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**Psychological Resources and Self-Regulation –  
Advancing Research on Correlates of Physical Activity**

Dissertation

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## Abstract

Regular physical activity contributes to the prevention and management of non-communicable diseases. The low prevalence of physical activity indicates the need of research on how to promote physical activity. This dissertation therefore aimed at advancing research on correlates of physical activity. The focus was directed on psychological resources (i.e., phase-specific self-efficacy and positive outcome experience) as well as on self-regulatory strategies (i.e., action control, action planning, and coping planning).

The first set of research questions referred to the health action process approach (HAPA; Schwarzer, 1992). In *Chapter 2*, the stage assumptions of the HAPA were examined in an online sample to better understand which motivational and volitional processes drive physical activity change. By using a dynamic analytic approach, stage-specific prediction patterns were identified. These findings support the stage assumptions of the HAPA and argue for matching physical activity interventions to an individual's stage by targeting stage-specific resources and self-regulatory strategies. In *Chapter 3*, the continuum assumptions of the HAPA were investigated among adults with obesity. Study findings suggest that social support may be more relevant for engaging in physical activity than individual self-regulatory strategies such as action planning and coping planning. The results imply that the HAPA has the potential to constitute a theoretical basis for physical activity interventions among this high-risk group.

The second set of research questions focused on the role of positive outcome experience in the physical activity change process as there is only limited research available. In *Chapter 4*, it was found among university students that experiencing positive consequences of physical activity goes along with higher self-efficacy which in turn improves physical activity. Beyond that, results indicated that individuals with low levels of action control did not translate positive experience into physical activity via self-efficacy. In *Chapter 5*, direct and indirect associations between positive outcome experience and motivational as well as volitional predictors derived from the HAPA were investigated in a non-clinical as well as in a clinical sample. The main findings of these longitudinal studies suggest that positive outcome experience is more meaningful for intention formation than for behavior performance. Thus, correlational findings of this thesis contribute to the understanding of how outcome experience is involved in the physical activity change process and may initiate experimental research on the relatively unexplored theoretical construct.

This thesis advances research on motivational and volitional correlates of physical activity by providing empirical support for the HAPA and theoretical considerations concerning outcome experience.

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## Zusammenfassung

### Psychologische Ressourcen und Handlungsregulation -

#### Weiterführende Forschung zu Korrelaten der körperlichen Aktivität

Körperliche Aktivität wirkt sich positiv auf unsere körperliche und psychische Gesundheit aus. Regelmäßig ausgeübt, trägt sie zur Prävention und Behandlung von nicht übertragbaren Krankheiten wie z. B. den häufig auftretenden Herz-Kreislaufkrankungen und Diabetes bei. Jedoch sind nur wenige Menschen so ausreichend körperlich aktiv, dass sie von der gesundheitsförderlichen Wirkung auch profitieren. In Deutschland erreichen lediglich 15.5% der Frauen und 25.4% der Männer das empfohlene gesundheitsförderliche Maß an körperlicher Aktivität (30 Minuten an mindestens 5 Tagen in der Woche; Kurth, 2012). Dieser verbreitete inaktive Lebensstil ist mitverantwortlich für den kontinuierlich zunehmenden Anteil adipöser Menschen ( $\text{BMI} \geq 30 \text{ kg/m}^2$ ) in der Bevölkerung (Kurth, 2012).

Bei der Entwicklung effektiver Interventionen zur Förderung von körperlicher Aktivität sollte auf den theoretischen und empirischen Wissensstand gesundheitspsychologischer Forschung zurückgegriffen werden. Das Ziel der vorliegenden Dissertation ist, durch die Untersuchung des Zusammenspiels zwischen psychologischen Ressourcen (z.B. Selbstwirksamkeitserwartung und positive Konsequenzerfahrungen), selbstregulativen Kompetenzen (Handlungsplanung, Bewältigungsplanung und Handlungskontrolle) und körperlicher Aktivität diesen Wissensstand zu erweitern. Dafür werden in den ersten beiden empirischen Kapiteln dieser Arbeit die theoretischen Annahmen des sozial-kognitiven Prozessmodells gesundheitlichen Handelns (HAPA, Schwarzer, 1992; Schwarzer, Lippke, & Luszczynska, 2011) im Kontext der körperlichen Aktivität für unterschiedliche Personengruppen überprüft. Das HAPA vereint sowohl stadien- als auch kontinuumstheoretische Annahmen. Als Stadienmodell eignet es sich für die Entwicklung maßgeschneiderter Interventionen. Abhängig davon, ob Personen unmotiviert (nicht-intentionales Stadium), motiviert (intentionales Stadium) oder bereits handelnd sind (aktionales Stadium), erhalten sie passende Interventionsinhalte. Als Kontinuummodell ermöglicht das HAPA die Vorhersage und Analyse von Verhaltensänderungen. In den anschließenden zwei empirischen Kapiteln der Dissertation wird der Fokus auf das Konstrukt der Konsequenzerfahrungen gerichtet, welches bis dato im Bereich der Forschung zur Förderung von körperlicher Aktivität nur wenig Aufmerksamkeit erhalten hat. Es ist bislang beispielsweise unklar, welche Rolle Erfahrungen mit positiven Konsequenzen

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von körperlicher Aktivität (z.B. gesteigertes Wohlbefinden, Gewichtsreduzierung und soziale Kontakte) im Prozess der Verhaltensänderung spielen.

In *Kapitel 1* wird der theoretische Hintergrund dieser Arbeit dargestellt, und es werden folgende Forschungsfragen hergeleitet:

- 1) Gehen Veränderungen in den sozial-kognitiven Variablen des HAPAs mit einem Stadienwechsel einher?
- 2) Treffen die kontinuumstheoretischen Annahmen des HAPAs auf die körperliche Aktivität von Personen mit Adipositas zu?
- 3) Wie können positive Konsequenzerfahrungen in den Prozess der Veränderung von körperlicher Aktivität integriert werden?

Die o.g. Forschungsfragen werden in fünf korrelativen Studien untersucht, an denen verschiedene Personengruppen aus nicht-klinischen und klinischen Settings teilgenommen haben. Diese Studien sind in den Kapiteln 2 bis 5 beschrieben. Ergebnisse und Implikationen aus den einzelnen Studien werden im Folgenden kurz zusammengefasst:

In *Kapitel 2* wird die Validität der drei vom HAPA postulierten Stadien mit einem dynamischen Analyseverfahren getestet. Die Stichprobe setzt sich aus Teilnehmern einer Online-Studie mit zwei Messzeitpunkten zusammen, die in der allgemeinen Bevölkerung durchgeführt wurde. Die Ergebnisse machen deutlich, dass a) ein Anstieg in der motivationalen Selbstwirksamkeit und in der Aufrechterhaltungsselbstwirksamkeit mit einem Wechsel vom non-intentionalen zum intentionalen oder aktionalen Stadium einhergeht. Anfangs unmotivierte Personen, die ihre Selbstwirksamkeit verbessern, entwickeln folglich eher die Absicht, körperlich aktiv zu werden. Außerdem zeigt sich b) bei anfangs motivierten Personen, dass eine Reduktion der Planung von körperlicher Aktivität häufiger eine Absichtslosigkeit zur Folge hat. Hingegen ist c) eine Zunahme der Planung häufiger mit einem Wechsel in das aktionale Stadium verbunden. Insbesondere werden diejenigen Personen aktiv, die nicht nur die Planung ihrer Aktivitäten, sondern auch ihre Aufrechterhaltungsselbstwirksamkeit verbessern können. Außerdem zeigen die Ergebnisse, dass d) anfangs körperlich aktive Personen mit einer Abnahme der motivationalen Selbstwirksamkeit häufiger in ein nicht-aktionales Stadium zurückfallen. Daraus kann geschlossen werden, dass sich auch aktive Personen ihre motivationale Selbstwirksamkeit bewahren sollten, um ihre körperliche Aktivität langfristig aufrechterhalten zu können. Zusammengefasst stützen

diese Ergebnisse die Annahme des HAPAs, dass im Kontext der körperlichen Aktivität zwischen drei sich qualitativ unterscheidenden Stadien differenziert werden kann. Es wird empfohlen, die identifizierten stadienspezifischen Prädiktoren in maßgeschneiderten Interventionen zu berücksichtigen.

Während das HAPA in Kapitel 2 als Stadienmodell betrachtet wird, fokussiert *Kapitel 3* auf das HAPA als Kontinuumsmodell. In einem Strukturgleichungsmodell mit latenten Variablen wird untersucht, ob die Annahmen des HAPAs auf adipöse Personen übertragbar sind. Wie angenommen, sind Adipöse mit höheren Ausprägungen in motivationaler Selbstwirksamkeit, positiven Handlungsergebniserwartungen und sozialer Unterstützung auch motivierter, körperlich aktiv zu sein. Kein Zusammenhang wird zwischen der Risikowahrnehmung und der Intention, körperlich aktiv zu sein, beobachtet. Des Weiteren geht eine höhere Motivation mit mehr Handlungs- und Bewältigungsplanung einher. Auch zwischen der Aufrechterhaltungselbstwirksamkeit und Bewältigungsplanung kann ein positiver Zusammenhang festgestellt werden. Außerdem sind adipöse Studienteilnehmer, die eine hohe Wiederaufnahmeselbstwirksamkeit und mehr soziale Unterstützung berichten, körperlich aktiver. Entgegen der Erwartung nimmt die körperliche Aktivität mit konkreterer Planung von Aktivitäten und der Bewältigung von antizipierten Barrieren nicht zu. Zusammengefasst sprechen die Ergebnisse dieser Studie teilweise für die kontinuumstheoretischen Annahmen des HAPAs. Insbesondere wird die phasenspezifische Unterscheidung der Selbstwirksamkeit untermauert. Eine hohe Wiederaufnahmeselbstwirksamkeit sowie soziale Unterstützung durch Familie und Freunde scheinen bei Adipösen von größerer Bedeutung zu sein als die Verwendung selbstregulativer Strategien (Handlungs- und Bewältigungsplanung). Diese Befunde sollten zukünftig in experimentellen Längsschnittstudien überprüft werden, um Aussagen über die Kausalität der identifizierten Zusammenhänge treffen zu können.

*Kapitel 4* setzt sich mit den Fragen auseinander, wie positive Konsequenzenerfahrungen das Verhalten beeinflussen und für wen sie bei der Verhaltensausführung besonders nützlich sind. Aufschluss darüber geben die Resultate einer moderierten Mediationsanalyse, in welche Daten einer studentischen Stichprobe über drei verschiedene Messzeitpunkte einfließen. Zunächst wird festgestellt, dass Studierende, die positive Konsequenzen körperlicher Aktivität erfahren haben, selbstwirksamer sind. Je höher ihre Selbstwirksamkeit ausgeprägt ist, desto größer ist die Steigerung ihrer körperlichen Aktivität. Des Weiteren zeigt sich, dass diese Mediation von der Variable Handlungskontrolle moderiert wird. Das bedeutet, dass bei Studierenden, die sich ihrer eigenen Ziele weniger bewusst sind, ihre Aktivitäten

weniger selbst beobachten und geringere Regulationsbemühungen berichten, die Zusammenhänge zwischen den positiven Konsequenzerfahrungen, der Selbstwirksamkeit und der Steigerung der körperlichen Aktivität nicht beobachtet werden. Diese Befunde legen nahe, dass über das Vorhandensein psychologischer Ressourcen hinaus die Nutzung selbstregulativer Strategien zu einer Steigerung der körperlichen Aktivität beitragen kann.

Während Kapitel 4 die Beziehung zwischen positiven Konsequenzerfahrungen und phasenunspezifischer Selbstwirksamkeit zum Gegenstand hat, werden in *Kapitel 5* die Zusammenhänge zwischen den Erfahrungen und motivationaler sowie volitionaler Selbstwirksamkeit separat in Strukturgleichungsmodellen mit latenten Variablen untersucht. Die Ergebnisse aus zwei Studien zeigen Folgendes: Je mehr positive Konsequenzen mit körperlicher Aktivität erfahren werden, desto höher sind die motivationale Selbstwirksamkeit und die Absicht, körperlich aktiv zu sein. In der ersten Studie, die Teilnehmer einer Online-Befragung (mit drei Messzeitpunkten) aus der allgemeinen Bevölkerung umfasst, sind die Erfahrungen auch mit volitionaler Selbstwirksamkeit positiv assoziiert. In der zweiten Studie (mit vier Messzeitpunkten), bei der ausschließlich medizinische Rehabilitanden befragt werden, kann dieser Zusammenhang jedoch nicht beobachtet werden. Weiterhin zeigt sich in beiden Studien, dass Personen mit hohen Ausprägungen in der motivationalen Selbstwirksamkeit auch eher höhere Ausprägungen in der volitionalen Selbstwirksamkeit und der Intention (Zielsetzung) haben. Studienteilnehmer mit einer hohen Intention wiederum sind nicht nur selbstwirksamer hinsichtlich der Verhaltensaufrechterhaltung und der Rückfallvermeidung, ihnen gelingt auch die Planung ihrer Aktivitäten besser. Dies ist bedeutsam, denn Teilnehmer beider Studien waren körperlich aktiver, wenn sie ihre Aktivitäten konkret geplant haben. Da positive Konsequenzerfahrungen nicht in direktem Zusammenhang mit einer Steigerung der körperlichen Aktivität zu stehen scheinen, legen die Ergebnisse die Vermutung nahe, dass die Erfahrungen positiver Konsequenzen von körperlicher Aktivität für die Förderung der Intentionsbildung (motivationale Phase) von größerer Relevanz sind als für die Förderung der Initiierung und Aufrechterhaltung des Verhaltens (volitionale Phase). Auch diese Befunde sollten in Studien mit einem experimentellen Design überprüft werden.

In *Kapitel 6* werden die Ergebnisse der Dissertation zunächst zusammengefasst und anschließend miteinander in Bezug gesetzt. Weiterhin werden theoretische und methodische Implikationen erörtert. Es

werden zudem Techniken vorgeschlagen, mit denen psychische Ressourcen und selbstregulatorische Fähigkeiten in motivationalen und volitionalen Interventionen vermittelt werden können.

Insgesamt leistet diese Arbeit mit neuen empirischen Evidenzen, welche die stadien- und kontinuumstheoretischen Annahmen des HAPAs stützen, einen Beitrag zur Forschung im Bereich der Förderung von körperlicher Aktivität. Außerdem wird auf die Bedeutung positiver Konsequenzerfahrungen für motivationale Prozesse im Verlauf der Veränderung von körperlicher Aktivität aufmerksam gemacht. Damit soll angeregt werden, dass das bislang eher unerforschte gesundheitspsychologische Konzept in zukünftigen Interventionsstudien mit experimentellen Designs berücksichtigt wird.

### Referenzen

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# Chapter **1**

## Introduction

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## Introduction

Physically active individuals are much less likely to suffer from premature death and disability in comparison to physically inactive individuals (World Health Organization; WHO, 2011). Beyond doubt, the positive impact of regular physical activity on health and well-being is manifold. However, most people are not sufficiently active to achieve health related benefits (WHO, 2011). The benefits as well as the low prevalence of physical activity have brought many health professionals to focus on investigating the determinants of physical activity change and on identifying effective methods to promote physical activity.

This dissertation aims to contribute to this endeavor by dealing with the interplay of theory-driven psychological correlates of physical activity and physical activity change. The health action process approach (HAPA; Schwarzer, 1992; Schwarzer, Lippke, & Luszczynska, 2011), a health behavior change model, constitutes the theoretical basis for this thesis. First, theoretical assumptions of the HAPA are investigated with innovative and distinct methods in different adult samples. Second, in non-clinical and clinical samples, novel relationships between social-cognitive variables derived from the HAPA and the construct of positive outcome experience are examined. The latter can be seen as a psychological resource that so far is relatively unexplored concerning the motivational and volitional stage of the physical activity change process.

This chapter is devoted to the health-related effects of physical activity and emphasizes the need for research on physical activity promotion in a primary, secondary, and tertiary prevention context. Subsequently, continuum and stage theories on health behavior change are outlined as these theories provide valuable implications for promoting physical activity. A special emphasis is put on the HAPA and its supposed social-cognitive predictors of behavior. Then, the theoretical construct of outcome experience is described. Finally, the research aims of this thesis are presented.

### **Physical Activity and its Importance for the Prevention of Non-Communicable Diseases**

Physical activity is one of the most important health behaviors and has a great potential for improving individual well-being and contributing substantially to the maintenance and recovery of health. According to Caspersen, Powell, and Christenson (1985), physical activity is specified as any movement of the body

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produced by the skeletal muscles that leads to energy expenditure. Physical exercise forms a subdomain of physical activity which requires “planned, structured and repetitive bodily movement” and aims at the maintenance and improvement of physical fitness (Caspersen et al., 1985). The studies of this thesis involve physical activity as well as physical exercise (within the introduction and discussion of this thesis the term physical activity is partly used as a superordinate term including physical exercise).

Previous research has found strong preventive effects of physical activity for coronary heart disease, type 2 diabetes, osteoporosis, and colon cancer as well as weak to moderate preventive effects for stroke, obesity and overweight, lower back pain, clinical depression, mental function, and some cancers (Department of Health, 2004). Additionally, there is strong evidence that physical activity has beneficial effects for individuals already diagnosed with cardiovascular diseases, musculoskeletal disorders and obesity (Department of Health, 2004). Thus, secondary and tertiary prevention increasingly focus on physical activity as an integral part of treatment due to its therapeutic and rehabilitative effects.

The wide range of positive effects of physical activity on health-related outcomes reflects the relevance of research on how to improve physical activity in the population. Looking at actual prevalence rates of physical activity the necessity of this research area becomes apparent. Figures of the WHO indicate that merely 52% of women and 59% of men in industrialized countries reach the recommended level of physical activity of at least 30 minutes on five or more days a week (WHO, 2011). A closer look at Germany reveals that even less, that is to say only 15.5% of women and 25.4% of men, meet these recommendations (Kurth, 2012). At this point, it is important to advert that these basic recommendations for adults aged 18 to 65 years refer to the minimum amount of moderate intensity physical activity (e.g., brisk walking, bicycling, and gardening) required to achieve general health benefits. Further guidelines exist for more specific benefits. For example, more than 250 minutes of physical activity a week are recommended for individuals with overweight to promote weight loss (Donnelly et al., 2009).

The tendency towards inactive lifestyles contributes to a dramatically increased prevalence of overweight (body mass index [BMI] 25 – 29.9 kg/m<sup>2</sup>) and obesity (BMI ≥ 30 kg/m<sup>2</sup>) in recent years (WHO, 2011). In Germany, especially the prevalence of obesity is on the rise. Recent results of a German longitudinal survey show that almost one quarter of the adult population in Germany is obese (Kurth, 2012). In developed countries, obesity has become a “pandemic” (Popkin, Adair, & Ng, 2012) which is a serious

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problem as obesity is related to physical, psychological, and social comorbidities as well as economic consequences (described in detail by Brennan & Murphy, 2013).

Furthermore, overweight and obesity belong to the five leading risks for global deaths (WHO, 2009). Besides dieting to lose weight, physical activity in particular is recommended for obese individuals to achieve direct health benefits (Mann et al., 2007). Combined dietary and exercise interventions have been found to result in higher amounts of weight loss than dietary interventions only (for a review see Shaw, Gennat, O'Rourke, & Del Mar, 2006). However, a meta-analysis showed that the impact of physical activity interventions for obese individuals varies greatly (Gourlan, Trouilloud, & Sarrazin, 2011). This implies that there is still uncertainty about how physical activity can be promoted effectively in obese individuals. The need for further research on this issue becomes even more obvious due to the fact that obese individuals are commonly less active than individuals maintaining normal weight levels (BMI from 18.5 to 25 kg/m<sup>2</sup>; Colley et al., 2011). The present thesis contributes to research on physical activity promotion addressing individuals with obesity by testing the theoretical assumptions of the HAPA among this high-risk group (*Chapter 3*).

To increase physical activity rates in the general public, a better understanding on what actually drives physical activity and physical activity change is needed (Bauman et al., 2012). Theory-driven analyses on physical activity change should therefore focus on the identification of mediators and moderators of health behavior change. Whereas mediators contribute to the understanding of how physical activity can be promoted, the detection of moderators helps to uncover for whom these identified relations are valid (Schwarzer et al., 2011). In this thesis, the role and the interplay of psychological resources and self-regulation strategies as putative mediators and moderators in the physical activity change process are examined. To that end, social-cognitive factors derived from established health behavior and health behavior change theories are used.

### **Theories of Health Behavior and Health Behavior Change**

Theories explain and predict health behavior and health behavior change and provide a basis for the development and evaluation of health behavior interventions (Lippke & Ziegelmann, 2008). Commonly, health behavior (change) theories fall either into the category *continuum theories* or into the category *stage theories* (Biddle, Hagger, Chatzisarantis, & Lippke, 2007; Weinstein, Rothman, & Sutton, 1998). In the

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following, continuum theories and stage theories are outlined. A framework that combines the assumptions of both is the HAPA (Schwarzer, 1992; Schwarzer et al., 2011). The models' continuous and stage assumptions are tested in the first two chapters of the present thesis. Thus, the characteristics of the HAPA are subsequently described in more detail along with its supposed social-cognitive predictors.

*Continuum theories and stage theories: A brief overview*

Continuum theories, such as social cognitive theory (SCT; Bandura, 1997), theory of reasoned action (TRA; Ajzen & Fishbein, 1977) and theory of planned behavior (TPB; Ajzen, 1985), assume that there is a linear relationship between social-cognitive predictors of health behavior and the likelihood of engaging in the target behavior. Under this term, interventions based on continuum theories focus on positively affecting all predictors as they are assumed to increase the likelihood of the target behavior (Conner & Norman, 2005; Sutton, 2008). In other words, everybody receives a so-called one-size-fits-all intervention always consisting of the same components (Schwarzer, 2008).

Stage theories on the other hand suppose that individuals sequentially progress through qualitatively different stages during the behavior change process and that regression to previous stages is possible (Sniehotta & Aunger, 2010; Weinstein et al., 1998). This can be explained by the assumption that individuals differ in their mindsets towards the behavior change process and therefore, have specific needs and encounter specific barriers (Heckhausen, 1991). Within one stage, a specific set of predictors is assumed to be relevant which is not important for individuals residing in other stages. This assumption has important implications for the development and evaluation of behavior change interventions. First, interventions need to be matched to distinct stages and ought to target appropriate stage-specific predictors (Weinstein et al., 1998). For example, self-regulatory strategies (i.e., planning ones activities) may be more useful for someone who intends to be physically active than for someone who wants to remain inactive. Thereby, the assumption is that stage-matched health interventions provide only relevant information and because they are avoiding irrelevant information, reactance can be circumvented. Second, stage-matched interventions are less time-consuming and less cost intensive and have proven to be more effective than one-size-fits-all interventions (e.g., Noar, Benac, & Harris, 2007; Schüz, Sniehotta, Mallach, Wiedemann, & Schwarzer, 2009; Schwarzer, Cao, & Lippke, 2010).

The present thesis involves both, assumptions of continuum theories as well as stage theories. In particular, the HAPA is investigated as a continuum model as well as a stage model in the domain of physical activity. Below, the theoretical assumptions of the HAPA are illustrated in detail.

*The health action process approach (HAPA)*

This thesis focuses on the HAPA (Schwarzer, 1992; Schwarzer et al., 2011), a framework that is supposed to predict individual behavior change (Figure 1). The special feature of the HAPA is that it combines the assumptions of continuum theories as well as stage theories and therefore is also referred to as a hybrid model (Schwarzer, 2008).

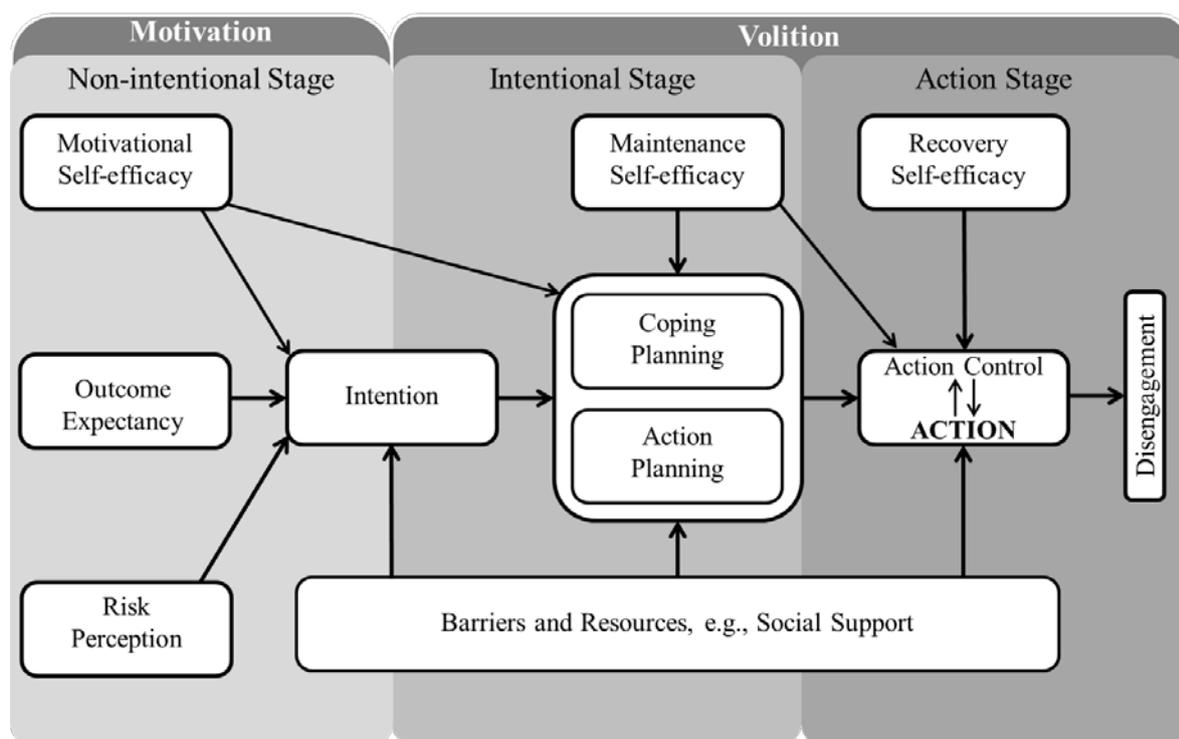


Figure 1. Health action process approach (HAPA; Schwarzer et al., 2011)

In accordance with the Rubicon model (Heckhausen & Gollwitzer, 1987), the HAPA differentiates between a motivational stage and a volitional stage. The assignment to the motivational or volitional stage depends on whether one has formed an intention or not. Individuals who do not yet intend to act are assigned to the motivational (non-intentional) stage. Individuals who already intend to act are assigned to the volitional stage (postintentional) which is further subdivided into the intentional (preaction) and action

stage. Individuals, who are motivated to pursue their behavioral goals, but do not yet act according to their intention can be assigned to the intentional stage. Individuals, who already perform the target behavior, can be assigned to the action stage. The two and three stages, respectively, are represented in Figure 1.

One approach to test the validity of stages is the prediction of stage transitions (Weinstein et al., 1998). Based on the HAPA, this method has so far been applied in the context of dental flossing and fruit and vegetable intake (Schüz et al., 2009; Wiedemann et al., 2009a). An aim of this thesis is to extend research on the prediction of stage transition in the domain of physical activity by investigating associations between changes in social-cognitive predictors derived from the HAPA and stage movement (*Chapter 2*). A detailed description of all social-cognitive predictors of the HAPA which are investigated within the framework of this thesis is given in the following sections.

### *Intention*

Intentions represent a person's motivation to engage in a desired target behavior and play a key role in the health behavior change process. However, the intention to act does not yet guarantee that the target behavior will be performed. A meta-analysis of experimental studies in the physical activity domain demonstrated that medium changes in intention ( $d = .45$ ) bring about small changes in behavior ( $d = .15$ ; Rhodes & Dickau, 2012). Planning, action control, volitional self-efficacy, and social support (all predictors are described in detail below) are supposed to be more proximal predictors of behavior than intention. Beside motivational self-efficacy and risk perception, outcome expectancy is supposed to be a predictor of intention.

### *Outcome expectancy*

Outcome expectancy describes a contingency between an individual's behavior and the consequences following that behavior (Bandura, 1997), and is generally defined as the expectation that a specific outcome will follow a given behavior (Williams, Anderson, & Winett, 2005). The beliefs people hold about beneficial effects of performing a behavior (e.g., expecting to feel more flexible after doing yoga) are referred to as positive outcome expectancy (pros). The beliefs people hold about adverse effects of performing a behavior (e.g., expecting to feel pain after doing yoga) are referred to as negative outcome

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expectancy (cons). Depending on whether positive or negative outcome expectancy predominate, the target behavior will be affected directly or indirectly via intentions. According to the HAPA, outcome expectancy is regarded as a motivational factor and as being mainly influential in the non-intentional stage of the behavior change process (Schwarzer et al., 2011). In the domain of physical activity, this theoretical assumption is supported by a review that identified outcome expectancy as a consistent predictor of the intention to be physically active (Williams et al., 2005). Beside outcome expectancy, risk perception is suggested in the HAPA to be a further predictor of intention.

### *Risk perception*

Risk perception refers to the individual's beliefs about the likelihood that a health problem will be encountered (Stephan, Boiche, Trouilloud, Deroche, & Sarrazin, 2011). For example, a person may perceive a high likelihood to suffer from diabetes or a cardiovascular disease. Believing to be at risk for developing certain diseases can stimulate the motivation to change a health behavior by contemplating about precautions. However, people often underestimate their personal health risk. Even overweight and obese individuals often do not perceive their weight as a health related risk factor (Gregory, Blanck, Gillespie, Maynard, & Serdula, 2008). In the HAPA, risk perception is assumed to predict intention. However, risk perception in itself seems to not suffice for intention formation and is therefore merely seen as a distal antecedent in the initial motivational stage (Schwarzer et al., 2011). A more proximal antecedent of intention seems to be self-efficacy which is described in detail below.

### *Self-efficacy*

Perceived self-efficacy was originally introduced by Bandura (1977) and emerged as a psychological resource in health behavior and health behavior change theories. Bandura (1997) defined perceived self-efficacy as "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" and referred to the multidimensionality of the construct. For example, a person with high self-efficacy beliefs to resist temptation to smoke does not necessarily have high self-efficacy beliefs about being physically active on a permanent and regular basis. Therefore, self-efficacy beliefs are not only observed generically but also domain specifically. The studies of this thesis only focus on self-efficacy referring to physical activity and physical exercise, respectively.

Self-efficacy has been found to be crucial in all phases of the health behavior change process (Bandura, 1997). However, depending on the particular task (i.e., forming an intention, maintaining an activity), different self-efficacy beliefs are required. This is encompassed in the phase-specific distinction of self-efficacy which was introduced by Marlatt, Baer, and Quigley (1995). The HAPA distinguishes between two and three, respectively, phase-specific self-efficacy beliefs (Ochsner, Scholz, & Hornung, 2013; Schwarzer et al., 2011). Motivational self-efficacy is assumed to predict behavioral intentions and can help initiate a novel behavior (Schwarzer et al., 2007). For example, a person might be confident in his or her capability to make an attempt to be physically active even if it is difficult for him or her. Different terms are used as synonyms in the literature such as task or (pre-) action self-efficacy. While motivational self-efficacy is suggested to play a major role in the non-intentional stage, volitional self-efficacy should be beneficial for individuals already intending to change their behavior (Schwarzer et al., 2011). Volitional self-efficacy comprises maintenance self-efficacy (also called barrier self-efficacy, or coping self-efficacy) as well as recovery self-efficacy. Maintenance self-efficacy is important once an action has been started and refers to overcoming barriers that may arise at this stage (Schwarzer & Renner, 2000). Recovery self-efficacy represents optimistic beliefs about one's capability to resume an interrupted chain of action (Luszczynska, Schwarzer, Lippke, & Mazurkiewicz, 2011). For example, a person might be confident in his or her capability to be able to resume physical activity even if he or she wasn't physically active several times. Within most studies of this thesis, the phase-specific character of self-efficacy beliefs is taken into account. Numerous studies have shown unequivocally that self-efficacy is a consistent correlate of physical activity (e.g., Bauman et al., 2012). With regard to stage transitions, self-efficacy was found to facilitate stage progression (Lippke & Plotnikoff, 2009; Luszczynska & Sutton, 2006; McAuley, Jerome, Marquez, Canaklisova, & Blissmer, 2003; O'Hea et al., 2004; Plotnikoff, Lippke, Johnson, & Courneya, 2010). In experimental studies manipulating self-efficacy beliefs, intervention effects on physical activity were mediated by changes in self-efficacy (Darker, French, Eves, & Sniehotta, 2010; Dutton et al., 2009). A meta-analysis of physical activity interventions revealed a large relationship of  $r = .69$  between changes in self-efficacy and changes in physical activity (Williams & French, 2011).

Although self-efficacy is a crucial determinant in the health behavior change process, there still remains a deficit in our knowledge regarding how to modify these optimistic beliefs in one's personal efficacy. What kind of information feeds self-efficacy? Bandura (1997) differentiates four informational sources of self-

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efficacy, namely enactive mastery experience, vicarious experience, verbal persuasion and allied types of social influences as well as physiological and affective states. Personal mastery is considered the strongest source of self-efficacy, as it provides observable proof for goal achievement (Bandura, 1997). In the context of physical exercise, Warner, Schüz, Knittle, Ziegelmann, and Wurm (2011) found direct effects of mastery experience and vicarious experience on exercise-specific self-efficacy as well as indirect effects on exercise. The four informational sources of self-efficacy have implications for techniques to foster self-efficacy beliefs.

In the domain of physical activity, a systematic review of techniques improving self-efficacy revealed that providing specific feedback by comparing participants' performance with others as well as with their past performance yielded the best results (Ashford, Edmunds, & French, 2010). The assumption is that these techniques make participants aware of their positive achievements leading to increased self-efficacy. Another strategy which might enhance the awareness of one's achievements and subsequently increases self-efficacy is the acknowledgement of having experienced positive consequences that came along with the behavior performance (e.g., feeling better afterwards). The corresponding concept of outcome experience is specified in one of the next paragraphs. It plays a major role within two chapters of this thesis focusing on relationships between positive outcome experience and self-efficacy as well as between these psychological resources and self-regulatory strategies derived from the HAPA. These self-regulatory strategies are outlined in the following paragraphs.

### *Planning*

Planning is a prospective self-regulatory strategy facilitating the initiation of health behaviors as well as their maintenance on a regular basis (e.g., Armitage, 2006; Bélanger-Gravel, Godin, & Amireault, 2013; Gollwitzer, 1999; Gollwitzer & Sheeran, 2006; Lippke, Schwarzer, Ziegelmann, Scholz, & Schüz, 2010; Lippke, Ziegelmann, & Schwarzer, 2004; Sniehotka, Scholz, & Schwarzer, 2006). Studies on the prediction of stage transitions provide evidence that individuals high in planning are more likely to progress from the intentional stage to the action stage (Armitage, 2006; Schüz et al., 2009) and that individuals low in planning are more likely to regress from the action to the intentional stage (Courneya, Estabrooks, & Nigg, 1997; De Vet, de Nooijer, de Vries, & Brug, 2006; Wiedemann et al., 2009a).

In the domain of physical activity, planning has been observed as a mediator of the intention-behavior relationship, meaning that planning bridges the gap between intentions and behavior (e.g., Schwarzer, Luszczynska, Ziegelmann, Scholz, & Lippke, 2008; Wiedemann, Schüz, Sniehotta, Scholz, & Schwarzer, 2009). Intervention studies demonstrated that individuals who generate plans are more likely to translate their intentions into physical activity (e.g., Scholz, Sniehotta, Burkert, & Schwarzer, 2007; Sniehotta et al., 2006). In those intervention studies, individuals were prompted to generate action plans as well as coping plans. Action plans specify in detail “when”, “where”, and “how” to perform a target behavior (Gollwitzer, 1999; Leventhal, Singer, & Jones, 1965). Coping plans contain anticipated internal and external barriers that may jeopardize the performance of the intended behavior (if-condition). These barriers are then linked to appropriate strategies (then-condition) that help overcome them (Sniehotta, Schwarzer, Scholz, & Schüz, 2005). For example, “If I am not motivated to go to the gym, I will ask my partner to go with me”. Hence, action planning is a behavior-facilitating strategy and coping planning a barrier-focused strategy being relevant in the volitional stage. According to the HAPA, both planning strategies do not only mediate the intention-behavior relationship but also the relationship between volitional self-efficacy and behavior. However, most studies testing the HAPA in the domain of physical activity focused on action planning only or used an aggregate of action and coping planning (Barg et al., 2012; Caudroit, Stephan, & Le Scanff, 2011; Chiu, Lynch, Chan, & Berven, 2011; Perrier, Sweet, Strachan, & Latimer-Cheung, 2012) but did not treat action and coping planning as separate constructs in the model.

Apart from action planning and coping planning which are applied prior to encountering performance-relevant situations, action control is another self-regulatory strategy that helps control the behavior during or after behavior performance. All three types of self-regulatory strategies are involved in the studies of this thesis.

#### *Action control*

Action control is based on cybernetic self-regulation models (Carver & Scheier, 1998) and represents a further postintentional factor that is helpful for successful goal pursuit (Sniehotta, Scholz, & Schwarzer, 2005; Schwarzer et al., 2011). As an in situ self-regulatory strategy, action control is suggested to contribute in particular to the maintenance of a behavior as well as to the prevention of relapses. Awareness of one’s own standards (e.g., “I have always been aware of my prescribed training schedule”),

self-monitoring (e.g., "I consistently monitor when, how long, and where I am physically active"), and self-regulatory effort (e.g., "I really try hard to be physically active regularly") are suggested facets of action control (Sniehotta et al., 2005a). Previous studies have shown that action control predicts physical activity and therefore, seems to be an important and promising factor in the volitional stage (e.g., Pomp, Lippke, Fleig, & Schwarzer, 2010; Scholz, Nagy, Schüz, & Ziegelmann, 2008; Sniehotta, Nagy, Scholz, & Schwarzer, 2006).

Another promising predictor of the HAPA which is suggested to facilitate not only volitional but also motivational processes is social support.

### *Social support*

As specified by Schwarzer and Knoll (2007, p. 244), social support "refers to the function and quality of social relationships, such as perceived availability of help, or support actually received". A theoretical distinction is made between perceived and received social support (Haber, Cohen, Lucas, & Baltes, 2007). Perceived social support is prospective and refers to "anticipating help in time of need" (Schwarzer & Knoll, 2010, p. 284). For example, a person states that family members are encouraging of regular physical activity. In contrast, received social support is always retrospective and deals with help that has been "provided within a given time period" (Schwarzer & Knoll, 2010, p. 285). For example, a person states that a friend has engaged in physical activity with her/him. Further forms of social support have been examined (Schwarzer & Knoll, 2010), such as instrumental social support (e.g., taking care of the grandchild while the daughter is doing yoga), informational social support (e.g., giving instructions on how best to use special sports equipment) and emotional social support (e.g., providing encouragement). According to the HAPA, social support predicts intention as well as behavior.

In the domain of physical activity, intervention studies have demonstrated the effectiveness of social support, (e.g., Gellert, Ziegelmann, Warner, & Schwarzer, 2011; Salmon, Bremen, Fotheringham, & Finch, 2000) and underpin its function as a resource factor. In the context of obesity, it is also recommended to integrate social support into physical activity treatments (British Psychological Society, 2011; National Institutes of Health, 1998).

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*Empirical evidence for the HAPA in the domain of physical activity*

In the past few years, the HAPA has been tested in diverse samples with different age groups, genders, socio-cultural background, and health status, and in the context of many health behaviors such as physical activity, dietary behavior, breast self-examination, seat belt use and dental flossing (for an overview see Schwarzer, 2008). The model emerged as a promising theoretical basis for health behavior change interventions, especially in the area of physical activity promotion (Schwarzer et al., 2011). Studies in the context of physical activity found empirical evidence for the theoretically assumed associations between the constructs specified in the HAPA in samples consisting of different age groups (Barg et al., 2012; Caudroit et al., 2011; Renner, Spivak, Kwon, & Schwarzer, 2007), in orthopedic and cardiac rehabilitation patients (Lippke, Ziegelmann, & Schwarzer, 2005; Scholz, Sniehotta, & Schwarzer, 2005; Ziegelmann, Lippke, & Schwarzer, 2006), in patients with multiple sclerosis (Chiu et al., 2011), in individuals with type 2 diabetes (Lippke & Plotnikoff, in press), and with physical disabilities (Perrier et al., 2012). However, more research is needed to investigate whether the theoretical assumptions of the HAPA are also applicable in other high-risk groups (Schwarzer & Luszczynska, 2008). As there is a lack of studies on the HAPA in the area of physical activity targeting individuals with obesity, a second aim of this thesis is to fill this gap by testing whether the HAPA is applicable for this high risk group (*Chapter 3*). At the same time, empirical support for the continuous assumptions of the HAPA can be provided and a contribution to research on physical activity promotion addressing adults with obesity can be made.

A theoretical construct that has not yet been linked to the HAPA is positive outcome experience. This relatively unexplored psychological resource factor is addressed in *Chapters 4 and 5* of this thesis and, thus, is introduced in the following paragraph.

*Positive outcome experience*

Somebody who is doing yoga frequently might experience more flexibility. Somebody who is going for a run several times a week might feel better afterwards. Experiencing those benefits of physical activity might set motivational processes in motion as well as lead to future behavior engagement. The experience of those consequences is conceptualized as behavior-related outcome experience. According to Fuchs, Göhner, and Seelig (2011) outcome experience can be defined as individual experience of and appraisals after the adoption of a novel behavior. Its impact on the course of physical activity change is accounted for

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within the motivation volition model (MoVo model; Fuchs et al., 2011; Göhner, Seelig, & Fuchs, 2009). According to this process model, outcome experiences launch a feedback loop by affecting intentions via corresponding outcome expectancy. To date, much more evidence exists on the role of outcome expectancy which should not be confused with outcome experience. The difference lies in the temporal dimension: expectancies are prospective and anticipatory whereas experiences are retrospective. So far, research has paid little attention to the role of experiences with positive and negative consequences in the motivational as well as volitional stage of the physical activity change process. Rothman and colleagues (Rothman, 2000; Rothman, Baldwin, & Hertel, 2004) argue that the motivation to maintain a behavior partly depends on the experience of positive and negative behavior outcomes. The relevance of experiencing positive consequences for the volitional stage of the behavior change process was supported by a study showing that the maintenance of exercise among cardiac and orthopedic rehabilitation patients was fostered by prior positive outcome experience (Fleig, Lippke, Pomp, & Schwarzer, 2011). This study partly disentangled the experience-behavior relationship and revealed that satisfaction and planning mediated the relation. Another study found that the link between past experience and vicarious experience, respectively and physical exercise is mediated by self-efficacy (Warner et al., 2011). The question arises whether self-efficacy might also function as a mediator in the relationship between positive outcome experience and physical activity. This question is addressed in *Chapter 4* of this thesis. As psychological resources may be not sufficient for physical activity performance, a possible interplay with self-regulatory strategies should also be taken into account. Therefore, it is also tested whether the suggested experience-self-efficacy-behavior relationship might depend on the individual's level of using action control (*Chapter 4*).

To conclude, evidence on the effect of positive outcome experience on physical activity as well as its associations with determinants of the motivational and the volitional stage of physical activity change is scarce. Finally, a further aim of this thesis is to better understand how the experience with positive consequences is embedded into the physical activity change process. More precisely, it is examined how positive outcome experience is related to motivational and volitional determinants of physical exercise in a non-clinical (*Chapter 5, part 1*) as well as clinical context (*Chapter 5, part 2*).

Table 1 summarizes all theoretical constructs specified in the sections above. This overview also displays in which chapters of the thesis the respective variables are examined. Subsequently, research aims of the dissertation dealing with these constructs are presented.

*Table 1.* Overview of empirical chapters and investigated study variables

<b>Chapter</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>Study variables</b>				
<b>Behavior (baseline)</b>		X	X	X
<b>Behavior (follow-up)</b>			X	X
<b>Stage transition</b>	X			
<b>Intention</b>		X		X
<b>Outcome expectancy</b>	X	X		
<b>Risk perception</b>		X		
<b>Self-efficacy (SE)</b>	Motivational SE	X	X	X
	Volitional SE	Maintenance SE	X	X
		Recovery SE		X
<b>Planning</b>	Action planning		X	X
	Coping planning	X	X	
<b>Action control</b>			X	
<b>Social support</b>		X		
<b>Positive outcome experience</b>			X	X

### Research Aims

Health behavior change theories have been shown to be useful for the development and evaluation of interventions promoting health behavior change (Michie & Johnston, 2012; Michie & Prestwich, 2010). Stage theories assume that individuals in different stages of the health behavior change process differ in their cognitive and behavioral characteristics. Consequently, interventions should be tailored appropriately to individual needs by targeting stage-specific psychological resources and self-regulatory strategies. The HAPA incorporates these practical implications. Previous studies on the HAPA have found stage-specific predictors of stage transitions in the context of dental flossing and fruit and vegetable intake

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(Schüz et al., 2009; Wiedemann et al., 2009a). However, it remains open whether changes in social-cognitive variables also predict transitions between the three stages derived from the HAPA in the domain of physical activity. Therefore, this is an object of investigation in *Chapter 2* of the present dissertation. Within this longitudinal study, the most central predictors of the HAPA were chosen: motivational self-efficacy, positive outcome expectancy, maintenance self-efficacy and planning. Concretely, it is hypothesized that

- a) an increase in outcome expectancy and motivational self-efficacy is associated with progression from the non-intentional stage to a further stage,
- b) a decrease in motivational self-efficacy and planning is associated with regression from the intentional stage into the non-intentional stage,
- c) an increase in maintenance self-efficacy and planning is associated with progression from the intentional stage to the action stage, and
- d) a decrease in maintenance self-efficacy and planning is associated with regression from the action stage to an earlier stage.

While there is a lack of studies on the prediction of stage transitions in the domain of physical activity, there are numerous studies investigating the HAPA as a continuum model (Schwarzer et al., 2011). However, Schwarzer et al. (2011) pointed out that more research on at-risk groups is necessary to prove the universality and applicability of the HAPA. Obesity is a common and serious risk factor for several chronic diseases. Therefore, this dissertation tested in *Chapter 3*, whether the theoretical assumptions of the HAPA are applicable for individuals with obesity in the domain of physical activity. More precisely, it is hypothesized that

- e) outcome expectancy, motivational self-efficacy and risk perception are positively associated with intention,
- f) maintenance self-efficacy is positively related to planning and recovery self-efficacy to physical activity,
- g) intention is positively associated with action planning and coping planning, and both planning strategies are linked to more physical activity, and
- h) social support is positively associated with intention and physical activity.

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By differentiating phase-specific self-efficacy the HAPA emphasizes the importance of self-efficacy beliefs. However, the model does not propose how to affect self-efficacy. Within this dissertation, positive outcome experience is assumed to be a facilitator of self-efficacy. So far, the association between positive outcome experience and self-efficacy is rather unexplored. The same applies to the role of positive outcome experience in the process of physical activity change. Although outcome experience is considered in the MoVo model (Fuchs et al., 2011; Göhner et al., 2009), only few studies have dealt with this construct. Therefore, *Chapter 4* investigates

- i) whether positive outcome experience is linked to higher levels of self-efficacy which in turn increase physical activity.

Thereby, the interplay with self-regulatory processes should be taken into account. For this reason, it is further tested

- j) whether the relationships between positive outcome experience, self-efficacy and physical activity are dependent on action control levels.

The studies in *Chapter 5* take a step further. First, the association between positive outcome experience and phase-specific self-efficacy is regarded. Second, the focus lies on physical exercise which is a subdomain of physical activity. Third, hypotheses are investigated in a non-clinical and a clinical sample to learn more about differences between persons of the regular population and persons with chronic illnesses and disabilities. Fourth, action planning as a self-regulatory strategy is taken into account. More precisely, it is hypothesized that positive outcome experience is

- k) positively associated with motivational self-efficacy, behavioral intentions, and volitional self-efficacy and
- l) indirectly related to action planning and physical exercise.

The research aims specified above were investigated in five observational studies. These studies differed in their design and sample characteristics. Table 2 displays for each conducted study the target behavior, the sample size, the target group, the mode of assessment, the number as well as time of measurements.

Table 2. Overview of study characteristics

Chapter	Behavior	N	Target group	Mode of assessment	Baseline	Weeks after baseline					6 months after end of rehabilitation <sup>1</sup>
						2	3	4	5	9	
2	Physical activity	660	Sample of online population	Online questionnaire	T1		T2				
3	Physical activity	484	Individuals with obesity	Online questionnaire	T1						
4	Physical activity	193	University students	Paper pencil and online questionnaire	T1	T2		T3			
5 (part one)	Physical exercise	350	Sample of online population	Online questionnaire	T1	T2			T3		
5 (part two)	Physical exercise	275	Rehabilitation patients	Computer-based questionnaire and computer-assisted telephone interviews	T1		T2			T3	T4

Note. T = Time; N = Sample size. All studies have an observational design. <sup>1</sup>End of rehabilitation took place three weeks after baseline.

The concrete hypotheses which were derived from the above specified research aims are provided in the following *Chapters 2 to 5*. These chapters are published or submitted for publication in scientific journals.

Figure 2 summarizes the hypothesized framework of this thesis based on the HAPA.

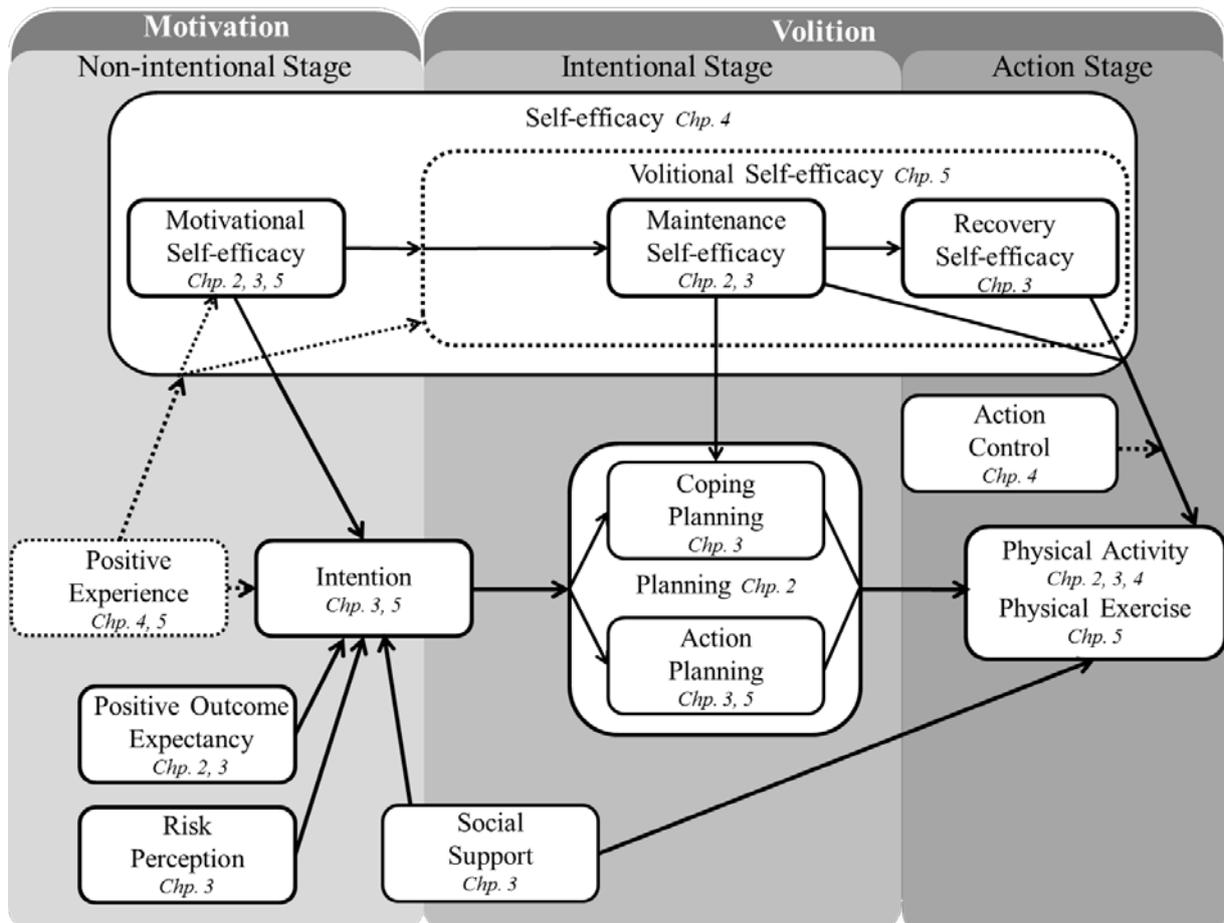


Figure 2. Summary of all hypothesized paths within the health action process approach

Note. Dashed lines indicate paths and constructs previously not specified in the HAPA. Chp. = Chapter(s).

The results of all studies conducted within the scope of the present thesis are discussed in *Chapter 6*.

Furthermore, implications for methodology, theory, and interventions are presented.

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# Chapter 2

## **Changes in Social-Cognitive Variables are Associated with Stage Transitions in Physical Activity**

# Chapter 3

## **Physical Activity among Adults with Obesity: Testing the Health Action Process Approach**

# Chapter 4

## **Positive Experience, Self-efficacy, and Action Control Predict Physical Activity Changes: A Moderated Mediation Analysis**

# Chapter 5

## **Positive Exercise Experience Facilitates Behavior Change via Self- Efficacy**

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Parschau, L., Fleig, L., Warner, L. M., Pomp, S., Barz, M., Knoll, N., Schwarzer, R., & Lippke, S. (2012). Positive exercise experience facilitates behavior change via self-efficacy. Manuscript submitted for publication.

# Chapter 6

## General Discussion

## General Discussion

The promotion of regular physical activity in primary, secondary and tertiary prevention is of paramount importance given its expansive benefits for physical and psychological health (Department of Health, 2004). However, most people are not sufficiently physically active to achieve these benefits (World Health Organization, 2011) and should be encouraged to improve their activity levels. Therefore, effective physical activity interventions should be implemented more frequently to contribute to disease prevention as well as to aid individuals in managing non-communicable chronic diseases such as cardiovascular diseases, musculoskeletal disorders, obesity, diabetes and cancer (Department of Health, 2004). Health behavior change interventions are claimed to be more effective when they are based on theory (Michie & Johnston, 2012; Michie & Prestwich, 2010). As this also applies for interventions in the domain of physical activity, it is necessary to unveil theory-based mechanisms through which individuals engage in more physical activity. To further theory and refine intervention development, research efforts should focus on which psychological determinants are associated with successful physical activity performance and on how they are interconnected.

The overall aim of this thesis was to contribute to research on how to promote physical activity by identifying associations between psychological resources as well as self-regulatory strategies (theory-driven social-cognitive constructs) and physical activity (change). This referred not only to the area of primary (e.g., participants of an online study in the general population and university students) but also to secondary and tertiary prevention (e.g., individuals with obesity and rehabilitation patients). The first set of research questions concerned the health action process approach (HAPA; Schwarzer, 1992; Schwarzer, Lippke, & Luszczynska, 2011) in the domain of physical activity. By using an innovative dynamic analytic approach, it was investigated in an online sample of the general population whether changes in psychological resources (i.e., motivational self-efficacy and maintenance self-efficacy) as well as self-regulatory strategies (i.e., planning) are associated with transitions between the three stages specified in the HAPA (*Chapter 2*). Furthermore, it was tested whether the theoretical assumptions of the HAPA are applicable for individuals with obesity (*Chapter 3*). The next set of research questions focused on the role of positive outcome experience which is so far relatively unexplored in terms of physical activity change. Among university students, it was examined whether positive outcome experience fosters self-efficacy which in turn improves physical activity. In addition, it was analyzed in *Chapter 4* whether these

relationships are dependent on using self-regulatory strategies (action control). Finally, positive outcome experience and its direct and indirect relationships with motivational self-efficacy, behavioral intentions, volitional self-efficacy, action planning, and physical activity change were examined in an online sample of the general population (*Chapter 5, part 1*) as well as among rehabilitation patients (*Chapter 5, part 2*). An overview of the structure of the four empirical chapters is represented in Figure 1.

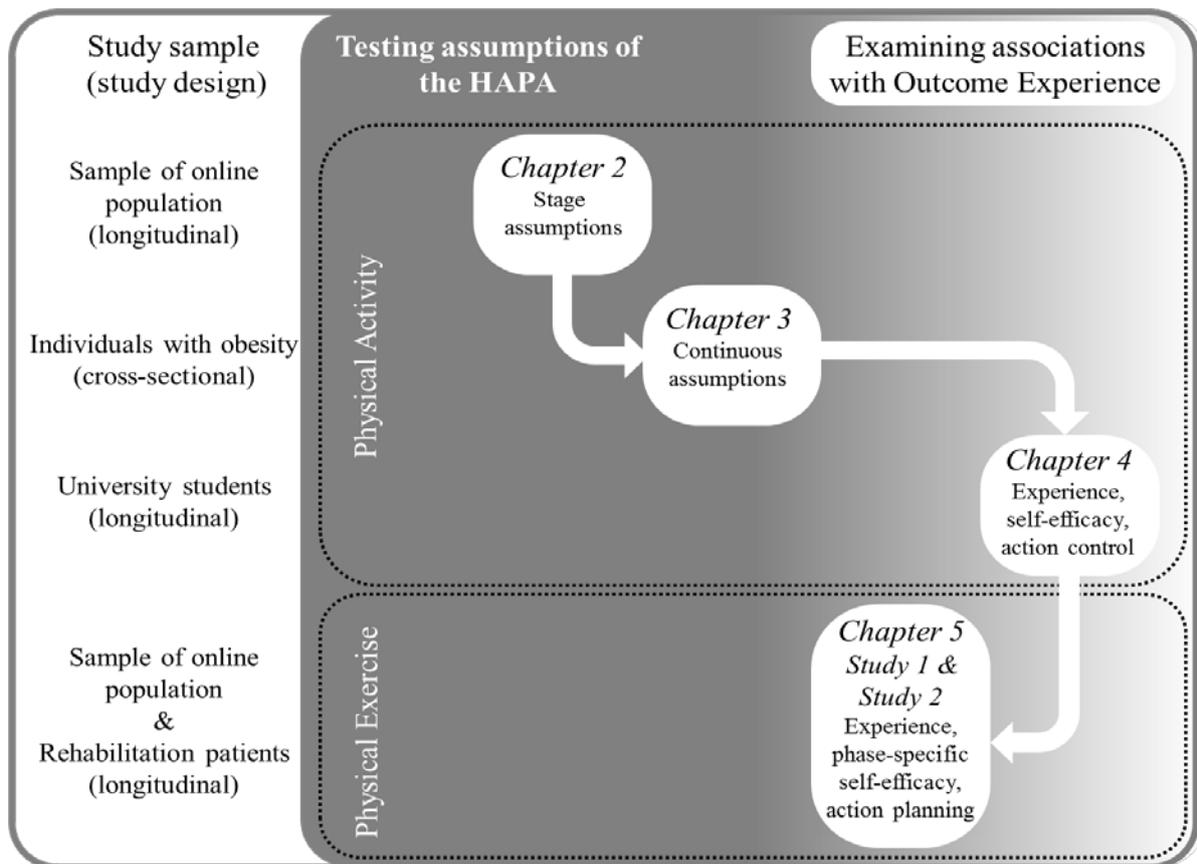


Figure 1. Structure of the empirical chapters

In this general discussion, findings of the empirical chapters are discussed, then, implications for methodology, theory, and interventions are presented. Dissertation aims, findings, conclusions, and implications are summarized in Table 1.

Table 1. Summary of dissertation aims, findings, conclusions and implications

	<b>Aims</b>	<b>Findings</b>	<b>Conclusions and Implications</b>
<b>Chapter 2</b>	<ul style="list-style-type: none"> <li>to identify stage-specific prediction patterns in an online sample of the general population by examining associations between changes in social-cognitive factors and transitions among HAPA stages with regard to physical activity (PA)</li> </ul>	<ul style="list-style-type: none"> <li>increases in self-efficacy (SE) were related to progression out of non-intentional stage</li> <li>a decrease in planning was linked to regression from the intentional stage</li> <li>increases in planning and maintenance SE were associated with progression from the intentional stage</li> <li>a decrease in motivational SE was correlated with regression from action stage</li> </ul>	<ul style="list-style-type: none"> <li>findings support the assumption of three qualitatively distinct HAPA stages</li> <li>to promote PA, one should improve SE for non-intending, intending, as well as acting individuals, and additionally planning for intending individuals</li> </ul>
<b>Chapter 3</b>	<ul style="list-style-type: none"> <li>to test cross-sectionally the applicability of the HAPA for a sample of individuals with obesity in the context of PA</li> </ul>	<ul style="list-style-type: none"> <li>motivational SE, outcome expectancy (OE) and social support were related to intention</li> <li>an association between maintenance SE and coping planning was found</li> <li>intention was related to action planning and coping planning</li> <li>motivational SE, maintenance SE and recovery SE were correlated</li> <li>recovery SE and social support were associated with PA</li> <li>no relationships were found between risk perception and intention and between planning and PA</li> </ul>	<ul style="list-style-type: none"> <li>study results partly endorse the applicability of the HAPA concerning PA among adults with obesity</li> <li>results confirm the importance of phase-specific SE and suggest that OE and SE facilitate the formation of the intention to be physically active</li> <li>social support may be more relevant for engaging in PA than planning within an obese sample</li> <li>the HAPA may constitute a theoretical backdrop for intervention designs to promote PA in adults with obesity</li> </ul>
<b>Chapter 4</b>	<ul style="list-style-type: none"> <li>to investigate longitudinally in a student sample whether positive outcome experience fosters physical activity change via self-efficacy</li> <li>to test whether this mediation is moderated by action control</li> </ul>	<ul style="list-style-type: none"> <li>SE was found to mediate between initial positive outcome experience with PA and later PA</li> <li>this mediation was moderated by action control</li> </ul>	<ul style="list-style-type: none"> <li>results indicate that participants' perceptions of positive outcome experience are associated with their subsequent SE fostering PA change</li> <li>however, persons with low levels of action control seem not to translate positive outcome experience into PA via SE</li> <li>future experimental studies could investigate whether the manipulation of positive outcome experience affects self-efficacy and should take self-regulation strategies such as action control into account</li> </ul>
<b>Chapter 5</b>	<ul style="list-style-type: none"> <li>to investigate longitudinally in a clinical and a non-clinical sample whether positive outcome experience stimulates motivational SE, intentions, and volitional SE directly as well as action planning and changes in physical exercise indirectly</li> </ul>	<ul style="list-style-type: none"> <li>positive outcome experience was directly related to motivational SE as well as to intentions in both samples</li> <li>in the non-clinical sample only, positive outcome experience was associated with volitional SE</li> <li>in each sample, action planning was indirectly associated with experience via motivational SE and intentions</li> <li>action planning was linked to changes in physical exercise levels</li> </ul>	<ul style="list-style-type: none"> <li>both studies contribute to the understanding of how experience with positive consequences of physical exercise is involved in the physical exercise change process</li> <li>results further suggest that this construct is a promising candidate to be integrated into the motivational stage of health behavior change models</li> <li>thus, research on positive outcome experience in the domain of other health behaviors (e.g., fruit and vegetable consumption) is necessary</li> </ul>

### **The Health Action Process Approach in the Domain of Physical Activity**

According to the stage assumption of the HAPA (Schwarzer, 1992; Schwarzer et al., 2011), individuals can pass through three different stages during the behavior change process: non-intentional, intentional and action. Within one stage, a specific set of predictors is supposed to be important for stage movement and this specific set is less relevant for individuals residing in other stages (Weinstein, Rothman, & Sutton, 1998). This assumption was examined regarding physical activity in *Chapter 2* by testing whether changes in psychological resources and self-regulatory strategies are associated with stage transitions. However, the HAPA that is regarded as a hybrid model, can also be analyzed as a continuum (or mediator) model (Schwarzer, 2008). So far, the model has not yet been investigated among individuals with obesity in the context of physical activity. Accordingly, it was tested whether the theoretical assumptions of the HAPA are also applicable for this high-risk group (*Chapter 3*). Findings of both chapters are at first discussed separately and subsequently in an integrated manner.

#### *Chapter 2: Stage transitions with regard to physical activity*

The aim of *Chapter 2* was to test the validity of stages derived from the HAPA in the domain of physical activity. Distinct sets of psychological resources (i.e., motivational self-efficacy, maintenance self-efficacy, and positive outcome expectancy) and self-regulatory strategies (i.e., planning) were assumed to predict stage movements. Associations between changes in these predictors and stage transitions were examined by comparing a) stagnating with progressing non-intenders, b) stagnating with regressing intenders, c) stagnating with progressing intenders, and d) maintaining with regressing actors. This was done in an online study on physical activity with two measurement points in time.

In line with the hypotheses, an increase in motivational self-efficacy and surprisingly, a positive change in maintenance self-efficacy were correlated with progression out of non-intentional stage. Previous studies on the prediction of stage movement also found that (usually non-stage-specific) self-efficacy is important for intention formation (e.g., Reid et al., 2007; Wiedemann et al., 2009a).

Contrary to the theoretical assumption, increases in positive outcome expectancy were not found to be associated with progression out of the non-intentional stage. A similar result revealed in a recently published study on stages derived from the HAPA among rehabilitation patients (Jackson, Lippke, & Gray, 2011). However, levels of positive outcome expectancy in individuals of the non-intentional stage were

already high at baseline and therefore, the possibility of further improvements was limited. In accordance with the hypotheses, positive outcome expectancy was also not associated with any other stage transition.

As hypothesized, a decrease in planning was related to regression from intentional stage. Individuals who once intended to be physically active but did not plan the behavior became less motivated over time. Moreover, an increase in planning was associated with progression out of the intentional stage. This corroborates findings of other studies on the prediction of stage transition providing evidence that planning predicts progression to the action stage (Armitage, 2006; Schüz, Sniehotta, Mallach, Wiedemann, & Schwarzer, 2009).

Additionally, a relationship between increasing maintenance self-efficacy and progression from intentional to action stage was observed. This result supports the assumption that maintenance self-efficacy is useful to overcome barriers that may arise in this stage (Schwarzer & Renner, 2000). Contrary to the hypotheses, decreasing motivational self-efficacy was not correlated with regression from the intentional stage but unexpectedly with regression from the action stage to the intentional and non-intentional stages. This suggests that being confident in one's capability to make an attempt to be physically active even if it is difficult seems to prevent relapses from the action but not from the intentional stage. Experiencing failures might lead to a decrease in motivational self-efficacy in actors which might be followed by less activity and relapses to previous stages. However, in contradiction to the hypotheses, such a relapse from action to previous stages was not related to decreases in maintenance self-efficacy. Furthermore, it was not observed that individuals with a drop in planning are more likely to regress from the action to previous stages. Other studies which examined predictors of stage transition on the basis of the HAPA did also not find planning as a factor that prevent relapses out of the action stage (Jackson et al., 2011; Schüz et al., 2009). Possibly, for actors, engaging in physical activity on a regular basis has become routine and thus, deliberate planning becomes less necessary to maintain the behavior.

In sum, the findings of *Chapter 2* supported the stage assumptions of the HAPA and that one can distinguish between three qualitatively distinct stages in the physical activity change process that differ in terms of their specific set of social-cognitive predictors. In particular, changes in individual resources (i.e., motivational and maintenance self-efficacy) and self-regulatory strategies (i.e., planning) were associated with stage movement.

*Chapter 3: Testing the HAPA among adults with obesity*

The aim of *Chapter 3* was to test whether the relationships between the theoretical constructs derived from the HAPA are applicable for individuals with obesity in the domain of physical activity and thus, to accumulate evidence on the HAPA across high-risk groups.

Regarding the non-intentional stage, as expected, positive outcome expectancy, motivational self-efficacy, and social support were associated with intention. However, risk perception was not associated with intention. This might be due to the fact that risk perception is merely useful to enhance the awareness about a potential risk and thinking about possibilities to reduce it without having the intention to act accordingly (progress to a contemplation stage; Schwarzer et al., 2011). Another reason might be that the participants already suffered from sequelae (such as diabetes). However, this result is consistent with previous research on the HAPA referring to other health behaviors and populations (e.g., Barg et al., 2012; Chiu, Lynch, Chan, & Berven, 2011; Perrier, Sweet, Strachan, & Latimer-Cheung, 2012) and supports the assumption that risk perception is a rather distal antecedent of intention which in itself seems not to be sufficient for becoming motivated to change a behavior (Schwarzer et al., 2011).

In the sample of adults with obesity, individuals with high intentions were more likely to formulate action plans as well as coping plans. This is in line with previous research on the HAPA in the domain of physical activity. However, previous research mostly subsumed action planning and coping planning to one composite scale (e.g., Caudroit, Stephan, & Le Scanff, 2011; Chiu et al., 2011; Perrier et al., 2012). Contrary to predictions, however, neither action planning nor coping planning were related to physical activity in the sample under investigation. This finding was not in line with expectations as forming implementation intentions has been demonstrated to be effective for individuals with obesity to become more active and to lose weight (Göhner et al., 2012; Luszczynska, Sobczyk, & Abraham, 2007). However, other studies on the HAPA among high risk-groups (e.g., individuals with acquired physical disabilities and in retired older individuals) also did not find a relationship between planning and physical activity (e.g., Caudroit et al., 2011; Perrier et al., 2012). A possible explanation for a missing mediator effect of planning between intention and physical activity might be that moderating effects were not taken into account. In the domain of physical activity, several moderators of the intention-planning-behavior mediation chain have been identified, such as a person's age (Amireault, Godin, Vohl, & Perusse, 2008; Renner, Spivak, Kwon, & Schwarzer, 2007; Reuter et al., 2010; Scholz, Sniehotta, Burkert, & Schwarzer, 2007), level of intention

(Wiedemann, Schüz, Sniehotta, Scholz, & Schwarzer, 2009) and self-efficacy beliefs (Koring et al., 2012a; Lippke, Wiedemann, Ziegelmann, Reuter, & Schwarzer, 2009). In the domain of obesity, the same moderators have been proven for saturated-fat intake (Soureti, Hurling, van Mechelen, Cobain, & Chinapaw, 2012).

In contrast to action planning and coping planning, social support was strongly related to physical activity in the sample of adults with obesity. A study on the HAPA in the context of dietary behavior of adults with overweight and obesity recently found a comparable result, namely that social support but not planning predicted behavior (Scholz, Ochsner, Hornung, & Knoll, in press). Thus, social facilitation of planning skills (e.g., dyadic planning) might be fruitful to improve physical activity in this high-risk group.

Furthermore, a positive association between maintenance self-efficacy and coping planning was found and as it has been demonstrated in previous studies, a relationship between recovery self-efficacy and physical activity emerged (Chiu et al., 2011; Luszczynska, Mazurkiewicz, Ziegelmann, & Schwarzer, 2007; Luszczynska & Sutton, 2006).

In sum, except for risk perception and planning, social-cognitive predictors derived from the HAPA were interconnected as hypothesized. With regard to the present sample of adults with obesity, one can conclude that positive outcome expectancy, intention, phase-specific self-efficacy, and social support appear to operate as suggested in the HAPA. Thus, findings reported in *Chapter 3* indicate that the HAPA has the potential to provide a theoretical basis for the development and evaluation of motivational and volitional physical activity interventions targeting adults with obesity. It is an avenue for future research to longitudinally and experimentally attest these findings.

#### *Integrated discussion of Chapter 2 and Chapter 3*

In *Chapter 2* and *Chapter 3*, the focus was set on social-cognitive predictors of physical activity derived from the HAPA. Therefore, two different outcomes were chosen: first, correlates of stage transition were investigated by using residual change scores and second, the behavior itself was examined by using static measures. Whereas the first study was conducted longitudinally in a general online population sample, the second study had a cross-sectional design and consisted of an online sample with obese individuals. Both studies, conducted and analyzed in a different way, revealed that in particular motivational self-efficacy represents a paramount correlate of the intention to be physically active. Regarding the volitional stage,

both studies demonstrated that maintenance self-efficacy plays an outstanding role for engaging in physical activity. These findings underpin the phase-specific characteristic of self-efficacy and the usefulness of differentiating between motivational self-efficacy as a facilitator in the non-intentional stage and maintenance self-efficacy as a facilitator in the volitional stage.

However, an association between positive outcome expectancy and intention was found in *Chapter 3* but not in *Chapter 2*. Planning (including action planning and coping planning) emerged as a promising correlate of the volitional stage in *Chapter 2*, but not in *Chapter 3*. For individuals with obesity, neither action planning nor coping planning seem to be sufficient to translate good intentions into behavior. This might be explained by the fact that the generation of action plans and coping plans is a cognitively demanding self-regulation strategy. Some evidence indicates that, on average, self-regulation skills are lower in individuals with obesity compared to individuals with normal weight (Davis, Patte, Curtis, & Reid, 2010; Nederkoorn, Smulders, Havermans, Roefs, & Jansen, 2006).

According to the HAPA, social support can have beneficial effects on intention formation as well as on the adoption and maintenance of health behavior (Schwarzer et al., 2011). The findings of *Chapter 3* corroborate these assumptions in the context of physical activity among adults with obesity. It was found that individuals indicating more social support had higher intentions and were more physically active.

To date, recovery self-efficacy, as a subcomponent of volitional self-efficacy, has not yet been investigated as a predictor of stage transition. Future studies should include recovery self-efficacy more often and may analyze whether a decrease in recovery self-efficacy is associated with regression out of the action stage whereas the maintenance of recovery self-efficacy and an increase in recovery self-efficacy, respectively, might be related to remaining in the action stage even after experiencing a setback.

*Chapter 2* and *Chapter 3* have taken into account the two-layer architecture of the HAPA by investigating the stage model as well as the continuum model and, thus, contributed to research on the HAPA in the domain of physical activity. Theoretical evidence is provided especially for the distinct relevance of phase-specific self-efficacy in the motivational and volitional stage of physical activity. However, the question remains how self-efficacy and in particular motivational and volitional self-efficacy can be enhanced effectively. Although self-efficacy has been found consistently as an individual resource factor facilitating physical activity (e.g., Bauman et al., 2012), a review on mediators of physical activity change comprising

intervention studies only found very limited support for the mediating effect of self-efficacy between changes in physical activity caused by interventions (Rhodes & Pfaeffli, 2010). This points out that more research on how to effectively foster self-efficacy is needed. Moreover, there is evidence that self-efficacy may be better specified as a moderator than as a mediator (Koring et al., 2012a; Warner, Ziegelmann, Schüz, Wurm, & Schwarzer, 2011). The next paragraph deals amongst others with the question of how experiencing positive consequences of one's physical activity might contribute to enhance self-efficacy.

### **The Role of Positive Outcome Experience in Physical Activity Change**

Whereas *Chapter 2* and *Chapter 3* focused on associations between physical activity and social-cognitive factors that represent well-known constructs incorporated in several behavior theories, *Chapter 4* and *Chapter 5* had the purpose to regard a theoretical construct which has attracted much less attention in previous research on physical activity. To be more precise, *Chapter 4* and *Chapter 5* investigated how positive outcome experience is integrated into the health behavior change process. In accordance with Rothmans definition of experience with consequences of a behavior (Rothman, 2000; Rothman, Baldwin, & Hertel, 2004) the construct outcome experience is integrated into the motivation volition model (MoVo model; Fuchs, Göhner, & Seelig, 2011; Göhner, Seelig, & Fuchs, 2009). The construct describes individual experience and appraisals after the adoption of a novel behavior (Fuchs et al., 2011), such as “jogging made me feel better” or “yoga made me more flexible”. It is suggested that experiencing such beneficial consequences of health behavior kicks off motivational processes and thereby contributes to engage regularly in the respective health behavior.

To learn more about possible mechanisms involving positive outcome experience, self-efficacy, which emerged as an important psychological resource in *Chapter 2* and *Chapter 3*, and self-regulatory strategies (action control and action planning) were included into the studies of *Chapter 4* and *Chapter 5*. The aim of *Chapter 4* was to test whether positive outcome experience improves self-efficacy which in turn leads to increased health behavior. Additionally, it was analyzed whether these relationships depend on one's levels of action control. The aim of *Chapter 5* was to look at positive outcome experience and its direct associations with phase-specific self-efficacy as well as with intentions. Furthermore, indirect paths between positive outcome experience and action planning as well as behavior change were examined.

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Therefore, a non-clinical and a clinical sample were investigated as the assumed associations with positive experience might differ dependent on the setting. The next paragraph begins with a summary of the results of *Chapter 4* and *Chapter 5*, then, an integrated discussion follows.

*Chapter 4: Outcome experience, self-efficacy, and action control*

In *Chapter 4*, a study with three measurement points in time among university students initially demonstrated that individuals who had positive outcome experience were more confident in performing physical activity and were ultimately more likely to actually engage in the target behavior. This finding was in line with the hypothesis which was driven from previous research demonstrating that past behavior experience affects self-efficacy directly and behavior indirectly via self-efficacy (Warner, Schüz, Knittle, Ziegelmann, & Wurm, 2011). In a second step, action control was identified as a moderator of this mediation. Individuals with low levels of action control were not able to translate positive experience into physical activity via self-efficacy. This result was also consistent with the preceding hypothesis.

To sum up, *Chapter 4* led to the conclusion that using self-regulatory strategies, such as action control, can aid individuals to increase their health behavior over and above drawing on their personal resources, such as positive experience with behavioral consequences and being self-efficacious.

*Chapter 5: Outcome experience, phase-specific self-efficacy, and action planning*

In accordance with the hypotheses of *Chapter 5*, it was found that positive outcome experience is directly linked to motivational self-efficacy and behavioral intentions among an online-recruited sample of the general population as well as among rehabilitation patients. This finding argues for the relevance of positive outcome experience in the initial phase of the health behavior change process and is in line with the theoretical assumptions of the MoVo model (Fuchs et al., 2011). In other words, individuals who had experienced more positive consequences of physical exercise were more confident in his or her capability to make an attempt to exercise and were more motivated to engage in physical exercise.

Although one would presume that this past positive experience with consequences of exercise would also come along with more physical exercise, direct relations between positive outcome experience and behavior were found neither in the non-clinical nor in the clinical sample. This is not in line with Rothman's (2000) theoretical assumption that experiencing positive consequences of a behavior leads to behavior maintenance. This assumption was empirically supported by a study in a rehabilitation context

(Fleig, Lippke, Pomp, & Schwarzer, 2011). However, more empirical evidence is necessary to understand the relevance of positive outcome experience for motivation, behavior initiation and maintenance. Probably, the timeframe of experienced consequences has an impact as there should be a differential effect of short-term (e.g., last week) and long-term outcome experience (e.g., years ago)

Another debatable finding of this study was the association between positive outcome experience and volitional self-efficacy which was only found in the non-clinical sample. There might be several explanations for these findings differing among non-clinical and clinical study participants. One explanation might be that in the non-clinical sample, participants eventually were more able to evaluate possible barriers, to come up with strategies to overcome them, and to know how to recover from setbacks as they engaged in physical exercise during their everyday life. In contrast, participants of the rehabilitation sample recovered from a health-threatening event and probably could not yet anticipate whether they will be able to deal with their own barriers or setbacks arising after discharge. It may be the case that the structured environment of the rehabilitation context (e.g., being under the guidance of health professionals) reduced the relationship between one's personal positive outcome experience and confidence of being able to cope with barriers and to resume physical activity.

In both samples, motivational self-efficacy was correlated with volitional self-efficacy as well as with behavioral intentions. Moreover, intentions as well as volitional self-efficacy were related to subsequent action planning. Action planning then stimulated changes in physical exercise. These latter relationships remind of the ones postulated within the HAPA and thus, the indicated findings additionally support some theoretically assumed associations within the HAPA (Schwarzer et al., 2011).

Overall, the reported associations in *Chapter 5* suggest a more dominant role of positive outcome experience in the motivational than in the volitional stage of the health behavior change process.

#### *Integrated discussion of Chapter 4 and Chapter 5*

So far, empirical evidence on the role of outcome experience in the health behavior change process is rather sparse. From a theoretical perspective, outcome experience can play a role in terms of motivation but also in terms of behavior maintenance (Fuchs et al., 2011; Rothman et al., 2004). *Chapter 4* and *Chapter 5* give insight into how and under which circumstances the experience of positive consequences is associated with subsequent engagement in health behavior. This was done in three longitudinal studies

with distinct samples. Results of *Chapter 4* and *Chapter 5* revealed that the more positive consequences are experienced the higher are self-efficacy beliefs.

Furthermore, findings indicated that positive outcome experience may be more meaningful in the motivational than in the volitional phase of the health behavior change process. Analyses of both chapters also included self-regulatory strategies. In *Chapter 4*, results demonstrated that besides having personal resources, such as experiencing positive outcomes of physical activity and being self-efficacious, one can profit from action control, to perform physical activity. In *Chapter 5*, action planning to enhance physical exercise was stimulated indirectly by positive outcome experience via self-efficacy and intention.

The models analyzed in *Chapter 4* and *Chapter 5* comprised intention, phase-specific self-efficacy, action planning and action control representing social-cognitive predictors of the HAPA (Schwarzer et al., 2011). Associations postulated within the HAPA which were already supported in *Chapter 2* and *Chapter 3* could be corroborated in *Chapter 5*, such as the relationship between motivational self-efficacy and intention as well as between intention and planning. Whereas planning was found to be a predictor of regression and progression from the intentional stage in *Chapter 2*, no relation between planning and physical activity was found in the sample of obese individuals (*Chapter 3*). However, a link between action planning and physical exercise was found in *Chapter 5* among non-clinical and clinical study participants.

To conclude, the presented longitudinal and correlational findings from different contexts help to understand how outcome experience is embedded into the health behavior change process. More precisely, being aware of experienced positive consequences with physical activity such as “feeling better afterwards” reflects an individual resource that is beneficial for one’s confidence of being physically active as well as for one’s intention setting the stage for successful behavior change.

Finally, a summary of all hypothesized relationships between study variables that could be confirmed in the empirical chapters of this thesis is represented in Figure 2 (for reasons of clarity hypothesized paths that could not be confirmed as well as identified but unexpected relationships are not displayed).

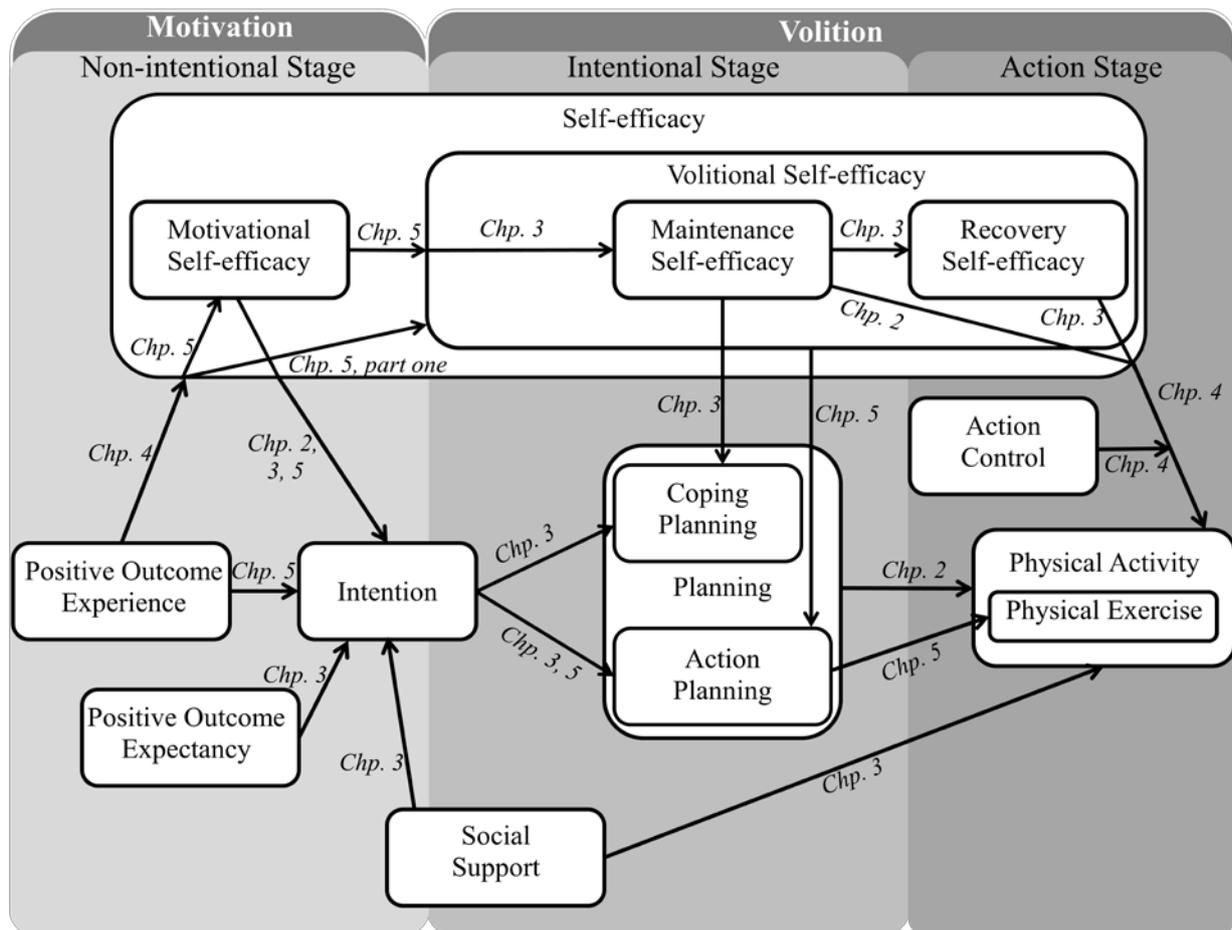


Figure 2. Summary of all hypothesized paths that could be confirmed in the empirical chapters

Note. Chp. = Chapter(s).

### Further Directions and Implications for Research

#### Methodological implications

##### Sample

A strength of this dissertation lies in the investigation of physical activity correlates among adults in multiple contexts (e.g., clinical and non-clinical) which were recruited in diverse ways. In almost each study, participants needed to be computer-literate to be able to answer the online questionnaires. This issue may have an impact on the generalization of study results. However, the benefits of online-based research are strong, such as the reduction of intentional misreporting because of the high level of anonymity. Furthermore, the economic advantages are compelling. Altogether, three of the five

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investigated samples were recruited online and had a relatively high educational background. In particular, study participants of *Chapter 5, part one* were recruited through a scientific TV program with rather well-educated viewers. Whereas these participants eventually had a paramount interest in contributing to psychological research, it may be the case that study participants of *Chapter 2* were mostly interested in the announced intervention promoting physical activity. Similarly, individuals with obesity eventually participated in the study because they expected professional weight loss support (*Chapter 3*). In contrast to the three online recruited samples, rehabilitation patients might have seen study participation as a component of their rehabilitation program and, thus, might have developed a stronger bond with the study (*Chapter 5, part two*). Furthermore, the sample of university students (*Chapter 4*) was supposedly motivated to take part in the study because of the reward with credit points. This sample was not only the youngest but also the one with the highest rate of participants who have graduated from high school.

Beside the differences in the samples regarding age, education, and motives for study participation, it is noticeable that the rate of women was higher in each of the five investigated samples. It is difficult to prevent sample limitations such as gender imbalance. However, to strengthen the findings within this thesis, respective demographic variables were included as control variables into the statistical analyses and taken into account when drawing conclusions.

In the longitudinal studies of this dissertation, the relatively high attrition rates are regarded as a further limitation. An accompanied selection bias cannot be excluded and might have affected study results. However, each study drew on a reasonable sample size and if differences between responders and non-responders could be identified they were statistically controlled for. Replications of the demonstrated associations are necessary as the degree of limitations on the results remains unclear. Future studies could try to prevent high attrition rates by increasing the interest of participants in taking part in follow-up assessments, by giving them the feeling not to waste time and by communicating the importance of their participation for the success of the study project.

### *Design*

Except of the study presented in *Chapter 3*, all studies were conducted longitudinally with follow-up assessments up to three times ranging from two weeks to approximately six months after baseline (for an

overview see Table 2, *Chapter 1*). However, all studies of this dissertation had an observational design and yielded correlational findings. According to Weinstein (2007, p. 1) “correlational designs are not adequate for deciding whether a particular construct affects behavior” and thus, results do not reflect causal relationships. Future research could pursue to find evidence for causality by using experimental study designs (e.g., randomized controlled trials). In terms of testing stage assumptions, comparing effects in distinct groups, such as a matched intervention group compared to a mismatched intervention group as well as compared to a control group could provide stronger empirical support than predicting stage transition (Weinstein et al., 1998). With the latter method, a non-linear continuum or a continuum including interactions with other factors cannot be excluded.

In the context of physical activity, an experimental matched-mismatched design has been used to provide evidence for the effectiveness of a volitional planning intervention addressed to individuals in the intentional stage (matched condition) compared to individuals in the non-intentional stage (mismatched condition) and to participants of a control condition (Lippke, Schwarzer, Ziegelmann, Scholz, & Schüz, 2010). In order to support findings of *Chapter 2*, future research could investigate a full matched-mismatched study design with a motivational intervention (matched to non-intentional stage, mismatched to intentional and action stage), a volitional planning intervention (matched to intentional stage, mismatched to non-intentional and action stage) and a relapse prevention intervention (matched to action stage, mismatched to non-intentional and intentional stage).

Additionally, theory-based intervention studies might test whether changes in the supported motivational and volitional correlates of physical activity indeed result in behavior change. This could be tested with (multiple) mediation analyses further unveiling the underlying mechanisms of physical activity change and yielding promising components of interventions aiming at physical activity promotion. Such analyses have been conducted in previous intervention studies. For example, Koring et al. (2012b) revealed that action planning, coping planning, and volitional self-efficacy mediate between intervention effects and physical activity. On top of that, moderators could be included into those mediation analyses. For example, future studies could test whether action planning and coping planning mediate intervention effects on physical activity only in participants with a specific range of body mass index (BMI). The BMI as a moderator of the planning-behavior association could demonstrate whether planning indeed is less helpful in persons with obesity (*Chapter 3*).

### *Statistical analyses*

Although changes in physical activity and physical exercise, respectively, were analyzed in the presented studies (except of the cross-sectional study in *Chapter 3*), the dynamic changes in predictor variables were taken into account only in one study by using residual change scores (*Chapter 2*). In *Chapter 4*, a moderated mediation model was conducted, and in *Chapter 5*, structural equation models were used. Although these methods of analyses are appropriate for the purpose of the particular investigations, only a semidynamic perspective was adopted as correlates of behavior change were assessed only once at different measurement points in time and then analyzed in a static manner (for methodological reasons). The predictive value of a static variable for a behavior does, however, not necessarily mean that a change in this variable results in a change in subsequent behavior. To better understand what facilitates physical activity change, associations between changes in social-cognitive determinants and behavior change could be investigated (Renner, Hankonen, Ghisletta, & Absetz, 2012; Rhodes & Pfaeffli, 2010).

Furthermore, it need not be the case that the earlier measured constructs are temporally precedent to the later ones and, thus, reverse causality cannot be excluded. However, associations analyzed in this dissertation were mainly derived from theory and partly empirically supported in previous studies. Nonetheless, future studies could measure social-cognitive variables repeatedly and then control for their previous levels. For example, multiple latent change score modeling is recommended to model change in all variables over time (McArdle, 2009). As the use of structural equation modeling bears the risk of estimating a mis-specified model, alternative models could be tested or the selected models could be replicated in other studies (as done in *Chapter 5*).

### *Measurement*

Within this dissertation, paper-pencil questionnaires, online questionnaires as well as computer-assisted telephone interviews were used. The different kinds of measurement can be seen as a strength, however, the exclusive use of self-reports can be regarded as a limitation which needs to be acknowledged.

Regarding the behavioral measurements, physical activity was measured by using items of the Physical Activity Questionnaire (IPAQ; Booth, 2000) and physical exercise was assessed by using items of the Godin Leisure-Time Exercise Questionnaire (Godin & Shephard, 1985). Both questionnaires were tested for reliability and validity and showed acceptable psychometric properties (Craig et al., 2003; Pereira et

al., 1997). However, it is quite common that social desirability, response bias and memory bias affect self-reports (Prince et al., 2008). Using objective measures (e.g., pedometers or accelerometers) those biases are preventable. On the other hand, objective measures also have its shortcomings (Wilcox & Ainsworth, 2009). For economic reasons, objective measures could not be used in the studies conducted within this dissertation. Future studies could back up self-reports by objective measures and may use weight loss as a further objective outcome measure (e.g., in the context of obesity).

In terms of the assessment of positive outcome experience, a very broad timeframe was chosen (experience that one has had in one's lifetime so far) which might be affected by a recall bias. Future research might choose a shorter timeframe (e.g., experience that one has had within the last month). However, effects of physical activity and physical exercise, respectively, on health and appearance occur over a longer time span and therefore, rather immediate benefits, such as affective outcomes (e.g., feeling better afterward) could then be taken into account. Findings on the relevance of affective compared to health-related outcome expectancy for intention and physical exercise (Gellert, Ziegelmann, & Schwarzer, 2012) lead to the question whether experienced affective benefits are also more important in the behavior change process than experienced health-related benefits.

#### *Theoretical implications*

Within this dissertation, correlates of physical activity and physical activity change were investigated based on the HAPA (Schwarzer, 1992; Schwarzer et al., 2011). Dissertation findings provide correlational evidence for the HAPA not only in terms of the stage layer (*Chapter 2*) but also in terms of the continuum layer (*Chapter 3*). In particular, the distinction of phase-specific self-efficacy could be supported. Additionally, the relevance of social support for intention formation and behavioral engagement concerning individuals with obesity was demonstrated. Previous research on the HAPA has mostly omitted to investigating social correlates, such as social support.

Schwarzer et al. (2011) describe the HAPA as a “versatile theoretical framework” that is characterized by “an open architecture” and thereby permit the opportunity to further extend the model. The findings of *Chapter 4* and *Chapter 5* indicate that positive outcome experience increases perceived self-efficacy as well as intention and lead to the idea that the construct of outcome experience has the potential to become a further component of the motivational stage of the HAPA. Although finding evidence for such a complex

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model might appear challenging, further research on the HAPA including outcome experience should be done to learn more about the utility of the suggested model extension and whether it can aid theory refinement. According to the MoVo model (Fuchs et al., 2011; Göhner et al., 2009), outcome experience has an influence on outcome expectancy which in turn affects intention.

Other health behavior theories do not take outcome experience into account but comprise comparable concepts. For example, from the view of self-determination theory (SDT; Deci & Ryan, 2000) experiencing activities as fun, enjoyable, interesting or challenging leads to intrinsic motivation (Ryan, Williams, Patrick, & Deci, 2009). However, intrinsic motivation is defined as “personal goals related to one’s growth, community involvement, and meaningful relationships” (Ng et al., 2012) and, therefore, represents a much broader concept than the narrower construct of outcome experience.

A further similar construct displays outcome expectancy which is prospective and therefore should not be confused with outcome experience which is retrospective. Outcome expectancy is included in most health behavior theories, such as HAPA (Schwarzer, 1992; Schwarzer et al., 2011) and MoVo model (Fuchs et al., 2011; Göhner et al., 2009). Within the transtheoretical model (TTM; Prochaska, DiClemente, & Norcross, 1992) decisional balance is the same as comparing positive with negative outcome expectancies. Furthermore, outcome expectancy is a main component within social cognitive theory (SCT; Bandura, 1977; Bandura, 1997).

SCT also proposes that mastery experience is the most important source of self-efficacy beliefs (Bandura, 1997). This means that someone who experienced success by performing a behavior (which can be seen as a positive experience) is more likely to feel confident to be able to perform the same behavior again. As mastery experience is success with the performance of the behavior itself and not a previously experienced positive outcome of this behavior, it is, however, not the same as positive outcome experience (e.g., positive impact on appearance, feeling better afterwards) which was a focus in this dissertation. Due to limited literature on positive outcome experience, future studies could examine whether relationships identified in *Chapter 4* and *Chapter 5* of this thesis can be replicated for other health behaviors such as fruit and vegetable consumption. Research on this theoretical construct should be accumulated especially within the realm of experimental studies. Those studies should manipulate outcome experience in interventions and, thereby, may use techniques which are outlined in the next paragraph.

*Implications for interventions*

Within the framework of this dissertation, relationships between modifiable correlates of physical activity were investigated in several contexts. The presented results have mainly implications for methodology as well as theory. Despite the correlational nature of the results, suggestions for intervention practice can be given. However, these rather guide the development and evaluation of interventions in a research context as evidence from experimental intervention studies is necessary before assured recommendations for healthcare settings can be provided.

First of all, results of *Chapter 2* indicate that interventions might profit from targeting stage-specific individual resources and self-regulatory strategies instead of providing one-size-fits-all interventions with generic information not taking intentions and behavior of participating individuals into account. In addition, findings of this dissertation suggest potential determinants which should be targeted in motivational and volitional interventions to promote physical activity.

*Motivational interventions: Potential determinants for intention formation*

In *Chapter 3*, more *positive outcome expectancy* was shown to be associated with higher intentions to be physically active in individuals with obesity. Providing information on positive consequences of physical activity, such as on the behavior-health link is a recommended health behavior change technique to enhance positive outcome expectancy (Michie et al., 2011). Emotionally positive messages, however, seem to be more beneficial than health-related messages (Conner, Rhodes, Morris, McEachan, & Lawton, 2011; Gellert et al., 2012). Thus, future interventions should highlight positive emotions coming along with physical activity such as pride and feeling well-balanced.

*Positive outcome experience* with behavioral consequences was found to be associated with self-efficacy (*Chapter 4* and *5*) and intention (*Chapter 5*). A strategy to improve positive outcome experience in interventions is to recall perceived positive short- as well as long-term effects in an interview or to ask participants to write them down in a diary (Fleig et al., 2011; Pomp, Fleig, Schwarzer, & Lippke, 2012). Such positive effects can comprise feelings during or after being physically active (e.g., to be in a better mood). The decision to perform a pleasurable type of activity (e.g., dancing) can make positive feelings more likely (Williams et al., 2008). Directing the attention to perceived improvements in one's appearance (e.g., to appear more attractive) and health status (e.g., to be fitter) could further enhance positive

outcome experience. Moreover, making aware received positive reinforcement by one's partner, friends or family members after being physically active (e.g., when I came back from the gym, I experienced that my partner is proud of me) might be fruitful to improve positive outcome experience. Additionally, individual feedback on positive activity outcomes (Ashford, Edmunds & French, 2010) could be offered by healthcare professionals in clinical settings (e.g., rehabilitation).

A relationship between *motivational self-efficacy* and intention was found in non-clinical as well as in clinical study participants (*Chapter 5*) and individuals with obesity (*Chapter 3*). Regarding progression from non-intentional to intentional stage, increased motivational self-efficacy as well as increased maintenance self-efficacy was important (*Chapter 2*). Techniques to enhance self-efficacy can be derived from the four sources of self-efficacy (Bandura, 1997). For example, interventions could focus on past success with physical activity performance (mastery experience), make use of role models (vicarious experience) as well as provide positive feedback and encouragement (verbal persuasion). Additionally, experienced positive consequences with physical activity could be addressed (as suggested above). According to a review by Williams and French (2011), the most effective techniques for changing physical activity self-efficacy in healthy non-obese adults seem to be action planning, reinforcing effort or progress towards behavior, and provide instruction. A recent review focusing on adults with obesity also identified action planning as an effective means to improve self-efficacy (Olander et al., 2013). Beyond that, time management, prompt self-monitoring of behavioral outcome, and plan social support/social change were found by this review to be effective techniques for improving physical activity self-efficacy in individuals with obesity.

#### *Volitional interventions: Potential determinants for physical activity performance*

Results of *Chapter 2* revealed that individuals high in *planning* are more likely to progress from the intentional stage to the action stage. In *Chapter 5*, action planning was linked to physical exercise among non-clinical and clinical study participants.

Planning can be targeted in interventions by asking participants to generate *action plans* by specifying in detail 'when', 'where', and 'how' to perform physical activity (e.g., Carraro & Gaudreau, 2013; Lippke, Ziegelmann, & Schwarzer, 2004; Ziegelmann, Lippke, & Schwarzer, 2006). Additionally, *coping plans* can be generated by anticipating internal and external barriers that may jeopardize the performance of

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physical activity and finding appropriate strategies that help overcome them (Carraro & Gaudreau, 2013; Sniehotta, Schwarzer, Scholz, & Schüz, 2005).

As neither action planning nor coping planning led to more physical activity in adults with obesity (*Chapter 3*) other planning strategies might be considered for this subgroup. Future studies could, for example, investigate the effects of interventions starting with planning how to get social support from one's partner, friends or family members to help achieving activity goals (Michie et al., 2011). Additionally, adults with obesity might benefit from dyadic planning, which means planning health behavior change together with a partner (Burkert, Scholz, Gralla, Roigas, & Knoll, 2011).

Results of *Chapter 4* indicated benefits for individuals using *action control*. This self-regulatory strategy can be implemented into interventions by asking participating individuals to record their physical activity in a diary (Michie et al., 2011) or even by self-monitoring one's behavior by using a pedometer (for a meta-analysis see Kang, Marshall, Barreira, & Lee, 2009) or an accelerometer (for a review see Taraldsen, Chastin, Riphagen, Vereijken, & Helbostad, 2012). Furthermore, promoting the comparison of achieved goals with intended goals, the reflection of previously set standards, and revision or readjustment of those goals can improve action control (Michie et al., 2011).

Improving *self-efficacy* beliefs is not only recommended for motivational but also for volitional interventions. Higher levels of self-efficacy were related to more physical activity among university students (*Chapter 4*). With regard to phase-specific self-efficacy, increases in motivational as well as maintenance self-efficacy were associated with progression from non-intentional to intentional stage (*Chapter 2*). Furthermore, volitional self-efficacy was linked to action planning among non-clinical and clinical study participants (*Chapter 5*). In the sample of individuals with obesity, maintenance self-efficacy was related to coping planning as well as recovery self-efficacy and recovery self-efficacy in turn was associated with physical activity (*Chapter 3*). So far, it is not clear which techniques should be applied for improving phase-specific self-efficacy. Most techniques identified in the presented reviews by Williams & French (2011) and Olander et al. (2013) seem to rather refer to volitional than to motivational self-efficacy enhancement. Future research should investigate which behavior change techniques should be applied in the motivational and the volitional stage, respectively, of health behavior change to improve phase-specific self-efficacy.

Finally, the more individuals with obesity were socially supported by family and friends the more physical activity did they perform (*Chapter 3*). It is nearby to recommend individuals with obesity to engage in physical activity together with family members and friends and to ask them to encourage ones efforts. However, that's easier said than done. A promising way to improve *social support* in adults with obesity seems to be the participation in group-based physical activity interventions which have been found to be more effective in this subgroup than individual-based interventions (Paul-Ebhohimhen & Avenell, 2009). Enrolling in an intervention together with a friend might be even more effective (Wing & Jeffery, 1999).

All above suggested techniques may be useful for future intervention studies further evaluating the mechanisms which have been touched in the correlational studies of this dissertation.

### **Conclusion**

This dissertation contributes to research on motivational and volitional correlates of physical activity (change): first, in participants of an online study, changes in psychological resources (i.e., self-efficacy) and self-regulatory strategies (i.e., planning) were associated with transitions between the three stages derived from the HAPA (Schwarzer, 1992; Schwarzer et al., 2011). Second, theoretical assumptions of the HAPA were partly applicable for adults with obesity. In particular, promoting psychological resources (i.e., phase-specific self-efficacy beliefs) and social support seem to be more relevant for this high-risk group than focusing on self-regulatory strategies (i.e., action planning and coping planning). Third, positive outcome experience improved physical activity in university students via self-efficacy, given that a minimum of action control strategies was used. Consequently, besides having individual resources, it seems to be important to use self-regulatory strategies. Finally, positive outcome experience mainly stimulated motivational than volitional factors of the health behavior change process among non-clinical and clinical study participants.

From a theoretical perspective, correlational evidence is provided for the stage-specific assumptions of the HAPA as well as for the models' applicability for adults with obesity in the domain of physical activity. Thereby, the importance of differentiating between phase-specific self-efficacy beliefs could be highlighted. Furthermore, findings of this dissertation convey useful knowledge to the literature on the theoretical construct of positive outcome experience. Future experimental research should replicate and test generalizability of the findings of this dissertation and particularly accumulate studies considering positive outcome experience in the domain of further health behaviors.

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## **Curriculum Vitae**

Linda Parschau

*For reasons of data protection, the curriculum vitae is not included in this version.*

## List of Publications

(\* indicates papers which are part of the dissertation)

### Journal articles (2010 – 2013)

- Fleig, L., Pomp, S., **Parschau, L.**, Barz, M., Lange, D., Schwarzer, R., & Lippke, S. (in press). From intentions via planning and behavior to physical exercise habits. *Psychology of Sport and Exercise*. doi: 10.1016/j.psychsport.2013.03.006
- Koring, M., **Parschau, L.**, Lange, D., Fleig, L., Knoll, N., & Schwarzer, R. (2013). Preparing for physical activity: Pedometer acquisition as a self-regulatory strategy. *Applied Psychology: Health and Well-Being*, 5(1), 136-47. doi: 10.1111/aphw.12003
- Koring, M., Richert, J., Lippke, S., **Parschau, L.**, Reuter, T., & Schwarzer, R. (2012). Synergistic effects of planning and self-efficacy on physical activity. *Health Education & Behavior*, 39(2), 152-158. doi: 10.1177/1090198111417621
- Koring, M., Richert, J., **Parschau, L.**, Ernsting, A., Lippke, S., & Schwarzer, R. (2012). A combined planning and self-efficacy intervention to promote physical activity: Effectiveness and working mechanisms? *Psychology, Health & Medicine*, 17(4), 488-498. doi: 10.1080/13548506.2011.608809
- Lippke, S., Ernsting, A., Richert, J., **Parschau, L.**, Koring, M., & Schwarzer, R. (2012). Nicht-lineare Zusammenhänge zwischen Intention und Handeln: Eine Längsschnittstudie zu körperlicher Aktivität und sozial-kognitiven Prädiktoren. *Zeitschrift für Gesundheitspsychologie*, 20(2), 105-114. doi: 10.1026/0943-8149/a000064
- \***Parschau, L.**, Fleig, L., Koring, M., Lange, D., Knoll, N., Schwarzer, R., & Lippke, S. (2013). Positive experience, self-efficacy, and action control predict physical activity changes: A moderated mediation analysis. *British Journal of Health Psychology*, 18(2), 395-406. doi: 10.1111/j.2044-8287.2012.02099.x.
- \***Parschau, L.**, Richert, J., Koring, M., Ernsting, A., Lippke, S., & Schwarzer, R. (2012). Changes in social-cognitive variables are associated with stage transitions in physical activity. *Health Education Research*, 27(1), 129-140. doi: 10.1093/her/cyr085

**Paper under review**

\***Parschau, L.**, Barz, M., Richert, J., Knoll, N., Lippke, S., & Schwarzer, R. (manuscript submitted for publication). Physical activity among adults with obesity: Testing the health action process approach.

\***Parschau, L.**, Fleig, L., Warner, L. M., Pomp, S., Barz, M., Knoll, N., Schwarzer, R., & Lippke, S. (manuscript submitted for publication). Positive exercise experience facilitates behavior change via self-efficacy.

Richert, J., Lippke, S., **Parschau, L.**, Lange, D., & Schwarzer, R. (in preparation). Intervention engagement in behavior change – how to plan fruit and vegetable consumption.

**Selected presentations (first authorships only)**

Parschau, L., Koring, M., Lange, D., Fleig, L., & Schwarzer, R. (2012). Intentionen erfolgreich umsetzen: Positive Erfahrungen mit körperlicher Aktivität, Planung und Selbstwirksamkeit als intermittierende Variablen in der Intentions-Verhaltens-Lücke. 48. Kongress der Deutschen Gesellschaft für Psychologie in Bielefeld, Deutschland.

Parschau, L., Koring, M., Lange, D., Fleig, L., & Schwarzer, R. (2012). Planning, self-efficacy, and activity experiences mediate the intention-behavior relationship. 26. Konferenz der European Health Psychology Society, in Prag, Tschechische Republik.

Parschau, L., Koring, M., Lange, D., Fleig, L., & Schwarzer, R. (2012). The interplay of experience, self-efficacy and action control in physical activity promotion. 30th International Congress of Psychology, in Kapstadt, Südafrika.

Parschau, L., Koring, M., Lange, D., & Lippke, S. (2011). Post rehabilitation support treatment for an optimized transfer in everyday life. 2. Chin.-Dt. Workshop Stress and Coping, in Peking, China.

Parschau, L., Richert, J., Koring, M., Lippke, S., & Schwarzer, R. (2011). Are stage transitions associated with changes in psychological variables? Stage-specific findings from physical activity. 25. Kongress der European Health Psychology Society, in Hersonissos (Kreta), Griechenland.

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Parschau, L., Richert, J., Koring, M., Ernsting, A., Lippke, S., & Schwarzer, R. (2011). Zusammenhänge zwischen Veränderungen in sozial-kognitiven Variablen und Stadienwechsel im Kontext körperlicher Aktivität. 10. Kongress für Gesundheitspsychologie, in Berlin, Deutschland.

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Parschau, L., Richert, J., Reuter, T., & Wiedemann, A. U. (2010). An internet-based health promotion program: Who will return to follow-up assessments? 24. Kongress der European Health Psychology Society, in Cluj, Rumänien.

**Erklärung**

Hiermit versichere ich, dass ich die vorgelegte Arbeit selbständig verfasst habe. Andere als die angegebenen Hilfsmittel habe ich nicht verwendet. Die Arbeit ist in keinem früheren Promotionsverfahren angenommen oder abgelehnt worden.

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Linda Parschau

Berlin, Mai 2013