes tengan los niveles de autoeficacia suficientemente altos. De otra manera, la planificación puede hacerse en vano. Se discuten las implicaciones para el desarrollo teórico y de intervenciones

PALABRAS CLAVES. Actividad física. Autoeficacia. Intenciones. Planificación. Adolescentes. Estudio descriptivo.

Physical activity in adolescence is a relevant predictor of youth's health, and it explains morbidity in adulthood as well (Hallal, Victora, Azevedo, and Wells, 2006). Systematic reviews indicate that an active lifestyle has short-term beneficial effects for bone and mental health, whereas long-term effects refer to protective effects on adiposity (Reichert, Menezes, Wells, Dumith, and Hallal, 2009), bone health in adulthood, and a reduced risk of some types of cancer in adulthood (Hallal *et al.*, 2006). An active lifestyle in adolescence is a significant predictor of physical activity in adulthood, with moderate effects sizes (Hallal *et al.*, 2006). Research conducted in developed countries indicated that compared to the late 1990s, adolescents in the year 2004 engaged in moderate to vigorous physical activity less frequently and spent more leisure time in front of computers (*cf.* Nelson, Neumark-Stzainer, Hannan, Sirard, and Story, 2006).

Intentions, planning, and behavior

To adhere to the recommendations, one has to form an explicit behavioral intention. However, intentions often fail to be translated into physical activity. Thus, additional

psychological constructs must be studied to understand the mechanisms that are involved in activity change. Although the construct of intention is indispensable in explaining health behavior change, its predictive value is limited. When trying to translate intentions into behavior, individuals are faced with various obstacles, such as distractions, forgetfulness, temptations, or conflicting bad habits. Godin and Kok (1996), who reviewed 19 studies, found a mean correlation of .46 between intention and health behavior, such as exercise, screening attendance, and addictions. Abraham and Sheeran (2000) reported behavioral intention measures to account for 20-25% of the variance in health behavior measures. These findings are likely an overestimate of the true nature of this relationship due to publication bias. Nonsignificant findings rarely find their way into journals. People often do not behave according to their intentions (Scholz, Nagy, Göhner, Luszczynska, and Kliegel, 2009; Sniehotta, 2009). Therefore, intentions need to be supplemented by other, more proximal factors that might facilitate the translation of intentions into action (Wiedemann, Schüz, Sniehotta, Scholz, and Schwarzer, 2009). Some facilitators have been identified, such as perceived self-efficacy and planning. However, it is not fully understood how these two factors interplay with intentions and behaviors. Previous studies have specified self-efficacy and planning as mediators between intentions and behaviors (*e.g.* Schwarzer, Luszczynska, Ziegelmann, Scholz, and Lippke, 2008). Recently, the question has been raised whether self-efficacy might rather operate as a moderator (Gutiérrez-Doña, Lippke, Renner, Kwon, and Schwarzer, 2009; Lippke, Wiedemann, Ziegelmann, Reuter, and Schwarzer, 2009). In the present study, the first purpose is to test whether planning mediates the intention-behavior relationship. As the second and main purpose, an interaction between intentions and self-efficacy and its effect on the assumed mediation is examined. This is done in order to elucidate the mechanisms that come into play after adolescents have formed an intention to change their physical activity.

Planning as a mediator between intentions and physical activity

Good intentions are more likely to be translated into action when people make an action plan. Intentions can foster action planning, which in turn may facilitate behavior change. Meta-analyses have summarized the findings on the effects of planning on health behaviors (for an overview, see Gollwitzer and Sheeran, 2006). Self-reported action planning was found to mediate partially the intention-behavior relation and to account for more variance in the prediction of health behaviors among adults (*e.g.* Norman and Conner, 2005; Scholz, Schüz, Ziegelmann, Lippke, and Schwarzer, 2008; Schwarzer *et al.*, 2007; Sniehotta, Scholz, and Schwarzer, 2005; Ziegelmann, Luszczynska, Lippke, and Schwarzer, 2007). However, the evidence is inconclusive as some studies failed to find mediation effects of planning (Norman and Conner, 2005). This suggests that the relationships between intentions, planning, and behavior might also depend on other variables. Mediation mechanisms might differ for subgroups of participants (*e.g.* in terms of sex, age, psychological characteristics). For example, the degree to which planning mediates between intentions and behavior has been found to be higher in older than in younger adults (Renner, Spivak, Kwon, and Schwarzer, 2007; Scholz, Sniehotta, Burkert, and Schwarzer, 2007). Further, the effects of a planning intervention

on adults' physical activity may depend on baseline self-efficacy beliefs (Luszczynska and Haynes, 2009). This represents a case of moderated mediation (Preacher, Rucker, and Hayes, 2007). The amount to which the mediator translates the effect of the independent variable on the dependent variable may depend on the levels of a moderator.

Adolescents' physical activity and its social-cognitive predictors

Although intention to exercise seems to be a powerful predictor of adolescents' physical activity (Hagger *et al.*, 2007), other social-cognitive variables, such as self-efficacy or planning, may explain additional variance over and above intention. For example, girls' physical activity was predicted by social cognitions such as proximal goals (*i.e.*, intentions) and plans, which mediated the relationship between self-efficacy and self-reported physical activity (Dishman *et al.*, 2005). This study, however, applied a cross-sectional design. Therefore, the directions of the relations between cognitions and behavior remained unclear. A longitudinal investigation of the associations between intentions, action and coping planning, and subsequent physical activity among 157 adolescents suggested that the intention together with an interaction of two indices of planning predicted physical activity at follow-up (Araújo-Soares, McIntyre, and Sniehotta, 2009). However, direct effects of self-efficacy and the direct effects of planning on physical activity (measured at six-month follow-up) were not significant. In sum, several studies explained physical activity among adolescents looking into the direct and indirect effects of intention and self-efficacy as well as the direct effects of planning. To date, the effects of the interactions between these cognitions were not investigated in the context of physical activity of youth (aged 12-19 years).

Aims of the two studies

Perceived self-efficacy is expected to moderate the planning-behavior relation because people harboring self-doubts might fail to act upon their plans (Bandura, 1997). In individuals with a high level of self-efficacy, planning might be more likely to facilitate their goal achievement because optimistic self-beliefs instigate the execution of plans. Whether intentions result in actual behavior via planning (the mediation effect) might depend on their self-efficacy levels (the moderation effect). The aims, therefore, are to analyze whether planning (the mediator variable) mediates the effect of intentions (the independent variable) on behavior (the dependent variable) as a function of the underlying level of self-efficacy (the moderator). It is assumed that the moderator operates on the planning-behavior relation, which is statistically reflected by an interaction between planning and self-efficacy.

STUDY 1: PREDICTING PHYSICAL ACTIVITY IN CHINESE ADOLESCENTS

This longitudinal study examines in a sample of Chinese adolescents whether perceived self-efficacy moderates the mediating effect that planning has on the intention-behavior relationship, using physical activity as the target behavior.

Method

Participants and procedure

From two types of middle schools in the central region of China, 706 adolescents attending grades 7 to 12 were recruited. The study was of longitudinal descriptive type (Montero and León, 2007; Ramos-Álvarez, Moreno-Fernández, Valdés-Conroy, and Catena, 2008). At time 1 (T1), questionnaires that were handed out by trained staff took 15 minutes to complete. Four weeks later at time 2 (T2), a follow-up questionnaire was administered. The final sample consisted of 534 participants who took part in the second wave of data collection, 75.60%, with a mean age of 13.80 years, $SD = 1.40$, ranging from 12 to 18 years. There were 46% boys and 54% girls. The study was performed in accordance with both the Helsinki Declaration and the Proposals for Safeguarding Good Scientific Practice by the German Research Foundation. It was also approved by the review board of Central South University, Changsha, China.

Attrition analysis

The original sample at T1 ($N = 706$), did not differ from the longitudinal sample ($N = 534$), in terms of sex ($t = .46$, *ns*), age ($t = 1.37$, *ns*), intentions ($t = .93$, *ns*), and physical activity ($t = 1.37$, *ns*).

Measures

- Intentions were measured at T1 by the item «*Do you intend to engage in regular exercise at least three times per week at moderate or vigorous intensity within the next four weeks?*» followed by a seven-point scale ranging from -3 (*no intention at all*) to +3 (*very strong intention*).
- Planning was assessed at T2 in terms of coping planning (Sniehotta *et al.*, 2005). Four items were used, such as «*I have made detailed plans regarding which physical activity to perform when there is bad weather or no sports equipment is available*,» followed by a four-point scale ranging from 1 (*completely disagree*) to 4 (*completely agree*), with Cronbach's $\alpha = .91$.
- Perceived self-efficacy was measured at T2 using three items that target recovery self-efficacy, such as «*I am certain that I can resume my strenuous activity level even if I have stopped working out for a longer time period*» (Schwarzer, 2008). These items on a four-point scale, ranging from completely disagree to completely agree, were summed up to a sum score ranging from 3 to 12, Cronbach's $\alpha = .87$.
- Physical activity was assessed at T1 and T2 with self-ratings concerning the frequency and duration of leisure-time exercise. Participants were asked to report on a four-point scale (1 = *seldom or never*; 2 = *2 times per week*; 3 = *3-4 times per week*; 4 = *almost every day per week*) for the average number of times in an average week (during the past month) that they had engaged in physical activity. Moreover, they were asked to judge on a five-point scale how much time they spent per session (1 = *less than 15 min*; 2 = *15-30 min.*; 3 = *30-45 min*; 4 = *45-60 min.*; 5 = *above 60 min.*). Responses for frequency and duration were then multiplied to obtain an index of physical activity per week.

Analytical procedure

The analyses were based on procedures recommended by Preacher *et al.* (2007). A moderated mediation model to predict T2 physical activity was specified with baseline physical activity as a covariate, using the MODMEDC macro (Version 1.0; Model 3) by Preacher and Hayes (2004). Centered variables were used (Aiken and West, 1991). Moderated mediation is expressed by an interaction between self-efficacy and planning (moderator*mediator) on behavior, which affects the mediation process (MacKinnon, 2008). Missing data were imputed using the Expectation Maximization (EM) algorithm in SPSS (Enders, 2001).

Results

Means, standard deviations, and intercorrelations of all variables are displayed in Table 1.

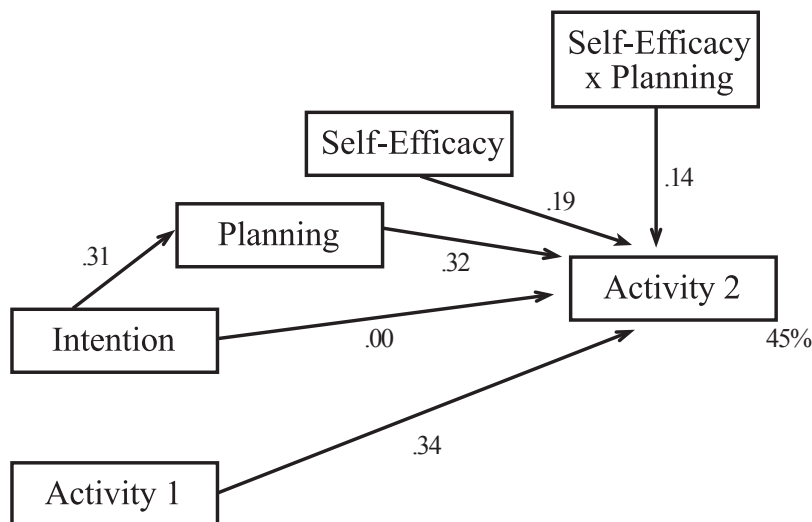
TABLE 1. Means, standard deviations, and intercorrelations for intention, planning, self-efficacy, and physical activity in Chinese adolescents.

<i>Variable</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>M</i>	.72	2.74	8.42	8.82	10.41 (6.46)
<i>(SD)</i>	(1.39)	(.76)	(2.30)	(4.59)	
1 Intention	1				
2 Planning	.31	1			
3 Self-efficacy	.34	.71	1		
4 Physical activity ¹ T1	.41	.27	.34	1	
5 Physical activity ¹ T2	.30	.53	.52	.49	1

Note. All correlations $p < .01$. ¹ Product of frequency by duration self-Ratings. T1 = Time 1, T2 = Time 2. $N = 534$.

The moderated mediation hypothesis was tested by regression analyses with centered variables (see Figure 1). First, plans were predicted by intentions, $\beta = .38$, $p < .01$. After introducing the mediator and the moderator, physical activity was no longer predicted by intentions, but by baseline activity, $\beta = .34$, $p < .01$, planning, $\beta = .32$, $p < .01$, self-efficacy, $\beta = .19$, $p < .01$, and the self-efficacy*planning interaction (Moderator*Mediator), $\beta = .14$, $p < .01$, accounting jointly for 45% of the behavioral variance. The significant interaction effect supported the assumption of moderated mediation. Planning mediated the intention-behavior relation, and this mediation was moderated by perceived self-efficacy.

FIGURE 1. Predicting physical activity among Chinese adolescents: moderated mediation analysis.



Note. All coefficients $p < .01$, $N = 534$.

Participants needed an above-average self-efficacy value of at least 4.5 on the 3-12 scale to allow for a significant mediation effect ($p < .05$). Thus, mediation appeared to be conditional upon the value of self-efficacy, underscoring the assumption that planning did not translate intentions into behavior within the subgroup of individuals who had very low levels of self-efficacy.

STUDY 2: PREDICTORS OF PHYSICAL ACTIVITY IN POLISH ADOLESCENTS

This study investigated whether action planning mediates the relationship between intention to exercise and physical activity, with maintenance self-efficacy acting as the moderator of the effects of planning. We aimed at testing the effects of social cognitions on physical activity measured ten weeks later.

Method

Sample and Procedures

Of 927 adolescents who agreed to take part, 620 individuals participated in both measurement points, and consequently the longitudinal data were analyzed. The respondents were attending eight high schools in four cities of eastern and central regions of Poland. The schools represented all main types and profiles of secondary education in Poland.

Respondents were 15 to 19 years old, $M = 16.46$, $SD = .61$, 62% were girls and 38% were boys.

The study was presented as an investigation of physical activity and its personal determinants. Potential respondents were informed about the second wave of data collection. Personal codes were used to secure anonymity. Informed consent and parental consent (in case the respondents were younger than 18 years old) were obtained. The study was approved by the Institutional Review Board. At T1, those who agreed to participate filled out measures of physical activity, intentions, planning, and self-efficacy. Physical activity data were collected again at T2, which took place approximately ten weeks later, range 9-11 weeks.

Attrition analysis

Of 927 T1 respondents, 620 (67%) were available at T2. Dropout analysis indicated that the completers did not differ from T1 participants in terms of T1 physical activity, $F_{(1, 926)} = .27$, ns, planning, $F_{(1, 926)} = .11$, ns, self-efficacy beliefs, $F_{(1, 926)} = .12$, ns, intention, $F_{(1, 926)} = .11$, ns, or age, $F_{(1, 926)} = 3.46$, ns. However, significantly more boys (39%) than girls (31%) dropped out at T2, $\chi^2 = 5.73$, $p < .05$.

Measures

Physical activity was assessed at both measurement points in time with three items from the Godin Leisure-Time Exercise Questionnaire (Godin and Shephard, 1985). The items refer to the frequency of performing strenuous and moderate exercise for at least 15 minutes during free time within the last seven-day period. Participants are asked to indicate the actual number of exercise session within respective period. The scale yielded reasonable reliability, alpha of .61 at T1 and .64 at T2.

Intention was measured with one item, «During the next four weeks I intend to engage in regular physical activity (strenuous, moderate, or mild),» with responses ranging from 1 (*definitely not*) to 7 (*definitely yes*).

T1 action planning was measured with five items. The statement «I have my own plans regarding...» was followed by «how to exercise», «when to exercise», «how often to exercise», «where to exercise» and «with whom I would exercise». This scale was based on measures previously applied in research on planning and physical activity among adolescents (Dombrowski and Luszczynska, 2009). The response scale ranged from 1 (*definitely not*) to 4 (*exactly true*). The scale had good reliability with Cronbach's alpha of .91.

Maintenance self-efficacy was measured with seven items. The stem «I am able to maintain regular physical activity» was followed by examples of barriers, such as «even if physical activity would be boring,» or «even if I usually stay with my friends who do not like to be physically active». The barriers were developed in an elicitation study with 60 adolescents asked to list the most frequent barriers for their maintenance of regular physical activity. The response scale ranged from 1 (*definitely not*) to 4 (*exactly true*). Cronbach's alpha for the scale was .94.

Data analysis

Study 2 applied the same procedures of data analysis as Study 1. Gender was coded as -1 (girls) and +1 (boys).

Results

Correlation analysis indicated that intention, self-efficacy, and planning were related. The cognitive predictors were also associated with physical activity indices at both measurement points. Although age was unrelated to the study variables (*rs* ranging from -.01 to .05), there were significant effects of gender. In particular, girls reported less frequent physical activity at T1, $F_{(1, 619)} = 13.79, p < .001$ (girls: $M = 7.91, SD = 3.47$; boys: $M = 9.05, SD = 3.82$) and at T2 $F_{(1, 619)} = 13.51, p < .001$ (girls: $M = 8.29, SD = 3.25$; boys: $M = 9.41, SD = 3.96$). Girls had weaker intentions than boys, $F_{(1, 619)} = 5.73, p < .05$ (girls: $M = 4.61, SD = 1.41$; boys: $M = 4.88, SD = 1.22$), weaker self-efficacy beliefs, $F_{(1, 619)} = 24.84, p < .001$ (girls: $M = 19.31, SD = 4.66$; boys: $M = 21.26, SD = 4.72$), and were less likely to form plans about physical activity, $F_{(1, 619)} = 20.09, p < .001$, (girls: $M = 12.90, SD = 4.16$; boys: $M = 14.50, SD = 4.43$).

Further analyses aimed at testing the moderated mediation hypotheses, with the following predictors: T1 intention (the independent variable), T1 planning (the mediator), T1 self-efficacy (the moderator), gender, and T1 physical activity (the control variables). Physical activity measured at ten weeks later was the dependent variable.

Action plans (T1) were predicted by T1 intentions, $B = .79, SE = .12, p < .001$, T1 physical activity, $B = .34, SE = .05, p < .001$, and gender, $B = .50, SE = .16, p < .001$. The dependent variable model, incorporating the mediating, moderating and control variables, indicated that physical activity at T2 was unrelated to T1 intentions, $B = .01, SE = .10, ns$, whereas there were significant effects of T1 planning, $B = .08, SE = .04, p < .05$, T1 maintenance self-efficacy, $B = .10, SE = .04, p < .01$, T1 physical activity, $B = .38, SE = .04, p < .001$, and gender, $B = .34, SE = .12, p < .01$. The effect of interaction between T1 planning and T1 self-efficacy was significant, $B = .01, SE = .00, p < .05$. Adolescents needed an above-average self-efficacy value of at least 20.35 on the 7-28 scale (which can be translated into mean item response of 2.91) or to allow for a significant mediation effect, $p < .05$.

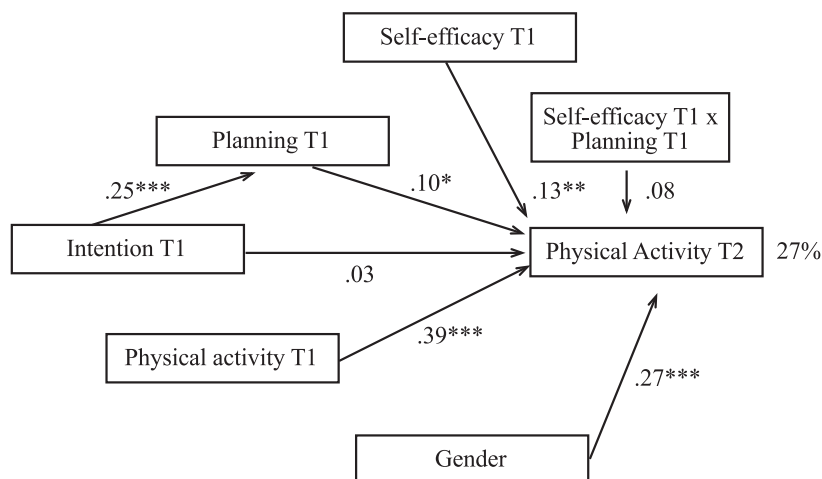
Concluding, mediation was conditional upon the value of self-efficacy. Adolescents declaring weak self-efficacy did not benefit from plans they made. In sum, the T1 predictors explained 27% of physical activity measured ten weeks later. The standardized solution for the moderated mediation hypothesis is presented in Figure 2.

TABLE 2. Means, standard deviations, and intercorrelations for intention, planning, self-efficacy, and physical activity in Polish adolescents.

Variable		1	2	3	4	5
<i>M</i>		4.72	13.52	20.06	8.35	8.70
<i>(SD)</i>		(1.35)	(4.33)	(4.77)	(3.65)	(3.57)
1	Intention		.36	.42	.35	.22
2	Action planning			.64	.40	.34
3	Maintenance self-efficacy				.41	.35
4	Physical activity at T1					.51
5	Physical activity at T2					

Note. All correlations $p < .001$, T1 = Time 1, T2 = Time 2, $N = 620$.

FIGURE 2. Predicting physical activity among Polish adolescents moderated mediation analysis.



Note. * $p < .05$; ** $p < .01$; *** $p < .001$

Discussion

To change physical activity levels, adolescents need to develop an intention to do so. Moreover, action planning and coping planning strategies are beneficial to translate these intentions into actual activity. Many studies have found evidence for the claim that planning mediates between intentions and behavior, although inconsistent results have also emerged (*e.g.* Norman and Conner, 2005; Schüz, Sniehotta, Wiedemann, and Seemann, 2006; Schwarzer *et al.*, 2007). The aim of our studies was to analyze whether planning (the mediator variable) mediates the effect of intentions (the independent variable) on behavior (the dependent variable) as a function of the underlying level of self-efficacy (the moderator). It was assumed that the moderator operates on the planning-behavior relation, which is statistically reflected by an interaction between plans and self-efficacy.

It was hypothesized in line with Bandura (1997) that perceived self-efficacy may be a necessary precondition for the putative mediation process. Self-efficacious individuals hold optimistic beliefs about their capability to resume their exercise regimen after a break, which might help them to enact their plans. Therefore, self-efficacious people might be more likely to translate their intentions into action. In other words, planning does not translate intentions into behavior if people are plagued by self-doubts. Those who report low self-efficacy do not benefit from planning. In other words, planning is a powerful volitional strategy if individuals are confident that they could take action.

This leads us to the importance of the present studies. First, mediation does not apply to everyone in the same way. Moderated mediation provides a better understanding of the mechanisms of activity change. There are subgroups of people for whom a

putative causal mechanism does not hold true. In the present case, this is the subgroup of poorly self-efficacious individuals, but other research has found other relevant moderators, such as sex and age (Renner *et al.*, 2007). Planning helps to translate intentions into behavior particularly well in those individuals with average to high intentions (in terms of the psychometric scales mentioned above), as they are more likely to act on their plans (Gollwitzer and Sheeran, 2006; Lippke *et al.*, 2009). Also, in a model of moderated mediation, Wiedemann *et al.* (2009) specified intention as an independent variable and as a moderator as well. The present analyses replicate two recent studies on physical activity and dietary behaviors in Germany, South Korea, and Costa Rica that have found similar results (Gutiérrez-Doña *et al.*, 2009; Lippke *et al.*, 2009).

How can the present research results facilitate the design of interventions? It is obvious that individuals with low self-efficacy are handicapped when it comes to the adoption of health behaviors. It does not make much sense to teach them how to plan their behavior better or how to improve their intention levels. They first need to gain more confidence in their own resources to change or maintain a healthy lifestyle even when barriers prevail (Bandura, 1997).

Some limitations are to be mentioned. In Study I, planning and self-efficacy were only measured at T2. An alternative approach could have been to use change scores of these two variables. Both studies applied different methods of measurement, which does not allow for direct comparisons across the countries. Although the validity of self-reports on physical activity appears to be satisfactory (*e.g.* Godin and Shephard, 1985; Miller, Freedson, and Kline, 1994), further validity studies of self-reports should replicate the results of this study, for example applying strength, flexibility, and cardiovascular fitness indices (Annesi *et al.*, 2007). Moreover, these are nonexperimental longitudinal data that do not allow for causal inferences. Experimental causal chain designs may be superior when it comes to examining the intention-behavior mediation by planning (Reuter, Ziegelmann, Wiedemann, and Lippke, 2008). Future studies may take a closer look at the complex relationships between gender and social cognitions, which are predictive of adolescents' physical activity. Although gender has a well-established effect on physical activity among youth (for a systematic review, see Van Der Horst, Paw, Twisk, and Van Mechelen, 2007), the relationships between adolescents' cognitions and their gender are unclear. Finally, future research should explain physical activity controlling for the effects of other predictors incorporated in Social Cognitive Theory (Jiménez-Castuera, Cervelló-Gimeno, García-Calvo, Santos-Rosa, and Iglesias-Gallego, 2007).

Nevertheless, the present study is innovative because it extends the well-known mediator model by moderating processes. Changes in adolescents' levels of physical activity in Poland and China operate along the common intention-planning-behavior chain unless they do not feel confident to make such a change. This can be an example for future studies that vary the kinds and numbers of such moderators, which would help to accumulate further evidence on the mechanisms of physical activity change.

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