

Social Exchange Processes and Self-Efficacy Beliefs in Health Behavior Change: Examining
Their Reciprocal Relationship in Couples

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Abstract

In romantic relationships, partners are actively involved in each other's health practices. They often exert their influence through social exchange processes, such as social support (providing aid to another person) and social control (influencing another person). Literature underscores their potential to promote health behavior change. However, detrimental or no effects were also documented. Whether supportive or controlling attempts are perceived as helpful by the recipient may depend on the recipient's self-efficacy (the belief in her/his capability to successfully manage behavior change). On the association between social support and self-efficacy, the enabling hypothesis (social support enhances self-efficacy beliefs) and the cultivation hypothesis (self-efficacy facilitates support receipt) have been proposed. Less is known, about the relationship between social control and self-efficacy. So far, knowledge on the dyadic and potentially reciprocal association between social exchange processes and recipient partners' self-efficacy beliefs has been largely neglected.

To uncover whether self-efficacy is a predictor or an outcome of social exchange processes, I will examine the development of this interrelationship over time in couples' (one or both partners'), considering both sides of the predictive association and both partners' reports, respectively.

In the first study, one partner's self-efficacy and received support as well as support provided by the other partner will be investigated. Study 1 aims to answer the following research question: How is social support related with self-efficacy in the prediction of one partner's health behavior change? Can findings be cross-validated if in a second attempt received support is substituted by the other partner's provided support (Chapter 2)? These questions are investigated using data from a larger project (DFG; KN 937/3-1) that examined how couples coped with the aftermath of radical prostatectomy. Data from $N = 175$ patients with prostate cancer and their partners are extracted for study 1. The correlational design

spans seven months and includes five measurement points in time. Patient's regular performance of pelvic floor exercises (PFE) represents the outcome. Patient-received and partner-provided support as well as patients' self-efficacy are PFE-specifically assessed.

In the second study (Chapter 3) the aim is to adopt a dyadic perspective of the support-self-efficacy-relationship. The following research question will be examined: How is both partners' provided support related with the recipient partner's self-efficacy over time and vice versa? The study represents a secondary analysis of a randomized controlled trial (RCT; NCT01963494, <https://clinicaltrials.gov/>). The RCT tested a planning intervention that aimed to foster couples' physical activity. In study 2, $N = 338$ couples are included. The design is dyadic, including 6 measurement points in time spanning one year. Provided support and self-efficacy are physical activity-specifically assessed.

In study 3 (Chapter 4) the focus will be on social control's association with self-efficacy. The aim is to answer the following research question: How is one partner's provided social control associated with the other partner's self-efficacy and vice versa, and is this interrelationship beneficial or detrimental to the recipient's behavior change? From the overall sample included in study 2, in study 3, only $n=113$ couples from the control condition are included in the analyses. The design is dyadic and entails the first seven weeks and 3 measurement points in time from study 2. Provided negative control and self-efficacy are physical activity-specifically assessed. The outcome is moderate-to-vigorous physical activity (MVPA).

Results of the first two studies suggest that being self-efficacious facilitates supportive attempts by providing partners. This finding is consistent in study 1 with prostate cancer patients' received support from their partners and in study 2, with partner provided support in healthy couples. Only prostate cancer patients show a self-efficacy-enhancing effect from their partners' provided support. In study 3 (healthy couples) findings point towards men's

and women's negative provided control being a facilitator of their partner's self-efficacy. Also, results show that women's self-efficacy fosters men's provision of negative control. Findings from study 1 suggest that received support as well as partner provided support facilitate patient's adherence to regular PFE. In study 1, findings with received support have been partially cross-validated with partner provided support. Results from study 3 point towards negative partner control being detrimental for women's and men's increase in MVPA.

To sum up, evidence indicates that self-efficacy is rather a precursor to social exchange processes, thus facilitating the provision of partner support and control for health behavior change. Less evidence points to the other predictive direction. Overall this dissertation provides insights into social and cognitive mechanisms that underlie couples' health behavior change, advancing knowledge by applying statistical models that allow to disentangle their complex association.

Zusammenfassung

Personen, die in einer Partnerschaft leben, sind oft in das Gesundheitsverhalten der anderen Person involviert. Sie üben ihren Einfluss meist über soziale Austauschprozesse, wie u.a. soziale Unterstützung (Hilfeleistungen durch Andere) oder soziale Kontrolle (Regulationsbemühungen durch Andere) aus. Es gibt Hinweise darauf, dass beide bei der Verhaltensänderung hilfreich sein können. Allerdings sind auch negative und Nulleffekte dokumentiert worden. Inwieweit soziale Unterstützung oder soziale Kontrolle als hilfreich empfunden werden, könnte zu einem großen Teil mit der Selbstwirksamkeitserwartung (optimistische Selbstüberzeugung hinsichtlich des Erfolgs einer Verhaltensänderung) der Empfängerin/des Empfängers zusammenhängen. Dazu sind folgende Hypothesen aufgestellt worden: 1) Befähigungshypothese, die besagt, dass soziale Unterstützung die Selbstwirksamkeitserwartung stärkt; 2) Kultivierungshypothese, die besagt, dass eine hohe Selbstwirksamkeitserwartung die Gabe von sozialer Unterstützung fördert. Es ist vergleichsweise wenig über die Beziehung zwischen sozialer Kontrolle und Selbstwirksamkeitserwartungen bekannt. Bisher ist der dyadische und potentiell reziproke Zusammenhang zwischen Selbstwirksamkeitserwartungen und sozialen Austauschprozessen in der Forschung weitgehend vernachlässigt worden.

Um herauszufinden, wie die prädiktive Richtung der Beziehung zwischen Selbstwirksamkeitserwartung und sozialen Austauschprozessen ausfällt, werde ich diese längsschnittlich im Kontext der Gesundheitsverhaltensänderung von Partnerschaften untersuchen. Hierbei werde ich beide prädiktive Richtungen, sowie die Berichte beider Partner berücksichtigen.

In der ersten Studie werde ich folgende Fragestellungen untersuchen: Wie ist der Zusammenhang zwischen erhaltener Unterstützung und Selbstwirksamkeitserwartung in der Vorhersage der Gesundheitsverhaltensänderung eines Partners? Können Ergebnisse mit der

geleisteten Unterstützung der anderen Person kreuzvalidiert werden? Um diese Fragestellung zu beantworten, sind Daten aus einem größeren Projekt (DFG; KN 937/3-1) entnommen worden. Fokus des Projekts ist die Bewältigung der Folgen einer radikalen Prostatektomie gewesen. In Studie 1 werden $N = 175$ Patienten mit Prostatakrebs und ihre Partnerinnen über 7 Monate, mit Hilfe von 4 Messzeitpunkten, betrachtet. Beckenbodentraining (BBT) stellt das visierte Gesundheitsverhalten dar. Soziale Unterstützung geleistet durch die Partnerin, erhaltene Unterstützung durch den Patienten und die Selbstwirksamkeitserwartung des Patienten sind jeweils BBT-spezifisch erfasst worden.

In der zweiten Studie werde ich Unterstützung und Selbstwirksamkeitserwartung dyadisch betrachten und dabei folgende Fragestellung untersuchen: Wie hängt die geleistete Unterstützung einer Person mit der Selbstwirksamkeitserwartung der anderen Person über die Zeit zusammen? Studie 2 stellt eine Sekundäranalyse, einer randomisierten kontrollierten Paarstudie dar, in deren Fokus die Planung körperlicher Aktivität (RCT; NCT01963494, <https://clinicaltrials.gov/>) stand. Für Studie 2 wird die Gesamtstichprobe des Projekts von $N = 338$ gesunden Paaren analysiert. Betrachtet werden, über ein Jahr und zu 6 Messzeitpunkten, die geleistete Unterstützung und Selbstwirksamkeitserwartung beider Partner (jeweils aktivitätsspezifisch erfasst).

In der dritten Studie (Kapitel 4), werde ich mich mit sozialer Kontrolle näher beschäftigen. Ich möchte hier folgende Fragestellungen beantworten: Wie hängt die geleistete soziale Kontrolle einer Person mit der Selbstwirksamkeitserwartung einer anderen Person zusammen und ist diese Beziehung günstig oder ungünstig für die Gesundheitsverhaltensänderung der Rezipientin/des Rezipienten? Von der Gesamtstichprobe, des in Studie 2 genannten Projekts, sind hier $n = 113$ Paare (Kontrollgruppe) in die Sekundäranalysen eingegangen. Studie 3 berücksichtigt die ersten 7 Wochen und 3 Messzeitpunkte von Studie 2, betrachtet werden die geleistete negative Kontrolle und

Selbstwirksamkeitserwartung sowie moderate bis anstrengende körperliche Aktivität (KA) beider Partner.

Zusammengenommen weisen die Ergebnisse der ersten zwei Studien darauf hin, dass eine hohe Selbstwirksamkeitserwartung unterstützende Handlungen seitens der Partnerin/des Partners begünstigt. Dieser Befund hat sich in Studie 1 mit der erhaltenen Unterstützung von Patienten mit Prostatakrebs (im Kontext der regelmäßigen Ausübung von BBT), wie auch in Studie 2 mit der geleisteten Unterstützung von gesunden Paaren (im Kontext der Förderung von körperlicher Aktivität) gezeigt. Patienten mit Prostatakrebs haben hinsichtlich ihrer Selbstwirksamkeitserwartung von der geleisteten Unterstützung ihrer Partnerinnen profitiert. Die geleistete negative Kontrolle (Studie 3), hat einen positiven Zusammenhang mit der späteren Selbstwirksamkeitserwartung beider Partner aufgewiesen. Bei Frauen hing eine hohe Selbstwirksamkeitserwartung mit vermehrter partnerschaftlicher Kontrolle zusammen. Geleistete und erhaltene Unterstützung ist mit dem späteren BBT der Patienten (Studie 1) positiv assoziiert gewesen. Ergebnisse aus Studie 1 sind teilweise mit geleisteter Unterstützung kreuzvalidiert worden. Negative soziale Kontrolle hat einen negativen Zusammenhang mit der KA beider Partner aufgewiesen (Studie 3).

So lässt sich schlussfolgern, dass die Befunde, insbesondere die Rolle von Selbstwirksamkeitserwartungen als Vorläufer von sozialen Austauschprozessen untermauern, da diese bei der Förderung zweier unterschiedlicher Gesundheitsverhaltensweisen sowohl partnerschaftliche Unterstützungs- als auch Regulationsbemühungen in Gang gesetzt haben. Meine Dissertation ermöglicht somit Einblicke in die sozialen und kognitiven Mechanismen, die die Gesundheitsverhaltensänderung von Paaren beeinflussen können und erweitert das bisherige Wissen durch die Verwendung statistischer Modelle, die die Entwirrung ihrer komplexen Beziehung ermöglicht haben.

Chapter 1

Introduction

“The self is socially constituted, but by exercising self-influence, individuals are partial contributors to what they become and do. Moreover, human agency operates generatively and proactively rather than just reactively.” (Bandura, 1997, p.6)

Health behavior change often occurs within a social context (Jackson, Steptoe, & Wardle, 2015). Individuals decide, for instance, to live more healthily, and this affects those close to them. In intimate relationships, partners have been observed to be the major sources of behavioral influence (August, Kelly, & Markey, 2016; Lewis & Rook, 1999). Recent findings also indicate that partners' health behavior change is interrelated (Jackson et al., 2015). Potential social mechanisms underlying this interdependence may include the provision of aid to assist in the other person's behavior change (social support; Khan, Stephens, Franks, Rook, & Salem, 2013) as well as attempts to regulate the other person to change her or his behavior (social control; Khan et al., 2013). Furthermore, each partner's cognitions may be intertwined with the other partner's attempts at support and control (Khan et al., 2013). One partner's conviction that she or he can achieve a behavior change (self-efficacy; Bandura, 1997) may be crucial for the success of the other partner's provided support/control. In his social cognitive theory, Bandura (1997) proposed that individuals along with their thoughts, feelings and behavior are embedded in their social environment (for example, an intimate relationship with a partner) and emphasized that the nature of this association is reciprocal. The above cited words from Bandura (1997) reflect this co-dependence, emphasizing the agentic role that individuals take within their development. The mechanisms involved in this reciprocity that need to be considered to support couples' in their health behavior change, however, are still not well understood. Whether the association between social support and self-efficacy is reciprocal has rarely been addressed, especially in

the health behavior change domain. Even less is known about the reciprocal association between social control and self-efficacy.

To shed light on the association between social and cognitive factors involved in couples' health behavior change, the focus in this thesis will be on social support and social control and their reciprocal association with self-efficacy. I will examine this association in healthy couples as well as couples coping with one partner's disease.

The next section introduces the theoretical background and key concepts of this dissertation, namely self-efficacy, social support and social control in the context of health and health behavior change. I will describe the literature that links these concepts together. Finally, I will introduce my research questions and briefly describe the studies used to examine them.

Social Relationships and Health

Individuals do not live in isolation but, are embedded in relationships (mother-child, husband-wife, so on; Laurenceau & Bolger, 2012). In addition, the majority of people are in romantic relationships (around 50% of adults between the age of 25 to 29 and 80% between the age of 45 to 49, United Nations, 2011). Integration in a social relationship is found to be associated with longevity (Holt-Lunstad, Smith, & Layton, 2010; House, Landis, & Umberson, 1988). Some researchers discovered an association between marriage and longevity (Berkman & Syme, 1979; House et al., 1988). The assumption that partners show specific characteristics or use specific tactics that improve the other partner's health and foster longevity has been proposed years ago (Umberson, 1987). Attempts to disentangle possible mechanisms behind that effect have been manifold: Whereas the first wave of research has focused more on quantitative aspects of a social network (for example, relationship status, size of the social network, frequency of contact; Berkman, Glass, Brissette, & Seeman, 2000), the second wave has begun to focus on the importance of qualitative aspects as well (e.g., via

social support; Berkman et al., 2000). A third wave of research has recently emerged, one that moves from individual toward the dyad as the unit of analyses (e.g., actor-partner interdependence model, Kenny, Kashy, & Cook, 2006) thereby highlighting the role of social exchange processes in intimate relationships (Lewis et al., 2006; Pietromonaco, Uchino, & Dunkel-Schetter, 2013).

The question of how social relationships transmit effects onto health behavior change has inspired many theoretical proposals and empirical investigations (Berkman et al., 2000; Lewis et al., 2006; Pietromonaco et al., 2013; Tay, Tan, Diener, & Gonzalez, 2013; Thoits, 2011). Berkman et al. (2000) suggested that social relationships represent a resource for social exchange through which different health-related pathways are affected. Supportive behaviors (social support; Barrera 1986; Weiss, 1974) or regulative attempts (e.g., social control; Lewis & Rook, 1999; Umberson, 1987) are assumed to affect the behavioral pathway by fostering health-enhancing behaviors (such as physical activity) or discouraging health-compromising behaviors (such as smoking). The psychological pathway implies their impact on well-being (for example, negative and positive effect) and cognitions, such as self-efficacy beliefs (Berkman et al., 2000).

In his social cognitive theory, Bandura (1986, 1997) assumed that the individual, her or his behavior and environment, are reciprocally related. In other words, individuals are agents of their actions and creators of their social environment (including interpersonal interactions such as social support and social control), yet they are also shaped by them (Bandura, 1997). Internal factors that drive individuals toward their goals involve cognitive, affective and biological mechanisms. More specifically, cognitive factors (such as self-efficacy, outcome expectancies) and their intertwined relationship with social factors are assumed to affect individuals' goal setting, their behaviors and the outcomes that result from their actions. Self-efficacy beliefs (beliefs of personal efficacy in managing targeted

behaviors) as the central determinant of the theory, are proposed to act in concert with outcome expectancies (expectations for the consequence of a behavior) and socio-structural factors (facilitating or hindering factors from the social environment) in the pursuit of behavioral goals (Bandura, 1977; 1997). The social cognitive theory was shown to be useful in predicting several health behaviors such as physical activity (Ayotte, Margrett, & Patrick, 2013; McAuley, Jerome, Marquez, Elavsky, & Blissmer, 2003; Resnick, Palmer, Jenkins, & Spellbring, 2000), nutrition (Anderson, Winett, & Wojcik, 2007; Luszczynska, Gibbons, Piko, 2004) and smoking cessation (Van Zundert, Nijhof, & Engels, 2009) as well as in predicting psychological outcomes such as quality of life (Banik et al., 2017; Graves, 2003) or coping with posttraumatic stress disorder (Benight & Bandura, 2004; Shoji et al., 2014).

As the key factor of social cognitive theory, self-efficacy represents a central component of my thesis, in the next section, I will focus on this concept and highlight its relationship with health behavior change.

Self-Efficacy

Self-efficacy is defined as a subjective belief in one's own capability to successfully achieve a desired goal (Bandura, 1997). The subjectivity with which self-efficacy beliefs are constructed is important to note because they rely entirely on personal judgments about a person's own abilities and do not necessarily reflect her or his actual capabilities (Bandura, 1997). This is a critical differentiation, as it highlights the power that self-efficacy beliefs can have on enabling or debilitating behavior change (Bandura, 1997). According to Bandura's (1997) definition, self-efficacy beliefs can vary by their level of difficulty, generality and strength. The first one, level of difficulty, refers to the challenges that need to be managed for successful task performance. For instance, in the case of physical activity, the behavior itself may be easy to perform, but its regular performance under different circumstances represents a challenge. Accordingly, self-efficacy beliefs are specifically relevant if the health behavior

that will be performed poses a challenge requiring continued adaptation (Bandura, 1997). The second characteristic of self-efficacy beliefs, generality, refers to the extent that a subjective belief is applicable to several contexts. Bandura (1997) conceptualized self-efficacy beliefs as judgements that are prone to situational and contextual variation. Accordingly, a person can have a high self-efficacy in changing her or his diet while having low self-efficacy in increasing her or his physical activity. Thus, self-efficacy beliefs are situation sensitive and are assessed specific to the behavior that is targeted by a study (Bandura, 1997). For instance, a meta-analysis on interventions targeting self-efficacy in overweight populations noted that many studies used behavior and phase-specific measures of self-efficacy beliefs (Olander et al., 2013). Self-efficacy beliefs have also been conceptualized in a more trait-like manner. Schwarzer and Jerusalem (1995) proposed the concept of general self-efficacy and defined it as a subjective belief in one's capabilities to succeed in different domains of life. This formulation has also inspired research (Luszczynska, Sarkar, & Knoll, 2007; Schwarzer, Boehmer, Luszczynska, Mohamed, & Knoll, 2005). As a third characteristic, strength of self-efficacy beliefs refers to the extent of self-assurance a person perceives to have in performing a behavior (Bandura, 1997). The higher the judgement such that one can do what is necessary to achieve a desired goal, the more perseverance will be shown, which ultimately increases the probability of success (Bandura, 1997).

I will focus on self-efficacy as a time-varying belief and assess it in consideration of the targeted health behavior. In the next section, I will describe determinants of self-efficacy beliefs.

Sources of Self-Efficacy

Self-efficacy beliefs are considered the driving force behind the achievement of behavioral goals (Bandura, 1997). Furthermore, several studies (by way of meta-analysis), such as that by Williams and French (2011), highlight the role of self-efficacy in predicting

physical activity whereas others emphasize its influence on different domains of health behavior change (e.g., meta-analysis by Sheeran et al., 2016). Considering its relevance for health behavior change, exploring whether self-efficacy beliefs can be fostered via social exchange represents one of the goals of this dissertation.

Bandura (1997) describes four ways in which self-efficacy beliefs can be influenced: by providing a person with opportunities for mastery experiences or vicarious experiences, by using verbal persuasion and/or by correcting unfavorable perceptions of her or his physiological and affective states. Most of these sources (specifically vicarious experiences and verbal persuasion) depend on significant others, their characteristics, their attempts and appraisals. Accordingly, supportive or regulative behaviors from the social network form a great part of the influence that can increase or decrease self-efficacy beliefs. Furthermore, perceiving oneself as self-efficacious motivates one to invest effort into constructing one's social network and to make use of supportive or regulative attempts by significant others. In the following sections, I will describe in more detail the four sources of self-efficacy and present evidence on their association with self-efficacy beliefs.

Mastery experiences. Since learning from one's own experiences is the most direct way of determining whether one can or cannot perform a given behavior, mastery experiences are considered the most influential source of self-efficacy beliefs (Bandura, 1997). In an experimental study, self-efficacy beliefs were shown to increase with the successful mastery of tasks of varying difficulty (Stock & Cervone, 1990). Other methods of enhancing self-efficacy beliefs via mastery experiences can include feedback on a person's successful performance or by asking the person to recall her or his past successes. Both may require social interaction. Regarding different techniques to induce mastery experiences, Ashford, Edmunds and French (2010) reported in their meta-analysis that feedback on past successes was effective in fostering physical activity-specific self-efficacy beliefs whereas graded

mastery was not. The authors did not find any intervention studies using participants' recall of past successes.

Vicarious experiences. In contrast to mastery experiences, changing self-efficacy beliefs through vicarious experiences depends on the effect that others' modeling has on the observer's efficacy appraisals (Bandura, 1997). In their early study on the social learning of aggression, Bandura, Ross and Ross (1963) found that children who watched aggressive modeling showed more aggressive behavior afterwards. Successful observational learning of a modeled behavior can be difficult to achieve for the recipient as it requires attention to the behavior, its cognitive representation, its conceptual reconstruction and motivation to enact the behavior (Bandura, 1997). Whether modeling enhances the observant's self-efficacy beliefs also depends on the model's competence as well as her or his similarity in performance or normative attributes (age, gender) with the observer (Bandura, 1997). Accordingly, Bandura et al. (1963) found that correspondence between the gender of the observer and her or his model intensified the model's influence on children's aggressive behavior. In their meta-analyses, Ashford et al. (2010) discovered few interventions that included techniques targeting vicarious experiences, but these were more superior in increasing physical activity-specific self-efficacy beliefs than those without that component.

Verbal persuasion. Successfully raising self-efficacy beliefs through verbal persuasion is difficult and depends on the provider, her or his knowledge and credibility, the strategy she or he is using (for example, evaluative feedback: "I think you progressed in your exercises"), and on the discrepancy between the recipient's self-appraisal and the provider's wording (Bandura, 1997). Ashford et al. (2010) found that even though most interventions included techniques targeting verbal persuasion, these techniques produced generally negative effects on recipient's physical activity-specific self-efficacy beliefs. In a correlational study targeting older adults' physical activity, Warner, Schüz, Knittle, Ziegelmann and Wurm

(2011) did not find an association between participants' reports on verbal persuasion received from significant others and their exercise-specific self-efficacy beliefs or their physical activity. Although verbal persuasion is a widely used intervention technique, it seems to be less successful than vicarious or mastery experiences in increasing self-efficacy and fostering subsequent behavior change.

Appraisal of physiological and affective states. Individuals appraise their capabilities to successfully master a situation, and they do so also through the judgment of their somatic states (Bandura, 1997). More precisely, in stressful situations or situations that necessitate high performance, this information can result in debilitation. Thus, self-efficacy beliefs can be raised when somatic states are attributed to the challenging situation and the opposite can happen if they are attributed to a person's abilities (Bandura, 1997).

Few studies have investigated the effect of different sources of self-efficacy beliefs, some of them involving measures of social support, to assess vicarious experiences and verbal persuasion (McAuley et al., 2003; Warner et al., 2011). For instance, McAuley et al. (2003) found that positive affect (appraisal of affective states after exercise) together with other proposed sources of self-efficacy—such as social support (for example, by providing guidance, potentially entailing both vicarious experience and verbal persuasion)—as well as exercise itself (past performance of behavior, thus entailing mastery experience) enhanced participants' self-efficacy beliefs for exercise. Also, Warner et al. (2011) showed that appraisal of somatic states (operationalized as participants' reports of their subjective health) along with mastery experiences (operationalized as past reports of exercise) and vicarious experiences (operationalized as co-activity with significant others) directly predicted older adults' exercise-specific self-efficacy and indirectly predicted their physical activity.

In the following section, I will introduce social support and social control as two forms of interpersonal interactions that can be associated with self-efficacy beliefs and may foster

health behavior change. Although closely related, social support and social control represent different concepts, a distinction that will be made in upcoming sections.

Social Support

Social support has been extensively studied and has many definitions. One often used definition is articulated by Cohen, Gottlieb and Underwood (2001), which describes supportive attempts as resources (such as material, psychological) that are either considered to be available if needed or that have been provided in the past. Another definition by Thoits (2011) sets supportive actions equal to the functions that they fulfill for the recipient. The definition by Cohen et al. (2001) emphasizes different forms of social support: on the one hand, perceived social support, on the other hand, enacted support received or provided. Whereas perceived social support refers to a personal expectation that help will be available if needed and is prospective in nature and relatively time-stable (Knoll, Rieckmann, & Kienle, 2007; Sarason, Sarason, & Shearin, 1986), received and provided social support refer to actual attempts at aid, are retrospectively assessed and are rather time-sensitive (Barrera, 1986; Cohen et al., 2001; Lakey, Orehek, Hain, & Van Vleet, 2010; Tay et al., 2013). The distinction between these two forms of social support is necessary, as coping and social support theory assumes that perceived support is built up by supportive experiences from the past (enacted support; Lakey et al., 2010). However, enacted support was shown to be moderately related to perceived support (Barrera, 1986). Perceived support is consistently associated with better health and well-being, whereas results on the effect of enacted support are mixed (Lakey et al., 2010).

The literature offers different functions of social support (e.g., Barrera, 1986; Berkman et al., 2000). One prominent conceptualization is the distinction between emotional and instrumental social support. Emotional support describes actions that offer, for instance, reassurance, solace, love, or care. Instrumental support refers to providing, for example,

assistance in problem solving in the enactment of a behavior or supplies of material goods (e.g., Cutrona & Russel, 1990; Thoits 2011). Other functions illustrated in the literature are informational support (for example, providing advice, knowledge) and appraisal support (such as providing feedback or guidance). The latter is often included in the first one (e.g., Weiss 1974; Thoits 2011). However, these different functions can highly correlate (e.g., Cutrona & Russel, 1990), which is why the focus of this dissertation is on an overall measure of social support.

Interventions involving a romantic partner were found to be superior to those focusing on one individual (Gellert, Ziegelmann, Warner, & Schwarzer, 2011; Hong et al., 2005; Tay et al., 2013). Since in romantic relationships each partner is often highly involved in the other's health behavior change (e.g., Lewis & Rook, 1999), in this dissertation, my focus will be on social support provided and received by an intimate partner.

Another distinction that has been made regards the operationalization of social support. While some studies have used a general social support measure to predict health behavior change, others have used a behavior-specific measures (Tay et al., 2013). In their meta-analysis, Tay et al. (2013) noted that general measures of social support were less predictive of health behavior than behavior-specific measures. Thus, my focus is on behavior specific social support in this dissertation.

Social Support and Health Behavior Change

Tay et al. (2013) summarized evidence on the relationship between social support and several health behaviors, such as a healthy diet (e.g., review by Shaikh, Yaroch, Nebeling, Yeh, & Resnicow, 2008) or physical activity (e.g., meta-analysis by Carron, Hausenblas, and Diane, 1996). Social support has also been proposed to facilitate health behavior change by fostering a person's coping efforts to achieve her or his behavioral goals (Duncan, McAuley, Stoolmiller, & Duncan, 1993; McNeill, Kreuter, & Subramanian, 2006). Duncan and

McAuley (1993) suggested that a combination of different coping efforts (scheduling exercises, distracting oneself from physiological arousal) can be involved in initiating and maintaining health behavior change.

When examining the support-health-behavior-change link, the distinction between behavior-specific support perceived and enacted must be made. For perceived social support, the literature consistently suggests a positive relationship with health behavior change in different domains, such as nutrition (e.g., Luszczynska & Cieslak, 2009) or vaccination behavior (e.g., Ernsting, Knoll, Schneider, & Schwarzer, 2014). Research has also been conducted on received social support and its effect on health behavior change on, for instance, diet (Scholz, Ochsner, Hornung, & Knoll, 2013), physical activity (Martire et al., 2013) or smoking (Burns, Rothman, Fu, Lindgren, & Joseph, 2014).

What is important to note is that in contrast to research on the relationship between support exchanges and psychological outcomes, the relationship between social support and health behavior change outcomes has been broadly conducted on the individual level (focusing on reports of support from the recipient) but not from the provider (e.g., Khan et al., 2009; Martire, Schulz, Helgeson, Small, & Saghafi, 2010). Fewer studies have applied both perspectives of the dyad when examining supportive attempts in the context of a couple's health behavior change (Ayotte et al., 2013; Lüscher, Stadler, & Scholz, 2017). Accordingly, one aim of this thesis is to extend the view of the research on couples' health behavior change by accounting for the dyadic nature of supportive acts. Moreover, the success of supportive acts may also depend on their effect on the recipient's judgment of her or his abilities to enact a behavior change (self-efficacy). In addition, these judgments may affect how supportive acts are provided. Accordingly, the relationship between social support and self-efficacy beliefs within a dyadic context represents a central point of my dissertation. In the next section, I will

make the link between social support and self-efficacy beliefs and present assumptions on the nature of their association.

Social Support and Self-Efficacy

The nature of the relationship between social support and self-efficacy can be derived from two major points delineated by the social cognitive theory (Bandura, 1997): (1) the assumption about the reciprocity between internal and interpersonal processes in facilitating the enactment of behavioral goals and (2) the assumption that, within this causal chain, individuals exert their agentic role by means of their self-efficacy beliefs (Bandura, 1986, 1997). Even though the proposition about the bi-directionality of the relationship between self-efficacy and the social environment has been made by Bandura in his earlier work (1986, 1997), the specification to supportive attempts and formulation of two concurrent hypotheses has been proposed in a later article published with Charles Benight (2004). In their study, Benight and Bandura (2004) synthesized the literature on the role of perceived coping self-efficacy in overcoming posttraumatic events. The studies they summarize underline, on the one hand, the curative effect of social support on efficacy beliefs, and on the other hand, the coping facilitative effect of enhanced efficacy beliefs on overcoming adversities. For instance, one study by Benight, Swift, Sanger, Smith and Zeppelin (1999) suggested that the beneficial effect of social support on posttraumatic symptoms was mediated by survivors' coping self-efficacy. Another study that the authors cite is one by Holahan and Holahan (1987), which examined older adults' adjustment to aging. Holahan and Holahan (1987) found that high self-efficacy for coping with social concerns is positively associated with participants' reports of general social support and negatively with their depression scores one year later.

Overall, the above-mentioned studies highlight the reciprocal association between social support and self-efficacy (Benight & Bandura, 2004). From this article, the following two hypotheses have been derived: (1) the *enabling hypothesis*, assuming that social support

fosters self-efficacy beliefs and (2) the *cultivation hypothesis*, proposing that strong self-efficacy facilitates support provision from the social network (Benight & Bandura, 2004). While this relationship is well known, research on the reciprocity (testing both hypotheses), is scarce. Thus, one of my main goals in this thesis is to investigate the bi-directional association between social support and self-efficacy.

Even though the enabling hypothesis and the cultivation hypothesis have only rarely been explicitly investigated, many studies thus far have focused on some sort of the support-self-efficacy relationship. Most of them were from the disease management context, for instance investigating quality of life (Amir, Roziner, Knoll, & Neufeld, 1999; Banik et al., 2017; Haugland, Wahl, Hofoss, & DeVon, 2016; Wang & Eriksson, 2014), PTSD symptoms (Cieslak et al., 2009; Shoji et al., 2014), depression (Holahan & Holahan, 1987; Kim, Duberstein, Sorensen, & Larson, 2005; Schwarzer & Knoll, 2007), emotional distress (Deno et al., 2012), adherence to antiretroviral therapy (Luszczynska et al., 2007) or recovery from cardiac (Schröder, Schwarzer, & Konertz, 1998) or knee surgery (Khan et al., 2009). For instance, Khan et al. (2009) examined patients with osteoarthritis after a knee surgery and determined that patient's self-efficacy mediated the relationship between received support from spouses and patient's recovery. Similarly, Banik et al. (2007) found that support derived from different sources (family, friends, other patients, medical personal) facilitated lung cancer patients' post-surgery adaptation by improving their quality of life. Comparably fewer studies have investigated the support-self-efficacy relationship in the health-behavior-change context such as physical activity (Ayotte et al., 2013; Duncan & McAuley, 1993), vaccination (Ernsting et al., 2014) or nutrition (Luszczynska & Cieslak, 2009). In addition, the majority of the current evidence is based on cross-sectional designs (Amir et al., 1999; Ayotte et al., 2013; Ernsting et al., 2014; Haugland et al., 2016; Kim et al., 2005). Most studies have examined only one predictive direction: either the direction from support to self-efficacy

(Amir et al., 1999; Cieslak et al., 2009; Deno et al., 2012; Ernsting, et al. 2014; Haugland et al., 2016; Khan, et al., 2009, Luszczynska et al., 2007; Luszczynska & Cieslak, 2009; Wang et al., 2015) or the direction from self-efficacy to support (Holahan & Holahan, 1987, Kim et al., 2016, Suorsa et al., 2016). Additionally, many studies have focused on perceived social support (Amir et al., 1999; Benight & Bandura, 2004; Cieslak et al., 2009; Luszczynska et al., 2007; Luszczynska & Cieslak, 2009; Deno et al., 2012; Haugland et al., 2016; Holahan & Holahan, 1987; Wang et al., 2015; Shoji et al., 2014) and less on actual support received or provided (Ayotte et al., 2013; Banik et al., 2017, Khan, et al., 2009, Schwarzer & Knoll, 2007). Currently, out of the many studies conducted, only a few tested both predictive directions within a longitudinal design (i.e., Banik et al., 2017; Luszczynska & Cieslak, 2009; Schwarzer & Knoll, 2007; Shoji et al., 2014). From these, only one existed with controlled change in the mediator/outcome (Banik et al., 2017). Similarly, only one study examined the association between social support and self-efficacy within a dyadic framework and with a health-behavior-change outcome (Ayotte et al., 2013). Ayotte et al. (2013) explored the relationship between husbands' and wives' received family support (support from spouse or other family members in the past 12 months), self-efficacy and physical activity within a cross-sectional design. The authors found an association between wives' self-efficacy and their husbands' physical activity by way of the husbands' perceived family support. Results neither showed a clear evidence for the enabling nor the cultivation hypotheses.

None of the noted studies examined the social support—self-efficacy relationship in a longitudinal design, accounting for both predictive directions and within the health-behavior-change context. Accordingly, a substantial portion of the empirical evidence on the association between social support and self-efficacy relies on designs that failed to include both predictive directions and their development over time.

Knowledge on the development of the support —self-efficacy association over time on the individual as well as the dyadic level, specifically in the health-behavior-change context, remains insufficient. To foster understanding of this relationship, I aim to investigate this association by accounting for its potential reciprocity, variability over time and its dyadic nature. In the following section, I will introduce social control as another social exchange process and link it to self-efficacy beliefs.

Social Control

Social control refers to the influence and regulation that the social network has on an individual (Lewis & Rook, 1999). This can have many forms. A common differentiation that has been made is between indirect social control (internalized norms that imply the adherence to specific behaviors, such as abstaining from smoking during pregnancy) and direct social control (prompts from the social network that compel an individual adhere to a specific behavior, for example, being urged to stop smoking; Craddock, vanDellen, Novak, & Ranby, 2015; Lewis & Rook, 1999).

While supportive endeavors were assumed to enhance health through their stress reducing effect, controlling behaviors were proposed to keep an individual away from harmful behaviors, thus contributing to her or his health (Lewis & Rook, 1999; Rook & Pietromonaco, 1987; Umberson, 1987). What is important here is that attempts by the social network to influence can also be harmful; for instance, by coercing health damaging behaviors, such as peer pressure to smoke (e.g., Cohen, 1988). However, the emphasis in this thesis is on social control that is exerted to enhance an individual's health. I will further focus on direct social control (henceforth, social control).

Social Control and Health Behavior Change

As with social support, social control was proposed by Berkman et al. (2000) as a health-enhancing social mechanism. On the association between social control and health,

early research from Hughes and Gove (1981) revealed that cohabiting individuals showed fewer health-compromising behaviors (such as alcohol use) but were also more distressed. The authors concluded that social relationships have two opposite effects: a positive one on health behavior and a negative one on mood. Subsequent research using proxies (for example, relationship status) confirmed the authors' findings (Umberson, 1987, 1992). Lewis and Rook (1999) took these findings into account and proposed the dual-effects model of social control. The authors replicated earlier findings and expanded on them by showing that more social control from a specific network member was associated with fewer health-compromising and more health-enhancing behaviors on the recipient but also with her or him reporting more negative affect. Subsequent attempts to explain the effect of social control on health behavior resulted in mixed findings. For instance, Westmaas, Wild, and Ferrence (2002) reported a beneficial effect of spousal control on men's smoking cessation, whereas Helgeson, Novak, Lepore, and Eton (2004) found that spousal control discouraged prostate cancer patients' health enhancing and restorative behaviors. Furthermore, Khan et. al. (2013) found null effects or negative effects of spousal control on diabetes patients' physical activity.

To provide more clarity on the research on social control and its effect on health behavior, Lewis and Butterfield (2005; 2007) developed a taxonomy of control strategies. They differentiated amongst others between positive and negative tactics. Positive control strategies were defined as attempts to influence another person by persuading her or him by using explanations, modeling the desired behavior, or rewarding its execution (Lewis & Butterfield, 2007). In contrast to positive social control, negative social control strategies implied either negative emotions expressed by the provider (such as rejecting the recipient or giving her or him negative feedback, criticizing or nagging) or by engendering negative feelings in the recipient (shame, guilt, anger, sadness). In their study, Lewis and Butterfield (2007) conducted telephone interviews with couples and found that positive but not negative

control tactics had beneficial effects on a broad range of health-enhancing behaviors (for example, healthy diet, seatbelt usage, exercise). Okun, Huff, August, & Rook (2007) saw earlier research and also proposed to differentiate between positive and negative social control strategies. They synthesized existing findings from the literature into three models of social control. The authors suggested a domain-specific model of social control, where positive control strategies were assumed to lead to positive affect and negative strategies to negative affect (Okun et al., 2007; Tucker & Anders, 2001). They extended this model by adding possible outcomes of different control tactics on health behavior (mediational model of social control). Here, positive affect was assumed to foster adherence with control attempts, whereas negative affect was speculated to enhance non-adherence (such as hiding unhealthy behavior ; Okun et al., 2007; or ignorance of control attempts; Tucker, Orlando, Elliott, & Klein, 2006). Finally, the authors introduced the contextual model of social control, where the abovementioned link was suggested to be moderated by relationship factors, such as intimacy (Lewis & Butterfield, 2005), or relationship quality (Knoll, Burkert, Scholz, Roigas, & Gralla, 2012). All three of the above models received support from the literature; however, as authors of a recent meta-analysis on social control observe, findings remain inconclusive and difficult to synthesize (Craddock et al., 2015). What all three models have in common is their differentiation between positive and negative control tactics (see Okun et al., 2007).

Nevertheless, research on health behavior change, where social support and positive/negative control are examined, indicates a conceptual overlap between support and positive control, which seems to not be the case for negative control (Newsom, Shaw, August, & Strath, 2016). Considering its contradictory effects on the health-behavior-change process and its distinction from supportive attempts, the examination of negative control attempts seems to be particularly interesting. Accordingly, I will focus on negative social control and its effect on health behavior change. Within this process, I will take into account each

partner's control attempts and explore their relationship with the provider's and the recipient's behavior changes.

Social Control and Self-Efficacy

As a product of the social environment, social control may be a potential outcome and predictor of self-efficacy beliefs (SCT; Bandura, 1997). When looking closely at this relationship, an increase and decrease in self-efficacy beliefs seems plausible. On one hand, being under the control of another person may trigger perceptions of inability in control recipients, weakening their self-efficacy beliefs; on the other hand, well-intended control attempts from a person one trusts and is strongly attached to may also serve as a buffer and thus protect against confidence damage (e.g., Rook et al., 2011).

Social control was shown to elucidate different reactions in the recipient. For instance, Ungar et al. (2016) found that provided control from relatives (mostly partners) provoked reactance in patients, more so than a behavior change. Similar effects were documented by other authors in studies in which recipients showed contrary behaviors to those expected by the provider of control (Butterfield & Lewis, 2002; Logic, Okun, & Pugliese, 2009; Tucker, 2002). This effect was explained by reactance, an adverse motivational state that occurs when the recipient perceives control attempts as restricting her or his freedom of choice (Brehm, 1966). However, attempts of social control do not necessarily lead to reactance. Rook, August, Stephens, and Franks (2011), for instance, emphasized the role of cognitive processes in the acceptance of control attempts from spouses. The authors found that patients who expected spousal involvement in their disease management responded with appreciation and not with hostility. Furthermore, if spousal control was expected, female patients showed less resistance to adhere to their spouses' involvement. Comparably few studies thus far focused on self-efficacy beliefs as mediators between social control and health behavior change (i.e., de Montigny et al., 2017). One study investigated direct effects of social control on self-

efficacy (i.e., Badr, Yeung, Lewis, Milbury, & Redd, 2015), whereas another direct as well as moderated effects (i.e., Khan et al., 2013). Badr et al.(2015) and Khan et al. (2013) examined patients' self-efficacy and their spouses' control attempts, whereas de Montigny et al. (2017) investigated healthy men's self-efficacy and their reports of control. De Montigny et al. (2017) and Khan et al. (2013) targeted control recipient's physical activity, however, only the latter involved partners' reports of control provided. Only Badr. et al. (2015) differentiated between positive (for example, reminders) and negative control strategies (such as pressuring) provided by the partner. In contrast, Khan et al. (2013) collapsed both strategies and used an overall measure of social control. Unlike the aforementioned studies, de Montigny et al. (2017) solely assessed positive control strategies reported by the recipient. Badr et al. (2015) saw beneficial effects for partners' positive (but not negative) control strategies on patients' self-efficacy, whereas Khan et al. (2013) found a positive lagged effect on patients' received social control on their subsequent self-efficacy and a trend towards less same-day physical activity. De Montigny et al. (2017) also found a positive same-time association between positive received control by men and their self-efficacy, which related positively to their self-reported physical activity. None of the studies investigated the relationship between negative control and self-efficacy in the context of health behavior change. Also, the opposite direction of the control-self-efficacy association, namely whether self-efficacy beliefs facilitate or hinder the provision of control, has not yet been examined.

To unravel the mixed findings on social control on health behavior change and to enrich current research, my focus in the last section (Chapter 4) will be on the negative control-self-efficacy relationship and its effect on couples' health behavior change within a dyadic-longitudinal framework.

Aims and Research Questions

Even though many people live in a romantic relationship and the use of supportive and controlling strategies to foster the other partner's health behavior is common, research on the association between social exchange processes and recipient's self-efficacy beliefs is scarce. Evidence stems from analyses conducted on the individual level and involving mostly the recipient's perspective of the social exchange. Also, studies thus far predominantly examined one predictive direction of this association within a cross-sectional design. Accordingly, the question of the co-existence of both predictive directions and their association over time with recipient's health behavior remains open. This thesis aims to answer the question, whether self-efficacy fosters social exchange or is facilitated by these processes by using analytical approaches that allow the investigation of both predictive directions, in studies that were conducted longitudinally and, where applicable, dyadically. The following section provides further details on the specific research questions investigated by the three studies included in this thesis.

The first study (Chapter 2; Hohl et al., 2016) examines the following research questions: How is received support and self-efficacy related in the prediction of one partner's health behavior change? Can findings be cross-validated with the other partner's provided support? The study focused on the association between received social support, self-efficacy, and pelvic floor exercise (PFE) in patients coping with urinary incontinence and explored how their spouses' provided support related to their self-efficacy and behavior. Data were derived from a larger project (DFG; KN 937/3-1) focusing on prostate cancer patient's rehabilitation from radical prostatectomy (for more details please see Knoll et al., 2014; Knoll et al., 2015). Radical prostatectomy involved the removal of the prostate gland, which often led to urinary incontinence. The project recruited $N = 209$ patients and their partner's, however 175 remained in the study after surgery. The study design was correlational and longitudinal,

including one baseline assessment before surgery and four assessments afterwards (one, three, five and seven months). For study 1, data from $N = 175$ prostate cancer patients (age: $M = 63.53$ years, $SD = 6.74$, range 46 to 77) and their partners (age: $M = 60.12$ years, $SD = 7.91$, range 39 to 75) were analyzed. Assessments took place following prostatectomy, when patients' regular PFE was important for managing urinary incontinence. The study included patients' received support from partners for PFE, their PFE-specific-self-efficacy and PFE, as well as female partners' PFE-specific support provided to patients.

In the second study (Chapter 3; Hohl et al., 2017¹) the following research question is investigated: How is one partner's provided support related to the other partner's self-efficacy over time and vice versa? The focus of this study is on the reciprocal association between provided social support and self-efficacy in healthy heterosexual couples, where both partners intended to increase their physical activity (PA) level. The study represents a secondary analysis of a randomized controlled trial (RCT; NCT01963494, <https://clinicaltrials.gov/>) that was focusing on the effectivity of a dyadic planning intervention (planning together with one's partner) compared to an individual planning intervention (planning alone) and a control group (for more details see, Knoll et al., 2017). For study 2, all three groups are collapsed into one. Overall 346 heterosexual couples participated in the RCT, from which $N = 338$ couples (women's age: $M = 36.88$ years, $SD = 15.45$, range 18–77; men's age: $M = 39.19$ years, $SD = 15.71$, range 19–80) were randomized to one of the three groups. This sample will be used for study 2. In contrast to study 1, here both partners' PA-specific support provided to each other and their PA-specific self-efficacy beliefs are examined. The study design is correlational,

¹ Please note that between the submission of this dissertation and its publication the reference has changed. The in-text citation is: (Hohl et al., in press).

fully dyadic and longitudinal including all six measurement points of the RCT (baseline, one, six, 19, 26 and 52 weeks after the main intervention session).

The third study (Chapter 4; Hohl et al., 2018) investigates the following research questions: How is one partner's provided social control associated with the other partner's self-efficacy and vice versa, and is this interrelationship beneficial or detrimental to the recipient's behavior change? The focus is on the association between provided negative social control and self-efficacy and its effect on moderate to vigorous physical activity (MVPA) in couples motivated to enhance their PA. Secondary analyses of the above presented RCT (NCT01963494, <https://clinicaltrials.gov/>) are performed with data obtained from couples randomly assigned to the control condition ($n = 113$ couples; women's age was $M = 35.81$ years, $SD = 16.11$, range 18–77; men's age was $M = 37.84$ years, $SD = 16.23$, range 19–80). The study includes the first three assessment points from study 2. Both partners' reports on PA-specific provided negative social control, PA-specific self-efficacy, and moderate to vigorous physical activity (MVPA) (measured objectively via accelerometer) are taken into account.

The structure of the upcoming sections of the dissertation is as follows: In Chapters 2, 3 and 4, the above described studies will be presented. In Chapter 5, findings of the three studies will be briefly summarized and their results will be compared and integrated. Subsequently, strengths and limitations, and an outlook will be given together with implications for future research and practice. Finally, a conclusion will be provided.

List of Publications

Chapter 2 (Study 1)

Hohl, D. H., Knoll, N., Wiedemann, A., Keller, J., Scholz, U., Schrader, M., & Burkert, S. (2016). Enabling or cultivating? The role of prostate cancer patients' received partner support and self-efficacy in the maintenance of pelvic floor exercise following tumor surgery. *Annals of Behavioral Medicine*, 50(2), 247-258. doi:10.1007/s12160-015-9748-6

Chapter 3 (Study 2)

Hohl, D.H., Schultze M., J., Keller, J., Burkert, S., Luszczynska, A., & Knoll, N. (2017). *Cultivating partner support for physical activity: A dyadic longitudinal analysis*. Manuscript submitted for publication. ²

Chapter 4 (Study 3)

Hohl, D.H., Lüscher, J., Keller, J., Burkert, S., Scholz, S., Luszczynska, A., & Knoll, N. (2018). Inter-relations among negative social control, self-efficacy and physical activity in healthy couples. *British Journal of Health Psychology*. doi:10.1111/bjhp.12305 ³

² Please note that between the submission of this dissertation and its publication the reference has changed to: Hohl, D.H., Schultze M., J., Keller, J., Heuse, S., Luszczynska, A., & Knoll, N. (in press). Inter-relations between partner provided support and self-efficacy: A dyadic longitudinal analysis. *Applied Psychology: Health and Well-Being*. doi:10.1111/aphw.12166

³ Please note that between the submission of this dissertation and its publication the reference has changed to: Hohl, D.H., Lüscher, J., Keller, J., Heuse, S., Scholz, S., Luszczynska, A., & Knoll, N. (2018). Inter-relations among negative social control, self-efficacy and physical activity in healthy couples. *British Journal of Health Psychology*. 23(3), 580-596. doi:10.1111/bjhp.12305

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Chapter 2

Enabling or Cultivating? The Role of Prostate Cancer Patients' Received Partner Support and Self-Efficacy in the Maintenance of Pelvic-Floor Exercise Following Tumor Surgery

Hohl, D. H., Knoll, N., Wiedemann, A., Keller, J., Scholz, U., Schrader, M., & Burkert, S.

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⁴ The final publication is available at link.springer.com (<https://link.springer.com/article/10.1007/s12160-015-9748-6>). The version of the article included in the dissertation, is the one that has been accepted for publication but has not been proof read. Thus it differs slightly from the published one. Please also note that the citation style is AMA and not APA.

Abstract

Background: To manage incontinence following tumor surgery, prostate cancer patients are advised to perform pelvic-floor exercise (PFE). Patients' self-efficacy and support from partners were shown to facilitate PFE. Whereas support may enhance self-efficacy (enabling function), self-efficacy may also cultivate support (cultivation function).

Purpose: Cross-lagged inter-relationships among self-efficacy, support, and PFE were investigated.

Method: Post-surgery patient-reported received support, self-efficacy, PFE, and partner-reported provided support were assessed from 175 couples at four times. Autoregressive models tested interrelations among variables, either using patients' or partners' reports of support.

Results: Models using patients' data revealed positive associations between self-efficacy and changes in received support, which predicted increased PFE. Using partners' accounts of support provided, these associations were partially cross-validated. Furthermore, partner-provided support was related with increases in patients' self-efficacy.

Conclusion: Patients' self-efficacy may cultivate partners' support provision for patients' PFE, whereas evidence of an enabling function of support as a predictor of self-efficacy was inconsistent.

Keywords: enabling hypothesis, cultivation hypothesis, pelvic-floor exercise, prostate cancer, received social support, self-efficacy.

Prostate carcinoma is currently among the most prevalent cancers in men worldwide (1). A standard treatment for prostate cancer is radical prostatectomy (RP), which involves the surgical removal of the prostate gland including the tumor and seminal vesicles. Although RP has excellent outcomes in terms of recurrence and patient survival (2), post-surgery functional limitations such as urinary incontinence and sexual dysfunctions are common and may interfere with patients' quality of life (3). Especially urinary incontinence has a strong potential to disrupt patients' daily routines, limit their social contacts, and prevent patients from physical intimacy (3). Urinary incontinence sets in directly following the removal of the indwelling post-surgery catheter. In most patients, incontinence decreases again during the first year post-surgery, however, about 10% of patients remain incontinent even beyond the second year (4). To manage urinary leakage, patients are advised to perform regular pelvic-floor exercise (PFE) to strengthen their outer pelvic-floor muscles and use them as an external sphincter (5).

Previous findings indicated that patients' received PFE-specific social support from partners was positively related with patients' adherence to PFE (6). Additionally, maintenance of regular PFE was shown to be associated with patients' high self-efficacy that is, their confidence in their ability to perform PFE (7, 8). In turn, findings from several different study contexts point to associations between social support and self-efficacy (9) and indicate different predictive directions and thus potential reciprocal relations among the two constructs (10, 11). As such, social support may increase self-efficacy (enabling function of support) (10, 11) and self-efficacy may foster support (cultivation function of self-efficacy) (10, 11).

The present study aims at providing further evidence on potential reciprocal effects between patient-reported received support from their partners and patients' self-efficacy (i.e., enabling and cultivation functions). This study also examines longitudinal associations of

patients' received support and self-efficacy with patients' PFE and attempts to cross-validate associations involving patient-reports on received support by replacing the latter with partners' accounts of support provided to patients.

Social Support: Taxonomies and Pathways to Health

Social support has long been used as an umbrella term for different aspects of social embeddedness and social exchange and has been defined and operationalized in many different ways (11). It is now often differentiated from social integration in that the latter refers to structural aspects of an individuals' social network (size, density, etc.) (12), whereas the former signifies qualitative aspects of supportive exchange within the network (12). Support may entail attempts from significant others to ameliorate another person's hardship, provide resources, or assist in goal pursuit (11). Moreover, there are different forms and functions of social support (11). Perceived available support refers to an individual's relatively stable expectation that help will be available in times of need, it is assessed prospectively, and is only moderately correlated with past supportive interaction (11). Received support, on the other hand, refers to recipients' retrospective reports on assistance, help, or care received in the past. Received support represents only one side of a supportive interaction (13). If support interactions are dyadically assessed (i.e., when two partners provide reports of the same support event), received support as reported by one member of the support dyad (i.e., recipient) should be at least moderately associated with provided support as reported by the other member (i.e., provider) (11). In addition to these different forms of support, different functions of support can also be distinguished, they include, but are not restricted to emotional support (e.g., comfort, encouragement), instrumental support (tangible help), or informational support (e.g., advice) (12). Functions of support are, however, often highly inter-related (14).

Social support is assumed to be one of a number of social exchange processes that mediate the well-replicated effect of social integration on survival (12, 15). It is assumed that persons who are well-integrated experience more social support (12). Social support in turn is proposed to be associated with better health and lower mortality via a number of additional indirect effects, such as reduced distress and associated physiological responses, but also via facilitation of health-behavior change (12). Concerning the latter, social support was found to be related with a number of beneficial changes in adherence to medical regimens (16) and also the uptake and maintenance of regular PFE (6). When social support is examined as a potential predictor of health behavior change, items are usually framed in a domain-specific way (17). However, evidence on effects of social support on health behavior change is quite inconsistent to date (16, 18). Methodological reasons for this may include use of different support measures (general or domain-specific support), investigation of different predictive time frames, or insufficient recognition of the distinctive forms of support (e.g., perceived vs. received support).

Types and Sources of Self-Efficacy and Its Role in Health Behavior Change

Self-efficacy refers to the optimistic belief that one has the ability to adopt a behavior that is necessary to achieve a desired goal (19). Social cognitive theory (SCT) (19) conceptualizes self-efficacy as a central predictor of health behavior change, a claim that has been supported by numerous empirical studies examining change in several domains of health behavior, including adherence to medical advice (20) and regular PFE (7, 8). Self-efficacy is usually assessed in a behavior-domain specific manner with item wording directly addressing the target-behavior in question (19). Moreover, self-efficacy has been further differentiated to enhance fit with the concurrent stage of behavior change an individual is pursuing (8, 21). For instance, one taxonomy distinguishes self-efficacy regarding action, i.e., the behavior itself, from self-efficacy regarding action preparation (8). Another taxonomy

assumes different types of self-efficacy beliefs in persons who are motivated to change their behavior, have already implemented behavior change, or have suffered a relapse and strive for the reuptake of a target behavior (7, 21). According to Bandura (19), self-efficacy develops from four sources: (A) Mastery experience or prior successful behavior is proposed to be the strongest source of self-efficacy. (B) Vicarious experience involves inferring one's own level of competence from successful role models. (C) Social persuasion can impact a target person's self-efficacy by means of being assured of one's competence. (D) Finally, perceived affective and physiological states may impact self-efficacy negatively if they are attributed to one's inadequate level of competence.

Inter-Relations Between Self-Efficacy and Social Support

Benight and Bandura (10) proposed that social support may increase self-efficacy beliefs in individuals. This assumption has been called the *enabling hypothesis* of social support. Potential mechanisms behind the enabling hypothesis can be traced back to the four major sources of self-efficacy defined by Bandura (19) as (A) social support may facilitate individuals' mastery experiences; (B) support providers may act as role models; (C) support may take on the form of social persuasion when support providers assure recipients of their competence; and (D) when social support reduces distress, for instance during adoption of a new health behavior, the acting individual might be less tempted to question their own competence (11). To date, the enabling hypothesis was predominantly examined with individuals' *perceived available support* as a predictor (10, 22). A potential enabling function of *received support* has been investigated less often, for instance one study by Khan et al. (9) showed an enabling effect of received support on self-efficacy in the context of recovery from kneesurgery.

In addition to the enabling hypothesis of social support, Benight and Bandura (10) proposed the *cultivation hypothesis* assuming that higher self-efficacy predicts increases in

social support available to or received by individuals. Several theoretical links are possible. For instance, as individuals with higher self-efficacy use more self-regulatory strategies when faced with challenging demands (10) they might also more likely expand these self-regulatory activities to their social network by outsourcing chores, thereby receiving more support (11). Furthermore, highly self-efficacious individuals may use more efficient coping strategies when facing demanding tasks, which was shown to elicit higher support intentions in others (23). Again, evidence for the cultivation hypothesis initially involved relations between self-efficacy and perceived available support (10, 24), whereas relations between self-efficacy and received support have been examined less frequently (11).

Aims and Hypotheses

The major aims of the present study were threefold. First, to extend our understanding on the potential reciprocal relationships between received social support and self-efficacy, that is their proposed enabling and cultivating functions, we examined their interrelations in the context of prostate cancer patients' uptake and maintenance of regular PFE during the first seven months of rehabilitation from urinary incontinence following radical prostatectomy. Specifically, we examined reciprocal cross-lagged relationships between patient-reported PFE-specific received support and self-efficacy over time. We concentrated on *received support*, because its role in the enabling-cultivating processes is relatively understudied. Second, to cross-validate findings on enabling and cultivating functions of received support and self-efficacy, we included an alternative data source in this study, i.e., partners as support providers. In that, we replaced patients' accounts of received supports from their partners with partners' concurrent accounts of provided supports to patients and examined their potential reciprocal relations with patient self-efficacy. Third, we examined direct and indirect effects of patients' PFE-specific received social support and self-efficacy

on patients' PFE, again replacing patients' received support with partners' accounts of provided support to patients in a second step to cross-validate our findings.

In addition to our main hypotheses (see below), we expected mean level decreases in the central variables under study during the first seven months of patients' rehabilitation (H1): In accordance with prior evidence (4), we expected an overall decrease in patients' urinary incontinence over time. Because patients' incontinence is likely to act as a cue for PFE (7, 8), we also expected a concurrent decrease in patients' regular PFE. Decreases in regular PFE should also reduce patients' mastery experiences, thus, a decrease in patients' PFE-specific self-efficacy was expected. Finally, as patients recover and their need to perform PFE declines, support for patients' PFE – as reported by patients and their partners – should decline as well.

With regard to the central aims of our study, we hypothesized (H2) positive associations between earlier patient-reported received social support and changes in patients' self-efficacy (enabling functions of social support) and (H3) positive associations between earlier patient self-efficacy and changes in patients' received social support (cultivating functions of self-efficacy). We also assumed (H4) unique relations of patient self-efficacy and patient received support with changes in patients' PFE. Implied indirect effects of received support on changes in PFE via patients' self-efficacy as well as indirect effects of patients' self-efficacy on changes in PFE via increases in received support were explored. Furthermore, replacing patients' accounts of received support from partners with partners' respective accounts of provided support to patients, we expected (H5) to cross-validate evidence on enabling functions and (H6) cultivating functions as well as (H7) unique effects of self-efficacy and partner-reported provided support on patients' PFE. Again, implied indirect effects were explored. In light of the limited evidence on concurrently tested enabling and cultivating functions of support and self-efficacy (24), we refrained from forming

hypotheses on which of these relationships would take precedence over the other.

Furthermore, we expected that the strength of the assumed lagged associations would stay unchanged across different measurement lags (i.e., remain stationary).

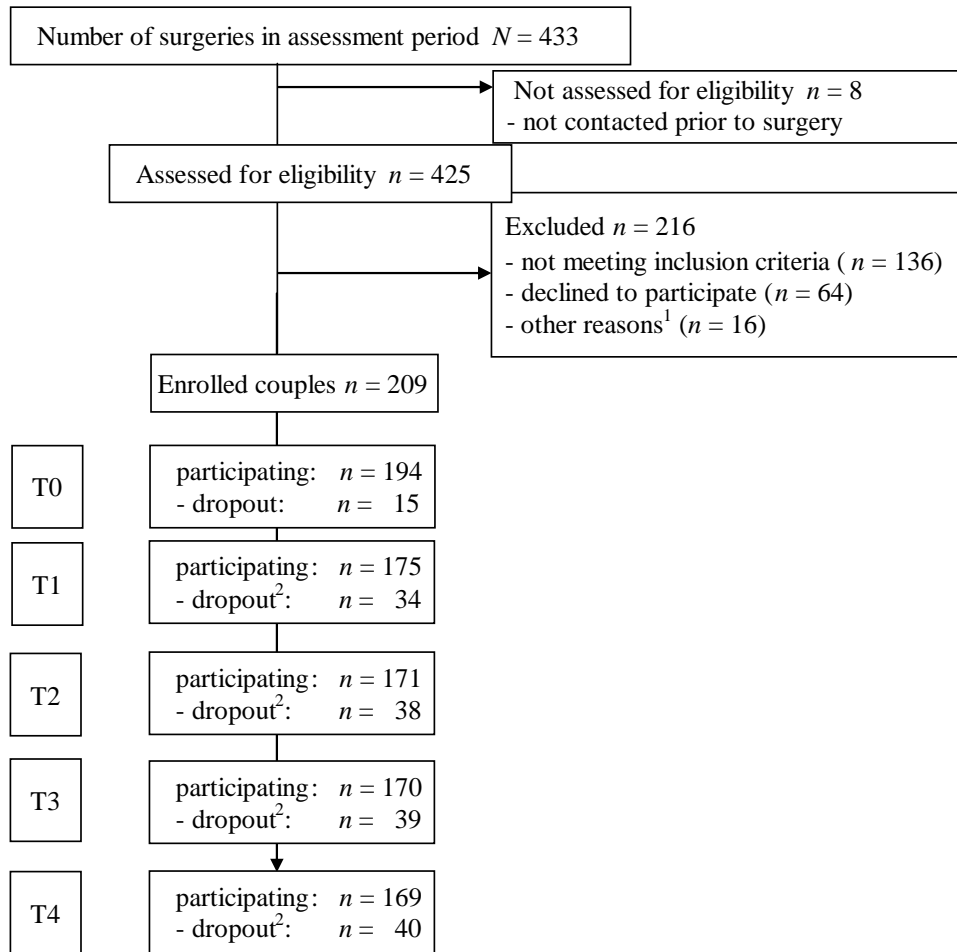
Method

Sample and Procedure

This study comes from a larger project on couples adapting to sequelae of radical prostatectomy, and parts of the data of this project were previously published (25-27). Overall, 209 patients with prostate cancer and their partners were enrolled in the study. Couples were recruited in two urological departments in a large north-eastern metropolitan area in Germany between 2009 and 2011. Patients had to meet the following inclusion criteria: undergoing radical prostatectomy and having a heterosexual partner. Patients and partners had to have sufficient knowledge of the German language and were asked to provide informed consent. Couples received a compensation of 110 Euro for full participation. An institutional review board provided a positive vote on the study design.

The first measurement (T0) point took place in the hospital, one day prior to patients' surgeries. For the following four assessments at 1 month (T1), 3 (T2), 5 (T3), and 7 months (T4) following the onset of patients' incontinence, questionnaires were sent to couples' homes together with pre-stamped and separate return envelopes for patients and partners.

Of the 209 couples, 175 provided questionnaire data at least until T1 and 169 provided data at all assessments (see Figure 1). Drop-out analyses revealed unique relations of study continuation with patient-reported difficulties in performing activities of daily life (less difficulties in performing activities of daily life in continuers; $r = -.24, p < .05$) and partners' vocational training (higher vocational training was less often reported by continuers $\rho = -.18, p < .05$; cf. (26)).



Note. ¹No reason stated ($n = 8$), temporarily abroad ($n = 6$), time/health-related issues ($n = 2$); ²cumulative dropout

Figure 1: Participant Flow.

Patients' mean age was 63.53 years ($SD = 6.74$, range 46 to 77) and partners' mean age was 60.12 years ($SD = 7.91$, range 39 to 75). All couples were in a long-standing relationship with an average duration of 32.35 ($SD = 13.96$) years. Nearly all couples were married (88%). Almost all patients lived together with their partner (93.1%). Most patients (88.6%) and partners (85.2%) reported to have children. Around half of the patients (52.1%) and nearly as many partners (41.3%) reported more than ten years of schooling, the remainder reported nine to ten years of schooling. Half of the patients (56.6%) and partners (48.80%) were retired. About half of the patients (44.6%) and close to one third of partners (29.7%) reported an average income higher than 2000 Euro per month. Concerning medical indicators, patients' tumors varied in size: T1 (small): 0.60%, T2 (larger but within the organ): 67.30%, T3 (spread beyond the organ): 32.10%. About 10% had spread to lymph nodes (N1), and 0.6% had spread further (M1).

Measures

The following constructs were assessed at all measurement points using questionnaires. If not otherwise stated, item responses were scaled from 1 (*not at all true*) to 6 (*exactly true*). All item examples were translated from German.

Patients' PFE (excluding participation in instructed PFE classes) during the past 7 days was assessed by 3 items, asking on how many days, how often per day, and how many minutes per session patients engaged in PFE. A product-score was calculated from the three items. Scores which exceeded 3.29 standard deviations above the mean were identified as univariate outliers (overall 8 scores) and therefore truncated to the next highest score of the range of the distribution (28).

Patient-reported received PFE-specific support from partners was measured with a 3 item-scale adapted from Burkert et al. (29) and the Berlin Social Support Scales (BSSS) (30). A brief 3-item measure with one item each representing emotional, instrumental, and

informational support was chosen to keep participant burden as low as possible. Items read: “My partner encouraged me to do my pelvic floor exercises regularly”; “My partner helped me to do my exercises”; “My partner reminded me of strategies, which help me to do my exercises regularly”. Internal consistencies were high and ranged from Cronbach’s $\alpha = .78$ to $.85$ across measurement points. All item inter-correlations were moderate to high and ranged between $r = .43$ and $r = .61$ (T1); $r = .43$ and $r = .65$ (T2), $r = .53$ and $r = .72$ (T3); $r = .54$ and $r = .75$ (T4; all $ps < .01$). Rank stabilities of the 3-item scale across consecutive measurement points were high ranging between $r = .63$ and $r = .81$ (all $ps < .01$). Across measurement points, PFE-specific received support as reported by patients correlated with patients’ pelvic-floor training ($r = .09$, n.s., to $r = .46$, $p < .01$), patient-reported general received support from their partners ($r = .42$ to $r = .57$, all $ps < .01$) (26) and PFE-specific provided support as reported by partners (see below; $r = .46$ to $r = .71$, all $ps < .01$), supporting validity of the scale.

Partner-reported provided PFE-specific support to patients was measured with a mirrored version of the received support scale described above (29, 30): “I encouraged my partner to do his pelvic floor exercises regularly”; “I helped my partner to do his exercises”; “I reminded my partner of strategies, which help him to do his exercises regularly”. Internal consistencies ranged from Cronbach’s $\alpha = .74$ to $.83$ across measurement points. Item inter-correlations were moderate to high and ranged between $r = .38$ and $r = .60$ (T1); $r = .32$ and $r = .61$ (T2), $r = .37$ and $r = .65$ (T3); $r = .48$ and $r = .76$ (T4; all $ps < .01$). Rank stabilities ranged between $r = .29$ and $r = .43$ (all $ps < .01$). Across measurement points, PFE-specific provided support as reported by partners correlated with patients’ pelvic-floor training ($r = .21$ to $r = .31$, all $ps < .05$) and partner-reported general provided support to patients ($r = .35$ to $r = .53$, all $ps < .001$) (26).

Patient-reported PFE-specific self-efficacy was measured with 2 items adapted from Wiedemann et al. (31): “I am confident, that I can perform PFE 3 times a day”; “I am confident, that I can maintain performance of PFE 3 times a day, even if I have to make myself do so”. Specified frequencies of PFE per day were in accordance with recommendations given to patients by the department of urology’s physiotherapy staff. A brief measure was chosen to minimize participant burden. Items were significantly correlated with associations across measurement points ranging from $r = .77$ to $.85$ (all $ps < .01$). Rank-order stability was high with correlations between $r = .48$ and $r = .70$ (all $ps < .001$). PFE-specific self-efficacy was positively correlated with patient-reported PFE ($r = .18, p = .085$ to $r = .34, p < .001$), patient-reported intentions to perform PFE 3 times a day ($r = .47$ to $r = .49$, all $ps < .001$), and slightly negatively correlated with depressive symptoms as assessed by the Center for Epidemiologic Studies Depression Scale (CES-D; $r = -.10, p = .194$ to $r = -.23, p < .001$) (32), indicating construct validity of the scale.

Patients’ urinary incontinence was measured with the short form of the International Consultation of Incontinence Questionnaire (ICIQ-SF) (33). The scale consisted of 3 items assessing frequency, amount, and burden by urinary incontinence. A sample item asked patients: “How often do you leak urine?” and was rated on a 6-point Likert scale ranging from 0 (*never*) to 5 (*all the time*). Internal consistencies ranged from $\alpha = .75$ to $.81$ across measurement points.

Data Analyses

Drop-out analyses were conducted in SPSS 22.0. Associations were tested using zero-order Pearson and Spearman correlations and logistic regression. All other analyses were conducted in MPLUS 7 (34). A full information maximum likelihood estimation with robust standard errors (MLR) was used to account for missing data (34). As the patients were the

main focus of the study, mainly patients' data were analyzed, except for partner-reported provided support and partner age in cross-validation models.

To examine change in the central variables under study (H1), two-level mixed models were used. In these models, time-points (level 1) were nested in individuals (level 2). A linear time trend coded in months and centered at the first assessment following the onset of incontinence (T1) was included as a level-1 predictor. Random intercepts and slopes were tested to account for individual differences in starting points (intercepts) and rates of change (slopes) over time.

For tests of the central hypotheses, we conducted autoregressive cross-lagged panel models. Autoregression involves regressing a variable that was assessed at a later point on *that same* variable measured previously; thereby stability (autoregressive effect: size of path coefficient) and variability (residual variance) can be modeled over time (35). Also, cross-lagged autoregressive models allow for the prediction of change in a variable with the help of *other* previously-assessed variables (cross-lagged effects) that explain variance in the outcome that cannot be explained by the autoregression (35). Moreover, autoregressive cross-lagged panel models elucidate indirect effects with model-components acting as predictors, mediators and outcomes. Autoregressions among repeatedly assessed indicators of patients' self-efficacy, their received support and PFE were combined with the hypothesized cross-lagged paths between patient self-efficacy and received support, as well as lagged effects of the two on later PFE. The basic structure of the model is depicted in Figure 2. Patient age and patient reported incontinence (T1 through T4), were included as covariates, but are not depicted in Figure 2.

When autoregressive cross-lagged panel models with repeatedly measured variables are used, tests of unchanging causal structure over time, so-called tests of stationarity are recommended (36). If stationarity is implied, the proposed causal structure of a set of

previously assessed variables affecting another set of later assessed variables does not change over time (36). To analyze whether autoregressive effects and cross-lagged effects were stationary across the different measurement lags, stepwise model comparisons were applied. The following fit-indices were used to examine changes in model fit: Satorra-Bentler-Scaled-Chi Square ($\Delta\chi^2$ (df)) with a better fit of the more parsimonious model indicated by a non-significant ($p > .05$) difference between the more restricted model that is nested in the less restricted model (37), the root mean square error of approximation (RMSEA $< .05$), the comparative-fit index (CFI $> .95$), and the Tucker-Lewis Index (TLI $> .95$) (38). Unstandardized values of all parameters were used for the model comparisons as well as the interpretation of the results (36).

A series of nested models testing Hypotheses 2 through 4 (models M1.1 through M1.5) used patient data only and included repeatedly assessed manifest indicators of patient self-efficacy, patients' received support, and their PFE. Also, repeatedly assessed patient-reported incontinence and patient age served as covariates. In the series of nested models testing Hypotheses 5 through 7 (models M2.1 through M2.5), patient received support and patient age were replaced by partner provided support and partner age.

All implied indirect effects of partner support on patient PFE via patient self-efficacy and patient self-efficacy on PFE via partner support were explored using bias-corrected bootstrapping (39). Bias corrected-bootstrapping (BC) methods yield reliable estimates of the indirect effect within the 2.5 percentile and the 97.5 percentile of the confidence interval (CI_{BC}). We chose 5000 resamples and a significance level of 5% ($\alpha = .05$).

Results

Change in Central Variables over Time (H1)

As shown in Table 1, patients' urinary incontinence, PFE, PFE-specific self-efficacy, and partner-reported provided support decreased significantly from 1 month to 7 months after

the onset of incontinence. The decrease in patient-reported PFE-specific support was non-significant. All models indicated significant inter-individual differences in starting points (i.e., intercepts) and rates of change (i.e., linear slopes).

Associations Among Patient-Reported Received Support, Self-Efficacy, and PFE (H2-H4)

The general model (M1.1; model with patient-reported received support, patient-self-efficacy and patient-PFE; basic model structure depicted in Figure 2) allowing for free estimation of all autoregressive and cross-lagged paths, yielded a satisfactory fit (see Table 2).

In four cumulatively restricted nested models and using the general model (M1.1) as a reference, the following sets of path coefficients were constrained to be equal across all assessment lags: (M1.2) autoregressive effects; (M1.3) cross-lagged effects of PFE-specific self-efficacy on patient-reported received support; cross-lagged effects of patient-reported received support on patient self-efficacy; (M1.4) cross-lagged effects of patients' urinary incontinence (covariate) on received support; [cross-lagged effects of incontinence on self-efficacy had to remain unconstrained]; (M1.5) cross-lagged effects of support on PFE; cross-lagged effects of self-efficacy on PFE; cross-lagged effects of patients' incontinence (covariate) on PFE. Results of the nested model comparisons indicated that the most restricted model (M1.5, see Figure 3) yielded the best fit to the data.

In this model, positive lagged associations between earlier PFE-specific self-efficacy and changes in patient-reported received support emerged. Lagged associations of earlier received support with changes in self-efficacy were non-significant. Whereas self-efficacy was not uniquely related with later changes in PFE, patient-reported support significantly predicted changes in patient PFE. Accordingly, only indirect effects of patient self-efficacy on change in PFE via patient-reported social support emerged ($B = .61$; $SE = .35$; $CI_{BC} = .098-1.53$ [95% bootstrap CI]). Regarding covariates in the model, incontinence was positively related with changes in patient-reported received support ($B = .04$, $SE = .03$, $p < .001$) and

patients' PFE ($B = 3.15$, $SE = .69$, $p < .001$), whereas patient age was associated with self-efficacy (T2: $B = .07$, $SE = .02$, $p < .001$; T3: $B = .06$, $SE = .02$, $p < .001$) and patient-reported received support (T3: $B = .04$, $SE = .01$, $p = .010$). Overall, results yielded support for a cultivation-function of patients' self-efficacy (H3). No evidence for enabling functions of received support emerged (H2). Also, only patient-received PFE-support, but not self-efficacy, was uniquely related with change in PFE (H4).

Table 1

Descriptive Statistics

Scale (range)	Mean (<i>SD</i>)				FIXED Effect Estimate (<i>SE</i>)		RANDOM Effect Estimates (<i>SE</i>)		
	1 Month	3 Months	5 Months	7 Months	Intercept	TIME	Intercept	TIME	Residual Variances
Patient PFE (0-473)	132.32 (113.96)	125.93 (100.87)	115.07 (108.73)	106.63 (117.51)	139.25*** (9.04)	-3.74† (1.91)	7,638.27 *** (1,562.66)	204.38*** (56.24)	3,348.08*** (582.09)
Patient received support (1-6)	2.74 (1.65)	2.89 (1.69)	2.71 (1.73)	2.65 (1.77)	2.83*** (.12)	-.02 (.02)	1.91*** (.22)	.02** (.01)	.76*** (.09)
Partner provided support (1-6)	2.93 (1.54)	2.98 (1.47)	2.69 (1.51)	2.62 (1.61)	2.99*** (.11)	-.06** (.02)	1.35*** (.20)	.02* (.01)	.83*** (.10)
Patient self-efficacy (1-6)	4.98 (1.29)	4.37 (1.63)	4.28 (1.76)	4.02 (1.79)	4.86*** (.10)	-.15*** (.02)	.78*** (.20)	.03* (.01)	1.11*** (.12)
Patient urinary incontinence (0-21)	10.93 (5.55)	8.48 (5.64)	7.02 (5.52)	6.49 (5.56)	10.46*** (.42)	-.74*** (.06)	26.25*** (2.58)	.31*** (.07)	5.30*** (.51)

Note. $N=175$. Time points refer to time span following the onset of incontinence. † $p = .05$; * $p < .05$; ** $p < .01$; *** $p < .001$.

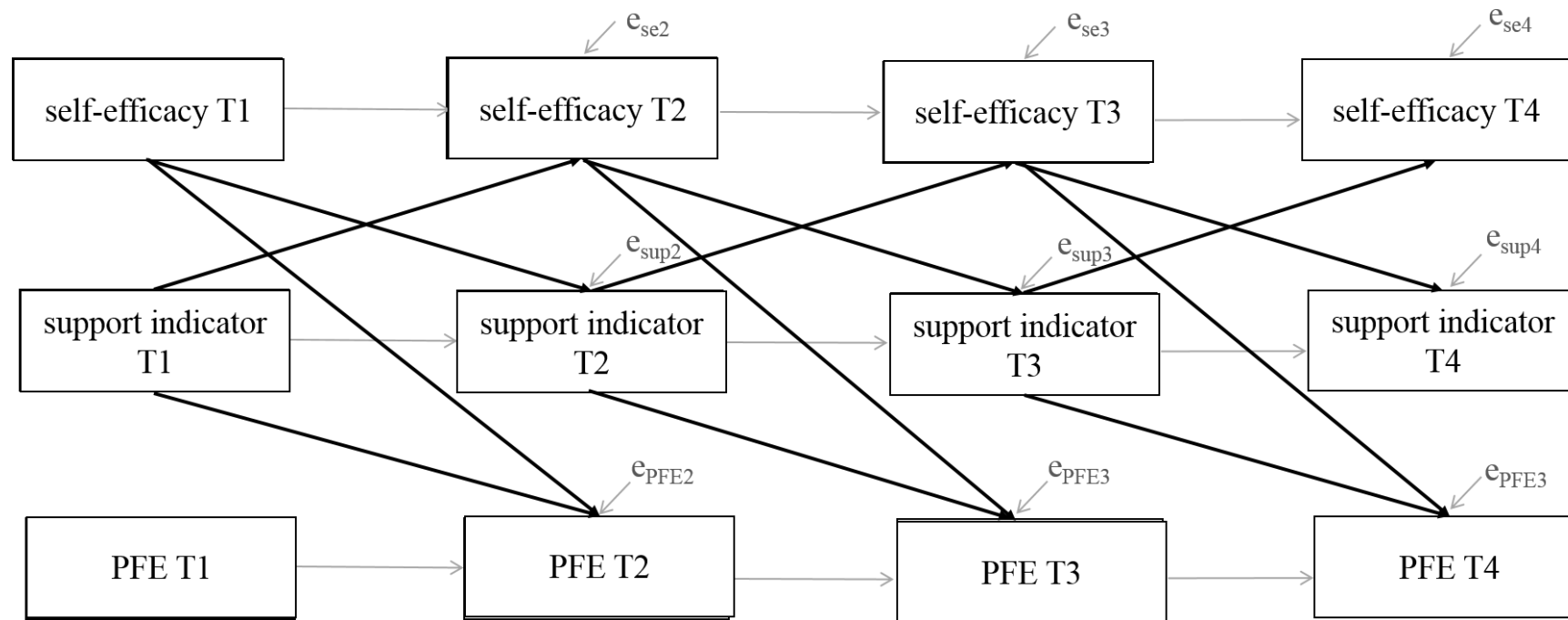


Figure 2. Conceptual model. Depicted are the hypothesized autoregressive (grey arrows) and cross-lagged paths (black arrows) among *self-efficacy* (patient-reported PFE-specific self-efficacy), a *support indicator* (patient-reported received PFE-specific support from partners or partner-reported provided PFE-specific support to patients, respectively), and their predictive paths to patient *PFE*. Second- and third-order autoregressive paths, covariances among predictors and those among residuals, as well as covariates are not depicted.

Table 2

Model Comparisons to Test Stationarity Assumptions

<i>Patient-Received Support</i>	χ^2	df	$p(\chi^2)$	CFI	TLI	RMSEA	$\Delta\chi^2$	$p(\Delta\chi^2)$
M1.1	65.32	51	.086	.99	.97	.04		
M1.2	71.61	59	.126	.99	.98	.04	3.42	.181
M1.3	76.28	63	.122	.99	.98	.04	4.71	.095
M1.4	78.53	67	.158	.99	.98	.03	.940	.625
M1.5	80.71	71	.202	.99	.99	.03	1.356	.508
<i>Partner-Provided Support</i>	χ^2	df	$p(\chi^2)$	CFI	TLI	RMSEA	$\Delta\chi^2$	$p(\Delta\chi^2)$
M2.1	60.27	51	.175	.99	.98	.03		
M2.2	69.29	59	.169	.99	.98	.03	3.04	.218
M2.3	71.26	63	.222	.99	.99	.03	.35	.838
M2.4	75.93	69	.265	1.00	.99	.02	.91	.634
M2.5	79.63	73	.278	1.00	.99	.02	2.50	.287

Note. $N = 175$; χ^2 = Chi Square; df = degrees of freedom; CFI = comparative fit index; TLI = Tucker-Lewis Index; RMSEA = root mean square error of approximation; $\Delta\chi^2$ = Satorra-Bentler Scaled Chi Square; $p(\Delta\chi^2)$ = p -value for the Satorra-Bentler Scaled Chi Square. All coefficients are unstandardized. M1.1 and M2.1 are the general models without constraints. M1.2 and M2.2: sets of corresponding autoregressive paths were constrained to be equal. M1.3 and M2.3: corresponding sets of cross-lagged paths between support indicator and self-efficacy were constrained to be equal. M1.4 and M2.4: sets of corresponding predictive paths from patients' incontinence (covariate) to respective support indicator and patients' self-efficacy were set to be equal (except for M1.4, where the model with the unconstrained path from incontinence to patients' self-efficacy had a better fit). M1.5 and M2.5: corresponding sets of paths from the support indicator, patients' self-efficacy, and patients' urinary incontinence to patients' PFE were constrained to be equal.

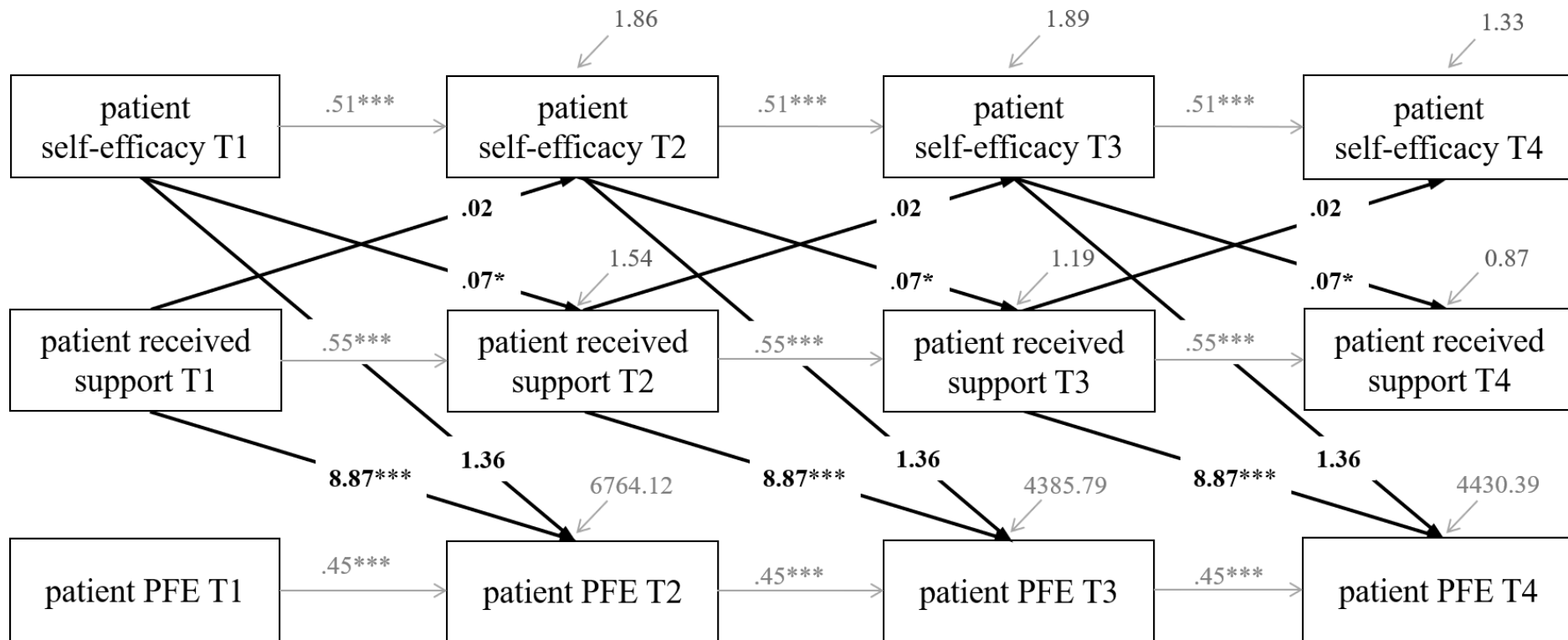


Figure 3. Model 1.5. Associations among patients' self-efficacy, patients' received support from partners, and patients' PFE. Corresponding sets of autoregressive paths (grey horizontal arrows) and cross-lagged paths (black arrows) were constrained to be equal (as indicated by equal path coefficients). Residual variances and coefficients are unstandardized. Second- and third-order autoregressive paths, covariances among predictors and those among residuals, as well as the covariates are not depicted, but controlled for. † $p < .10$; * $p < .05$; *** $p < .001$.

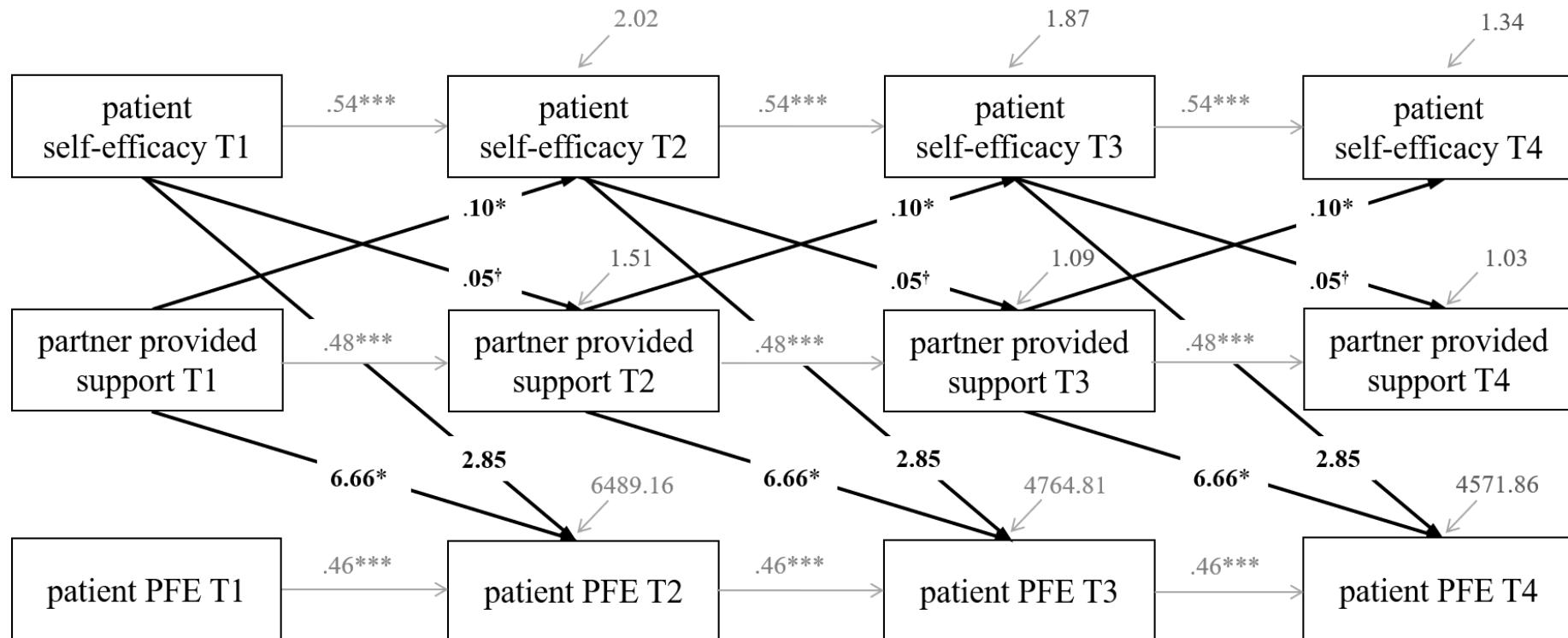


Figure 4. Model 2.5. Associations among patients' self-efficacy, partners' provided support to patients, and patients' PFE. Corresponding sets of autoregressive paths (grey horizontal arrows) and cross-lagged paths (black arrows) were constrained to be equal (as indicated by equal path coefficients). Residual variances and coefficients are unstandardized. Second- and third-order autoregressive paths, covariances among predictors and those among residuals, as well as the covariates are not depicted, but controlled for. † $p < .10$; * $p < .05$; *** $p < .001$.

Associations Among Partner-Reported Provided Support, Patient Self-Efficacy, and Patient PFE (H5-H7)

To cross-validate findings of the final model using patient data only (M1.5), we reran the above described models, including partner-reported provided support instead of patient-reported received support and partner age instead of patient age. As before, stepwise model comparisons were conducted. Again, the general model (M2.1; model with partner-provided support, patient-self-efficacy and patient-PFE as well as patient-reported incontinence and partner age as covariates; basic model structure net of covariates depicted in Figure 2) yielded a satisfactory fit (see Table 2). Using this general model as a reference, the following sets of path coefficients were constrained to be equal across all measurement lags in four cumulatively restricted nested models: (M2.2) autoregressive effects; (M2.3) cross-lagged effects of PFE-specific self-efficacy on partner-reported provided support; cross-lagged effects of partner-reported provided support on patient self-efficacy; (M2.4) cross-lagged effects of patients' incontinence (covariate) on partner-provided support; cross-lagged effects of incontinence on patient self-efficacy; (M2.5) cross-lagged effects of partner provided support on PFE; cross-lagged effects of patient self-efficacy on PFE; and cross-lagged effects of patients' incontinence (covariate) on PFE. Again, the final, most restricted model (M2.5) fit the data best (see Table 2).

Results of the final model using partner-reported provided support instead of patient-reported received support largely confirmed results reported for the final model using patient data only (see Figure 4). Although only approaching significance (at $p = .083$), patients' self-efficacy was again positively associated with changes in partner-reported provided support. In contrast to findings from models using patients' data only, partner-provided support also significantly predicted increases in patients' self-efficacy. Again, increases in patients' PFE were only predicted by earlier partner-provided support, but not by patients' self-efficacy. In this model, none of the implied indirect effects were significant. Regarding covariates,

incontinence was positively related with changes in partner-reported provided support ($B = .03$, $SE = .01$, $p = .003$) and changes in patients' PFE ($B = 2.99$, $SE = .80$, $p < .001$), whereas partners' age was positively related with patients' PFE-specific self-efficacy (T3: $B = .05$, $SE = .02$, $p < .001$) and changes in patients' PFE (T3: $B = 1.41$, $SE = 0.82$, $p = .086$; T4: $B = 1.35$, $SE = .76$, $p = .082$). Overall, results indicated support for the enabling function of support (H5) and the cultivation function of self-efficacy (at $p = .083$; H6). As before, only support (as provided by the partner), but not patient self-efficacy uniquely predicted later changes in patient PFE (H7).

Discussion

The present study aimed to shed more light on enabling functions of social support and cultivating functions of self-efficacy by examining longitudinal reciprocal inter-relations among PFE-specific social support (as provided by partners and received by patients) and PFE-specific self-efficacy in patients from 1 to 7 months after the onset of incontinence following radical prostatectomy. Additionally, effects of PFE-specific social support and patient self-efficacy on patient PFE as well as implied indirect effects were examined. Support indicators from patients (i.e., received PFE-specific support from partners) and partners (i.e., provided PFE-specific support to patients) were used in separate autoregressive cross-lagged panel models to cross-validate findings. Furthermore, mean-level changes of the central variables under study were examined.

In line with the first hypothesis (H1), both urinary incontinence and patients' PFE decreased over time. Because incontinence usually acts as a strong cue for PFE (8), with its decline, the necessity to regularly perform PFE also decreased. Related to this, we also observed decreasing mean levels of patients' PFE-specific self-efficacy which may be explained by the decline in behavior and associated mastery-experiences (19). Of note, the main barrier addressed in PFE-specific self-efficacy did not refer to the exercise itself, but to

performing it regularly, three times a day. While incontinence receded, and patients reduced their levels of PFE, also over time their confidence to adhere to a regimen of 3 bouts of PFE might have faded, which would imply a reciprocal relationship between self-efficacy and behavior. On the other hand, we observed a relatively high starting point of PFE-specific self-efficacy in patients early following the onset of incontinence (see Table 1). Patients might have overestimated their confidence in managing PFE three times a day and subsequently made downward adjustments. Also, in line with H1 partner provided PFE-specific support to patients decreased with time. However, the decrease in patient received PFE-specific support from partners was not significant, indicating that even though partners might have provided less support to patients, patients may not have fully picked up on this change. Several explanations for commonly observed discrepancies between recipient and provider accounts of support interactions are possible (13). For instance, partners' reminding patients of their pelvic floor training might have been encoded as helpful by patients whereas partners might have viewed reminders as controlling (17, 40).

Evidence for hypotheses on enabling and cultivating functions of support and self-efficacy (H2, H3, H5, H6) was mixed. Findings mostly supported the cultivation assumption, in that patients' self-efficacy was related with greater support as reported by patients (H3) and partners (the latter association was only a trend; H6) which corresponds with findings on predictors of social support provision: individuals who cope actively with a challenge inspire others to provide support (11, 23). However, only models using partner-reported provided support also yielded evidence for an enabling effect, in that partner-provided support predicted increases in patients' PFE-specific self-efficacy (H5). Models using patients' accounts of support received from their partners provided no evidence of an enabling effect of support. This discrepancy in findings may be explained by the phenomenon of invisible support (41). Invisible support refers to support provided within a dyad, that is not detected as

such by the recipient (41). Bolger and Amarel (41) argue that these shares of support that are skillfully provided but remain undetected by the recipient should be especially beneficial, because they come attached with the benefit of a supportive act, but without potential costs to recipients' self-esteem. Correlates of invisible support have been examined in the domains of adaptation to stress and health-behavior change (41, 42). Especially because rehabilitation exercise for urinary incontinence represents a very sensitive topic, partners might have provided help in such a sublime way that patients were unaware of parts of it. For instance, partners might have offered patients privacy for PFE or might have taken over patients' chores, while they exercised. Patients' lowered distress and/or increased opportunity for mastery may then have contributed indirectly to an increase in patients' PFE-specific self-efficacy (11, 19).

Only partly in line with hypotheses concerning the prediction of change in PFE itself (H4, H7), support indicators consistently predicted increases in patients' PFE, whereas patients' PFE-specific self-efficacy did not. The importance of social support for PFE may be explained by partners' central role in all stages of prostate cancer patients' treatment process (3). Partners' might have co-regulated patients' behavior by reminding them to do their exercises, or reassuring them of their capabilities, assisting them with their exercises, or simply by making them feel comfortable when they were exercising. In line with the present findings, Burkert et al. (6) found that partners' provided social support and social control were predictive of patients' changes in PFE over time. Several explanations could account for patients' PFE-specific self-efficacy being unrelated with behavior change. First, lags of two months between assessments could have been too long for the effect to unfold. Note, that cross-sectional zero-order correlations indicated small to moderate positive associations between self-efficacy and PFE in patients. Second, even though PFE is easily implemented and usually does not imply much preparation, the requirement of regular performance three

times a day might make regular reminders by one's partner more important than personal confidence in one's ability to comply with the regimen. Accordingly, even though most patients felt highly confident to perform PFE regularly (see Table 1), in this particular context where partner support and self-efficacy were competing against each other, partner support turned out to be more relevant for PFE. Third, whereas the outcome of the present study were weekly minutes of PFE, the self-efficacy measure addressed patients' confidence to keep the regimen of performing PFE three times daily. Although zero-order cross-sectional correlations indicated that self-efficacy and PFE were indeed related, the mismatch of self-efficacy and outcome assessment could have reduced the chance of successful longitudinal prediction. Finally, a bias due to selective dropout may have contributed to our pattern of findings. As reported above, patients continuing in the study reported less difficulties with daily activities. Also, partners of couples who had dropped out had a higher degree of vocational training that is often an indicator for self-employment. As a consequence, patients remaining in our sample might have experienced less difficulties to integrate the demanding regimen of PFE into their daily lives because they were less burdened. Also, partners in the study might have had more time to support patients within this period of adaptation, because they were less often self-employed.

Limitations and Outlook

This study focused on prostate cancer patients and their behavior. To reduce urinary incontinence following radical prostatectomy only patients were required to strengthen their pelvic floor muscles via exercises (PFE). Accordingly, the context we studied necessitated a specific gender - and patient focus. With set roles of recipient and provider, and only one member of the dyad being required to change their behavior, we could not take into account a fully reciprocal dyadic interaction. Our findings are thus limited in their generalizability to other health behaviors and other contexts where the roles might be mixed (e.g., diabetes

management) or reversed (e.g., cervical cancer). As supportive acts are usually reciprocated among partners (43), it would be desirable to explore how this might affect the self-efficacy of the reciprocating partner. Likewise, set patient and partner roles were fully confounded with biological sex of participants. Exploring gender differences as potential moderators of enabling and cultivation effects, however, would be important as evidence on gender differential effects of social support on behavioral and social cognitive outcomes (44) have been shown. Both of these limitations should be addressed in future work on different target behaviors that are performed by both dyad members. Furthermore, the present study featured long inter-measurement intervals of 2 months. To capture dyad members' more immediate reactions to supportive interactions, daily diary approaches would be desirable (42).

Brevity of measures used in this study required unidimensional assessments of support and self-efficacy. Recent findings, however, point to the benefits of more differentiated assessments of self-efficacy in particular. Tailored measurement of self-efficacy reflecting the stage of behavior change an individual is currently experiencing (7, 8), could improve predictive strength of the construct in future studies. Moreover, to reduce burden on participating couples, no laboratory sessions were scheduled in the study. Instead, questionnaires were sent to couples' homes for follow-up assessments. Although both partners were instructed to complete their questionnaires independently from one another and to return them in separate envelopes, couples' communication about the measures could not be controlled. Future research should address this limitation by considering other ways of assessment such as, telephone interviews or assessments in the lab. Another limitation concerns common problems associated with self-report assessments including memory or social desirability bias. Objective outcomes such as data on the strength of the pelvic-floor muscles would have been desirable. Finally, future research might address the issue of differential associations among social support and self-efficacy, as enabling and cultivating

functions may be further moderated by other social-cognitive predictors, such as outcome expectancies or intentional strength.

Conclusion

Our findings point to beneficial functions of partner support for the uptake and maintenance of pelvic-floor exercise following radical prostatectomy. Moreover, the present evidence sheds additional light on the complex relationship between self-efficacy and support over time, while taking into account two sources of data on support (patients' received and partners' provided support). Whereas consistent evidence was found for self-efficacy cultivating support, mixed evidence emerged for the enabling function of support.

Authors' Statement of Conflict of Interest and Adherence to Ethical Standards

The authors have no conflict of interest to disclose. 'All procedures, including the informed consent process, were conducted in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with them Helsinki Declaration of 1975, as revised in 2000.'

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Chapter 3

Cultivating Partner Support for Physical Activity: A Dyadic Longitudinal Analysis

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Abstract

Background: Existing evidence indicates that social support may enhance recipient's self-efficacy (enabling hypothesis) or that self-efficacy facilitates support receipt (cultivation hypothesis). However, less is known about time-lagged reciprocal relationships among self-efficacy and social support in romantic couples.

Purpose: Our aim was to disentangle interrelations among stable and time-varying components of support provision and self-efficacy in couples over time.

Method: We conducted secondary analyses of a published randomized controlled trial (NCT01963494, <https://clinicaltrials.gov/>) with 6 assessments, spanning 1 year and $N = 338$ heterosexual couples (age range: 18-80 years). Men's and women's reports on support provided to each other and self-efficacy were analyzed. Self-efficacy and social support were assessed in the context of physical activity.

Results: Based on the actor-partner interdependence model, we compared nested random-intercept cross-lagged panel models. The final model with stable and time-variant components showed no gender effects. Stable levels of both partners' support provision and self-efficacy were positively associated. On the time-varying level one partner's self-efficacy predicted the other partner's support provision later on. No lagged-association emerged between one partner's support provision and the other partner's self-efficacy later on.

Conclusion: Partners' stable shares of provided support and self-efficacy were interrelated, whereas higher time-varying self-efficacy of one seemed to activate support provision from the other partner, confirming the cultivation hypothesis but not the enabling hypothesis.

Keywords: random intercepts cross-lagged panel model, actor-partner interdependence model, self-efficacy, social support, enabling hypothesis, cultivation hypothesis, couple, physical activity.

Romantic partners may be an important source of support (Ayotte et al., 2013; Franks et al., 2012; Knoll et al., 2015). It has often been observed that couples' behavior (Ayotte et al., 2013; Jackson et al., 2015) and behavior-related cognitions (Franks et al., 2012) are associated, their interrelations thought to be in part transmitted by acts of support among partners (Ayotte et al., 2013). A myriad of research showed that social support and self-efficacy are associated (Benight & Bandura, 2004; Duncan & McAuley, 1993; Schwarzer & Knoll, 2007). Importantly, the direction of this association can be diverse, in that support received may enhance recipients' self-efficacy (the enabling hypothesis; Banik et al., 2017), while at the same time self-efficacy may facilitate receipt of support (cultivation hypothesis; Hohl et al., 2016). A related question that has rarely been addressed so far concerns the decomposition of time-stable and time-varying shares of this association in couples, thereby visualizing different change patterns. The purpose of the current study was to examine the interplay between behavior-specific self-efficacy and partner support over time and the differentiation of stable and variable shares of these effects in couples motivated to increase their physical activity levels.

Social support refers to help that is provided or expected to be provided by others in times of need (e.g., Schwarzer & Knoll, 2007). There are several ways how social support can be operationalised. One way is by differentiating between perceived support and enacted support (Barrera, 1986). The former represents an expectation that help is available when necessary (prospective) and the latter is the retrospective report on support provided or received in the past, depending on the role of the reporting person. Social support was found to facilitate health behavior change, often through its relationship with self-efficacy (Ayotte et al., 2013; Banik et al., 2017; Duncan & McAuley, 1993; Khan et al., 2009; Schwarzer & Knoll, 2007). Despite the fact that social support is a dyadic process, a vast majority of research focused on one person's reports of support and self-efficacy, and usually on the

reports of the support recipient (Banik et al., 2017; Khan et al., 2009; Shoji et al., 2014).

Much less is known about dyadic support exchanges as well as the recipients' and providers' self-efficacy (for an exception see, Ayotte et al., 2013).

Self-efficacy is a belief in one's own competence to enact behaviors necessary to achieve certain ends even in the presence of barriers (Bandura, 1997). A person's self-efficacy predicts her or his health behavior change (i.e., physical activity, Sheeran et al., 2016). Bandura (1997) postulated that self-efficacy may be influenced by several factors: a) mastery experiences (i.e., past successful behavior), b) vicarious experiences (i.e., model learning), c) verbal persuasion (e.g., receiving reassurance about one's competence), and d) perceived affective and physiological states (e.g., attribution of failure to one's emotional or physical arousal). Both model learning and verbal persuasion include some form of social interaction with another person. Specifically, verbal persuasion may often take the form of encouragement or social support. This conceptual link has inspired theorists to place self-efficacy in a close vicinity to social support in models that explain the link between social integration and health (Benight & Bandura, 2004; Berkman et al., 2000; Schwarzer & Knoll, 2007). Moreover, social cognitive theory postulates that individuals operate within 'a causal structure involving triadic reciprocal causation' (Bandura, 1997, p.6), in which the individual with her or his cognitions, emotions, biological mechanisms and behavior operates within the environment. In other words, the relationship between the social environment and the individual is assumed to be bi-directional. In line with that, provided support may constitute a successor as well as a precursor of self-efficacy beliefs.

Benight and Bandura (2004) formulated two hypotheses regarding the association between self-efficacy and social support: a) the enabling hypothesis of social support, where social support can increase an individuals' self-efficacy, and b) the cultivation hypothesis of self-efficacy, where individuals with high self-efficacy facilitate social support from others

(Schwarzer & Knoll, 2007). As indicated above, possible mechanisms of the enabling hypothesis may refer to the mediating role of an individual's sources of self-efficacy. For example, by exercising together, significant others (e.g., a spouse, a friend) may offer opportunities for successful mastery and modelling behavior. In line with this assumption, buddy or group interventions were found to be beneficial for enhancing self-efficacy beliefs (McAuley et al., 2000). Further, within the context of couples, one partner may create an environment that fosters another partner's self-worth, reduce her/his anxiety, stigma, or stress (Weiss, 1974). From the perspective of the cultivation hypothesis, the self-efficacy-support relationship implies that a self-efficacious individual activates other person's prosocial behavior, and with that her/his support provision. In this vein, self-efficacious individuals possess the 'personal resources to cultivate their competencies and to select and construct environments that promote successful adaptation' (Benight & Bandura, 2004, p. 1134). As being self-efficacious also implies taking action, instead of procrastinating, coping actively with a situation at hand may encourage other individuals to provide assistance (Silver et al., 1990). Specifically, in the context of couples trying to enhance their physical activity, a highly self-efficacious partner may prepare or plan activities and thereby encourage their partner to do the same. Likewise, a partner may be inspired to support the other partner's successful enactment by joining into activities, providing encouragement, or taking over chores.

To date only few studies examined the enabling and the cultivation hypotheses at the same time, with some findings supporting the enabling hypothesis (i.e., Banik et al., 2017) and others the cultivation hypothesis (i.e., Hohl et al, 2016; Shoji et al., 2014). Additionally, most studies focused either on asymmetrical support provision (i.e., disease management, Banik et al., 2017; Hohl et al, 2016; Shoji et al., 2014) or used a measure of perceived social support (i.e., prospective; Shoji et al., 2014). Furthermore, research on bi-directional

relationships between social support and self-efficacy, accounting for a longer time period, are scarce (i.e., Hohl et al., 2016). The present study extends the current literature on the associations between one partner's provided social support and the other partner's self-efficacy by using a fully reciprocal dyadic longitudinal study design. As in longitudinal measurements shares of the constructs remain relatively stable over time, while others change, Hamaker et al. (2015) argue that researchers need to account for stability and variability in constructs, to avoid biased cross-lagged effects and erroneous conclusions. In order to shed light on both partners' dynamics of change and taking into account Hamaker and colleagues (2015) proposal, we will decompose each partner's provided social support and self-efficacy over time into stable and time-varying components.

With the present study we want to examine the time-lagged relationships between behavior-specific provided social support and behavior-specific self-efficacy in healthy couples who were motivated to engage in physical activity on a regular basis. In line with social cognitive theory (Bandura, 1997), the proposed assumptions about the nature of the support-self-efficacy relationship (by Benight and Bandura (2004); the enabling hypothesis and cultivation hypothesis), and prior evidence for both predictive directions (Ayotte et al., 2013; Banik et al., 2017; Hohl et al., 2016; Shoji et al., 2014), we aimed at testing both the enabling hypothesis and the cultivation hypothesis. In line with the actor-partner interdependence model (APIM, Kenny et al., 2006) we assumed that one partner's provided support and self-efficacy are reciprocally associated over time. To control for each partner's stable components of social support and self-efficacy, and their inter-relationship, we decomposed the constructs into a time-stable component and a time-variant component (Hamaker et al., 2015). On a time-stable level, we assumed that one partner's self-efficacy would be positively related with the other partner's provided support (H1). We further explored whether both partners' provided supports and both partners' self-efficacy beliefs

were associated. Regarding the same relationships for the time-variant components of the constructs, we assumed the following predictive directions: (H2) provided support by one partner predicts the other partner's self-efficacy at the following occasion (enabling hypothesis); (H3) one partner's self-efficacy predicts the other partner's provision of support later on (cultivation hypothesis). We further explored whether one partner's provision of support was associated with the other partner's support provision later on, and whether one partner's self-efficacy was related with the other partner's self-efficacy later on.

Material and Methods

Procedure

This study represents a secondary analyses of a larger randomized control trial with couples. Results of the RCT have been already published elsewhere (Knoll et al., 2017; trial registration #NCT01963494, <https://clinicaltrials.gov/>). The primary goal of the RCT was to examine whether a dyadic planning intervention is more effective than an individual planning intervention and a dyadic control condition in helping couples change their daily physical activity (for the short-term results please see, Knoll et al., 2017). One week after a baseline assessment (T0), the intervention session took place (T1), where couples were randomly assigned to one of the 3 experimental groups and also randomly received a specific study role (partner or target person; for more details, Knoll et al., 2017). Follow-up measures took place 1 week (T2, postal), 6 (T3, lab), 19 (T4, postal), 26 (T6, postal) and 52 weeks (T7, lab) after the intervention (T1). A postal booster intervention session (T5) took place between T4 and T6, 20 weeks after the main intervention session (T1). Except for the main intervention session (T1) and the booster intervention (T5), data from all measurement points in time were used in the analyses presented here. For the current analyses, multiple group analysis were conducted to account for potential differences between the three study groups (dyadic planning condition, individual planning condition and dyadic control condition). The results

yielded no significant differences (details are reported in the data analyses section). We subsequently collapsed all study arms and distinguished partners by gender.

From overall $N = 346$ couples included in the study, $n = 338$ couples were randomized to intervention arms (see Figure 1) and were thus included in the current study. Predominantly reactive techniques were used for recruitment (flyers, newspaper announcements; see Knoll et al., 2017). Only heterosexual romantic couples who reported a relationship duration of at least 6 months were included in the study. Couples were excluded from the study if one of the partners was under the age of 18, had restrictions on being physically active, was a competitive athlete (vigorous physical exercises for more than 3 hours per day), was enrolled in other physical activity or weight-loss interventions, was pregnant, had a body mass index below 17.5, or did not have sufficient German language skills. All participating couples provided informed consent and received a compensation of 287.70 Euros for full participation up to T7. The Institutional Review Board of the first author's institution approved the study design.

Women were on average 36.88 years old ($SD = 15.45$, range 18-77) and men were on average 39.19 years old ($SD = 15.71$, range 19 to 80). Couples' relationship duration varied, with an average of 11.37 years ($SD = 12.6$, range 0.58 to 58.75 years). Around 40% of the couples were married. Approximately the same number had children. Most of the women ($n = 259$; 76.60%) and men ($n = 248$; 73.40%) had a high school diploma. Nearly half of the women ($n = 151$; 44.70%) and men ($n = 153$; 45.30%) had a university degree. Most women ($n = 215$; 63.60%) and men ($n = 235$; 69.50%) were employed. Income varied highly, some women ($n = 120$; 35.50%) but only few men ($n = 71$; 21.00%) reported an income below 750 Euro. The majority reported a higher income.

Measures

Both partners answered items on 6-point scales regarding their behavior-specific self-efficacy and provided behavior-specific social support to their partners, at baseline (T0), 1 week (T2), 6 weeks (T3), 19 weeks (T4), 26 weeks (T6) and 52 weeks (T7) post-intervention. All items were translated from German.

We assessed *physical activity-specific self-efficacy* (henceforth: self-efficacy) with 3 items adapted from Burkert et al. (2012) and Scholz et al. (2005). Items read: ‘I am confident, that I can increase my daily-life physical activity (e.g., using stairs, doing household-/garden work)’; ‘I am confident, that I can take more distances by riding my bike or by walking’; ‘I am confident, that I can be more active during my leisure time.’ Internal consistencies ranged between $.65 \leq \text{Cronbach's } \alpha \leq .73$ across assessment occasions.

Provided physical activity-specific support (henceforth: provided support) was assessed with 6 items adapted from Burkert et al. (2011) and Schulz and Schwarzer (2003). Example items read: ‘I complimented her/his for her/his perseverance in being regularly physically active’; ‘I reminded her/him of strategies to be physically active on a regular basis’. Internal consistencies ranged between $.83 \leq \text{Cronbach's } \alpha \leq .88$ across assessment occasions.

Data Analyses

Descriptive analyses and dropout analyses were performed in SPSS 23. Dropout analyses involved *t*-tests, χ^2 -tests and logistic regressions. To assess potential changes in the analysed variables, we conducted two-level mixed models in Mplus 7.1 (Muthén & Muthén, 1998-2012). We defined time points (level 1) nested in women and men within a couple (level 2) and added linear and quadratic time trends (centred at T0) as predictors. To capture mean differences between women and men, we performed paired *t*-tests and adjusted alpha levels with Bonferroni correction.

Structural equation modelling was conducted in Mplus 7.1 (Muthén & Muthén, 1998-2012) to test the hypotheses using full information maximum likelihood (FIML) to handle missing data. We used an extension of the actor-partner interdependence model (APIM, Kenny et al., 2006) to reciprocally relate partners' provided support and self-efficacy over time. In line with the APIM (Kenny et al., 2006), examining dyadic data involves the distinction between each partner's effect on her or his own outcome (actor effect) and her or his effect on the other partner's outcome (partner effect). Partners were distinguished by gender.

To disentangle the stable and variable components of the hypothesized reciprocal relationships between partners' support provision and self-efficacy, we applied the random intercepts cross-lagged panel model (RI-CLPM, Hamaker et al., 2015) to the APIM setting. The RI-CLPM (simplified conceptual model, depicted in Figure 2) accounts for individual consistency (stability) by introducing a latent random intercept variable, loading on repeated observations with a fixed factor loading of 1. The resulting time-variant components depict an observation's deviation from the stable component, thereby capturing the within-person dynamics (Hamaker et al., 2015). Cross-lagged and auto-regressive effects relate these time-varying components to each other, allowing for the investigation of the hypotheses regarding the varying components of provided support and self-efficacy.

Applying RI-CLPM to the current study involved including two partners, two constructs, six occasions, and allowed for the estimation of a total of 20 auto-regressive and 60 cross-lagged effects, as well as 30 residual correlations within occasions. In line with suggestions pertaining to data with varying time intervals (e.g., Eid et al., 2012), we assumed auto-regressive as well as cross-lagged effects to be an exponential function of the time (in weeks) passed between two occasions, to reduce overall model complexity. This resulted in the estimation of one global regression weight for each combination of constructs and

partners across all occasions - e.g., a regression coefficient β , representing the auto-regressive effect of self-efficacy, such that $\beta_{02} = \beta^2$, $\beta_{23} = \beta^5$, $\beta_{34} = \beta^{13}$, $\beta_{46} = \beta^7$, $\beta_{67} = \beta^{26}$. Using this model as a baseline, we performed multiple group analysis to detect potential differences in the covariance structure of the three study groups (dyadic planning condition, individual planning condition and dyadic control condition). The model assuming the equality of all regression weights (autoregressive as well as cross-lagged effects) did not fit the data less well than the model allowing for group differences in these parameters ($\Delta\chi^2 = 24.25$, $\Delta df = 32$, $p(\Delta\chi^2) = .83$). The same was the case for the model in which additionally all means, and intercepts were constrained to be equal ($\Delta\chi^2 = 48.05$, $\Delta df = 48$, $p(\Delta\chi^2) = .47$). Subsequently, data were pooled, and all three study groups were analysed together. Main analyses with the collapsed sample implied testing whether actor and partner effects were the same within couples independent of gender (indistinguishability assumption; Ledermann et al., 2011), by constraining the autoregressive and then the cross-lagged effects between women and men to be equal.

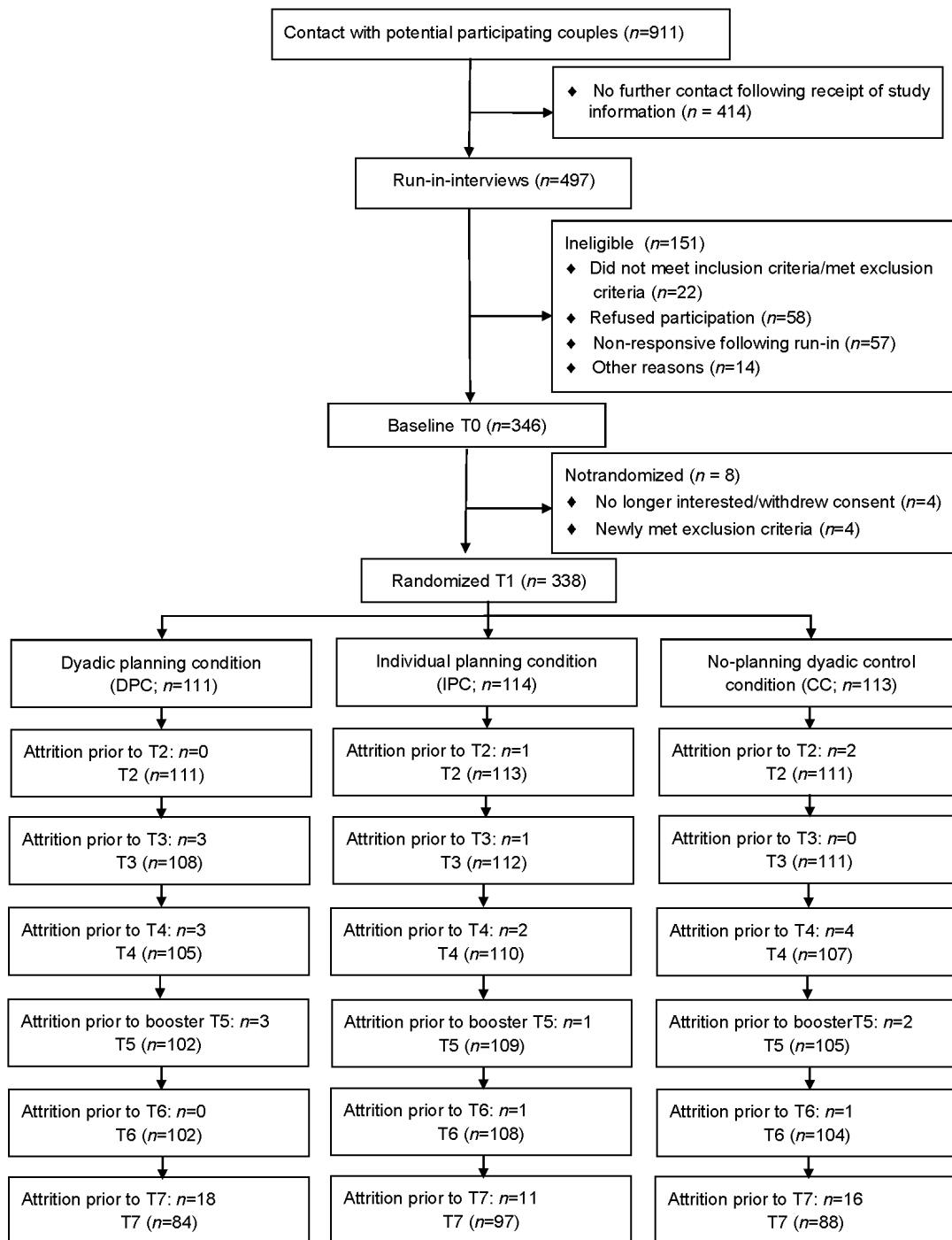


Figure 1. Participant flow. Depicted are the attrition rates for each intervention arm (first number), including the cumulated rates (second number).

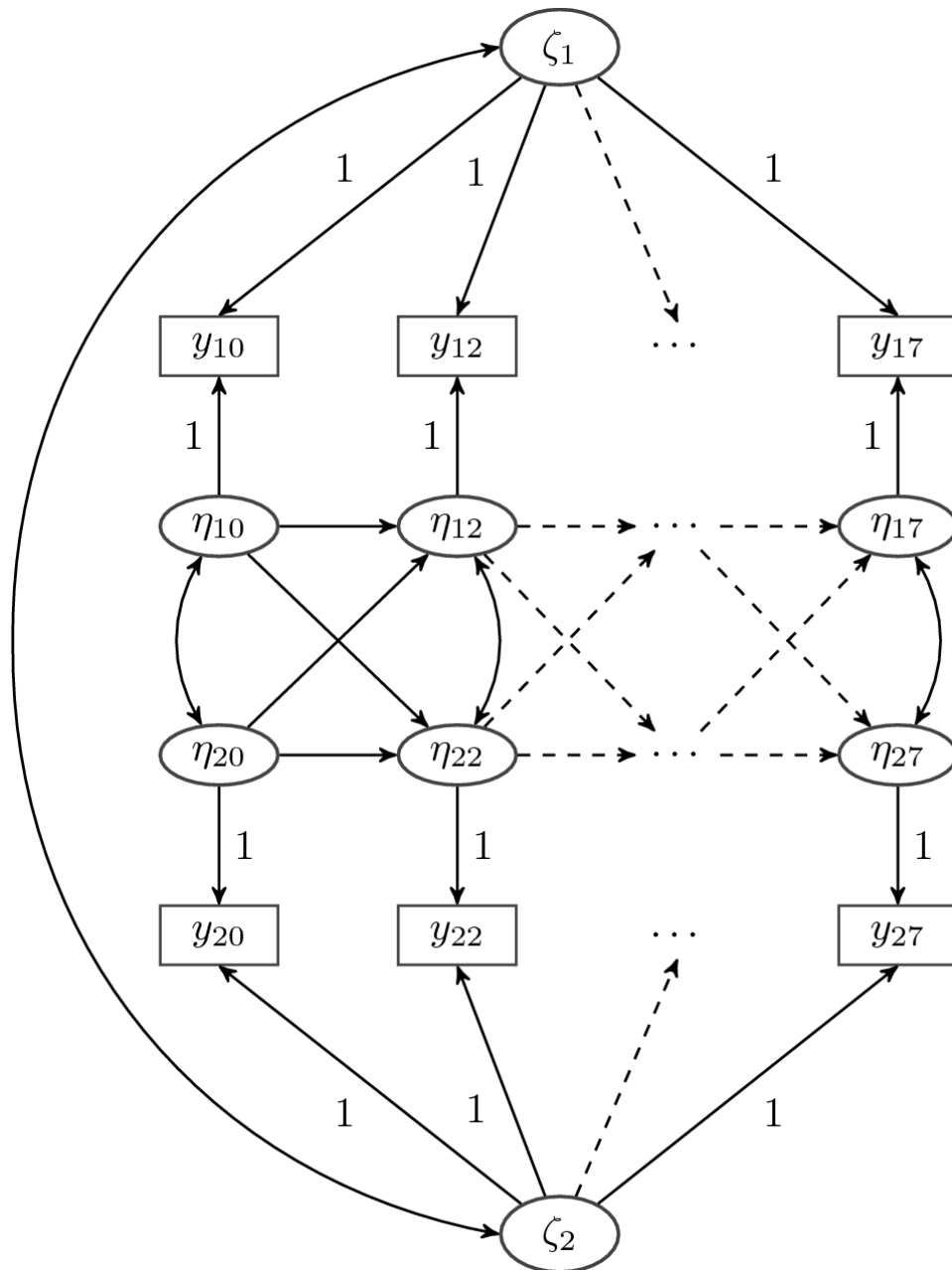


Figure 2. The conceptual model. A simplified path diagram of the RI-CLPM (Hamaker et al., 2015) used as the basis of analysis for one partner. Observed variables (y_{jt}) are presented in rectangles; latent variables in circles (η_{jt}). The first index, j , denotes the constructs, the second index, t , the measurement occasions. For clarity, relationships between the second and the last measurement point are not displayed in the figure.

Results

Attrition Analyses

Overall, 346 couples participated in the study. Of these, $n = 338$ couples (8 couples (2.31%) dropped out before randomization) were randomized to the three intervention arms (Figure 1). The dropout rate (T0 to T7, 1 year) was 22.30% (77 couples). Dropout analysis showed no association between study attrition and the main variables (self-efficacy and provided support). Comparing to the completers, in couples who dropped out men reported more lapses in physical activity at baseline ($\chi^2(1) = 4.689, p = .030, r = .11$), were more likely to be trained civil servants ($\chi^2(1) = 4.327, p = .038, r = .11$), and reported less intention to increase physical activity ($t(341) = 2.649, p = .008, d = .33$).

Changes over Time in Self-Efficacy and Provided Support

Paired t -tests at each occasion revealed significant mean differences in self-efficacy, but not provided support between partners, with women showing more self-efficacy at T0 ($t(336) = 3.586, p < .001, d = 0.27$). Self-efficacy (fixed effects) revealed quadratic time trends over one year for women (linear: $\gamma_{20} = -0.022, SE = 0.003, p < .001$; quadratic: $\gamma_{21} = 0.0003, SE = 0.00006, p < .001$) and men (linear: $\gamma_{20} = -0.018, SE = 0.003, p < .001$; quadratic: $\gamma_{21} = 0.0003, SE = 0.00006, p < .001$). Women's and men's self-efficacy showed an overall decrease up to T6 with a small increase at T7 (means depicted in Table 1). Quadratic trends were also found for provided support in women (linear: $\gamma_{20} = -0.013, SE = 0.004, p < .001$; quadratic: $\gamma_{21} = 0.0002, SE = 0.00007, p = .003$) and men (linear: $\gamma_{20} = -0.015, SE = 0.004, p < .001$; quadratic: $\gamma_{21} = 0.0003, SE = 0.00007, p < .001$). Women's and men's provided support roughly decreased until T6 and increased again at T7 (Table 1).

Table 1

Descriptive Statistics and Correlations

Scale	1	2	3	4	5	6	7	8	9	10	11	12	Women <i>M (SD)</i>	Men <i>M (SD)</i>
1 Self-efficacy T0	.06	.51*	.45*	.40*	.41*	.41*	.22*	.13*	.16*	.15*	.14*	.15*	4.52 (0.99)	4.25 (1.03)
2 Self-efficacy T2	.52*	.09	.58*	.52*	.50*	.47*	.19*	.17*	.24*	.14*	.21*	.17*	4.43 (1.02)	4.26 (0.99)
3 Self-efficacy T3	.50*	.55*	.09	.53*	.48*	.50*	.19*	.22*	.28*	.22*	.22*	.22*	4.35 (1.05)	4.21 (1.05)
4 Self-efficacy T4	.48*	.54*	.59*	.09	.58*	.56*	.15*	.10	.16*	.25*	.21*	.26*	4.16 (1.11)	4.01 (1.13)
5 Self-efficacy T6	.44*	.38*	.46*	.57*	.14*	.54*	.18*	.18*	.19*	.18*	.26*	.20*	4.12 (1.07)	4.01 (1.11)
6 Self-efficacy T7	.44*	.47*	.52*	.57*	.50*	.08	.14*	.09	.14*	.25*	.20*	.29*	4.16 (1.07)	4.18 (1.14)
7 Provided support T0	.09	.14*	.15*	.11	.14*	.16*	.37*	.50*	.45*	.32*	.39*	.42*	2.70 (1.25)	2.69 (1.22)
8 Provided support T2	.18*	.24*	.18*	.19*	.23*	.16*	.50*	.40*	.57*	.50*	.51*	.48*	2.87 (1.25)	2.83 (1.23)
9 Provided support T3	.08	.17*	.22*	.18*	.23*	.19*	.50*	.61*	.46*	.55*	.57*	.50*	2.72 (1.25)	2.71 (1.31)
10 Provided support T4	.01	.19*	.17*	.17*	.18*	.21*	.41*	.52*	.63*	.46*	.67*	.65*	2.60 (1.27)	2.58 (1.30)
11 Provided support T6	.03	.19*	.20*	.16*	.28*	.16*	.37*	.46*	.57*	.63*	.50*	.61*	2.57 (1.25)	2.55 (1.29)
12 Provided support T7	.07	.21*	.26*	.16*	.22*	.27*	.48*	.54*	.60*	.61*	.59*	.46*	2.65 (1.21)	2.70 (1.30)

Note. n (couples) > 266 (due to missing values). † $p < .10$; * $p < .05$. Diagonal: Within-couple same-time correlation. Below diagonal: correlations among women's indicators. Above diagonal: correlations among men's indicators.

Interplay Between Provided Support and Self-Efficacy over Time

Table 2 depicts the model fit as well as the comparisons between sequentially more restrictive versions of the adapted RI-CLPM model. The baseline model (M0) with auto-regressive and cross-lagged effects constrained to be an exponential function of time (in weeks between consecutive occasions) indicated a good overall model-data fit (Table 2). The following models M1 through M4 were used to assess the adequacy of the indistinguishability assumption between women and men in terms of the effects investigated in this study. M1 assumed equality of the auto-regressive effects within each partner, M2 additionally imposed the equality of the cross-lagged effects (actor effects), M3 assumed the equality of partner effects regarding the same constructs, and M4 imposed equality constraints on the partner effects regarding different variables. None of the model comparisons revealed a statistically significant decrease in model fit and the most restrictive model (M4) showed good overall model fit. Thus, the indistinguishability of actor and partner effects between women and men was proposed for all subsequent analyses.

Table 2

Model Comparisons for the Simplification of the Random Intercepts Cross-Lagged Panel Models (RI-CLPM) Based on the Actor-Partner Interdependence Models (APIMs).

	χ^2	<i>df</i>	$p(\chi^2)$	RMSEA	CFI	TLI	$\Delta\chi^2$	Δdf	$p(\Delta\chi^2)$
M0	382.47	244	<.001	.04	0.96	0.95	-	-	-
M1	383.34	246	<.001	.04	0.96	0.95	0.87	2	.65
M2	385.80	248	<.001	.04	0.96	0.95	2.46	2	.29
M3	388.16	250	<.001	.04	0.96	0.95	2.36	2	.31
M4	389.27	252	<.001	.04	0.96	0.96	1.11	2	.57

Note. $N = 338$ couples; χ^2 = Chi-Square; *df* = degrees of freedom; CFI = comparative fit index; TLI = Tucker-Lewis Index; RMSEA = root mean square error of approximation; $\Delta\chi^2$ = chi-square difference; $p(\Delta\chi^2)$ = *p*-value for the chi-square difference. Comparing nested models, involved testing indistinguishability between men and women by pairwise constraining effects. M1: equal autoregressive actor effects, M2: equal cross-lagged actor effects, M3: equal same variable partner effects, M4: equal different variable partner effects.

In terms of the time-stable components we found a positive association between women's provided support and men's self-efficacy ($r = .19, p = .002$) as well as between men's provided support and women's self-efficacy ($r = .15, p = .015$), which confirmed our first hypothesis (H1). Regarding the time-variant components (Table 3) we found that one partner's provided support did not significantly predict the other partner's self-efficacy later on ($B = -0.03, SE = 0.54, p = .956$), revealing no evidence for the enabling hypothesis (H2). Regarding the other predictive direction, we found that one partner's self-efficacy positively predicted the other partner's support provision later on ($B = 0.30, SE = 0.09, p < .001$), confirming the cultivation hypothesis (H3).

Next, findings (Table 3) revealed a positive association between time-stable components of women's and men's provided support ($r = .57, SE = .05, p < .001$), whereas on the time-variant level, provided support did not predict the other partner's support provision later on ($B = 0.12, SE = 0.16, p = .467$). Last but not least, on the stable level both partners' self-efficacy beliefs were positively associated ($r = .16, SE = .06, p = .013$), whereas on the time-variant level, one partner's self-efficacy was negatively related to the other partner's self-efficacy later on ($B = -0.25, SE = 0.08, p = .004$).

Table 3

Lagged Associations Between Time-Variant Components of Provided Support and Self-Efficacy

Time-Variant Components	Estimate	SE	p	95% CI
<i>Step1: Autoregression (actor: same variable)</i>				
η_{δ} self-efficacy $T_x \rightarrow \eta_{\delta}$ self-efficacy T_{x+1} ; ($\eta_{\delta} = \eta_{\varphi}$)	0.34	0.07	<.001	0.205, 0.483
η_{δ} provided support $T_x \rightarrow \eta_{\delta}$ provided support T_{x+1} ; ($\eta_{\delta} = \eta_{\varphi}$)	0.40	0.06	<.001	0.282, 0.517
<i>Step2: Cross-lags (actor: different variable)</i>				
η_{δ} self-efficacy $T_x \rightarrow \eta_{\delta}$ provided support T_{x+1} ; ($\eta_{\delta} = \eta_{\varphi}$)	0.34	0.08	<.001	0.193, 0.490
η_{δ} provided support $T_x \rightarrow \eta_{\delta}$ self-efficacy T_{x+1} ; ($\eta_{\delta} = \eta_{\varphi}$)	0.16	0.10	.126	-0.044, 0.358
<i>Step3: Cross-lags (partner: same variable)</i>				
η_{δ} self-efficacy $T_x \rightarrow \eta_{\varphi}$ self-efficacy T_{x+1} ; ($\eta_{\delta} = \eta_{\varphi}$)	-0.25	0.08	.004	-0.081, -0.410
η_{δ} provided support $T_x \rightarrow \eta_{\varphi}$ provided support T_{x+1} ; ($\eta_{\delta} = \eta_{\varphi}$)	0.12	0.16	.467	-0.200, 0.435
<i>Step3: Cross-lags (partner: different variable)</i>				
η_{δ} self-efficacy $T_x \rightarrow \eta_{\varphi}$ provided support T_{x+1} ; ($\eta_{\delta} = \eta_{\varphi}$)	0.30	0.09	<.001	0.132, 0.469
η_{δ} provided support $T_x \rightarrow \eta_{\varphi}$ self-efficacy T_{x+1} ; ($\eta_{\delta} = \eta_{\varphi}$)	-0.03	0.54	.956	-1.093, 1.033

Note. η = latent time-variant component; δ = men; φ = women; T_x = time point; T_{x+1} = next time point; $\eta_{\delta} = \eta_{\varphi}$ = women's and men's latent time-variant component is equal (indistinguishability hypothesis, Ledermann et al., 2011). The first index denotes gender, the second denotes the construct, the third indicates whether the measurement point is the previous or the next one.

Discussion

The present study extends existing knowledge on the enabling hypothesis and the cultivation hypothesis explaining associations between self-efficacy and support provision. The novel insight was obtained by examining the interplay between time-stable and time-variant components of provided support and self-efficacy over 6 measurement points, spanning one year in couples motivated to increase their physical activity. Results regarding the stable components of the provided support-self-efficacy relationship confirmed our first hypothesis: one partner's provided support and the other partner's self-efficacy were positively associated (H1). On the time-variant level, findings pointed towards the cultivation hypothesis (H3) but not the enabling hypothesis (H2): one partner's prior self-efficacy predicted the other partner's subsequent provision of support, whereas the other predictive direction did not reach statistical significance. On the time-stable level (but not on the time-variant level) we found a positive association between partners' provision of support. Further, on the stable level, partners' self-efficacy components were positively associated, while on the time-variant level, one partner's increase in self-efficacy related negatively to the other partner's self-efficacy later on.

Disentangling the Self-Efficacy-Support Provision–Relationship by Accounting for the Time-Stable and the Time-Variant Perspectives

The findings provide evidence for a positive association between both partners' stable components of physical activity-specific self-efficacy and provided support. This correspondence might be explained by dyadic theories where not just a person-centred, but also a relationship-centred perspective is taken into account (Kelley & Thibaut, 1978; Lewis et al., 2006). For instance, Rusbult and Van Lange (2003) emphasise that in couples, one partner's prosocial motives and behavior (i.e., providing support) may affect thoughts and feelings of the other partner, which might lead to a mutual process. Further, this positive association also indicates a beneficial exchange between partners' support provision and self-

efficacy, however the co-occurrence of the cultivation and enabling effects was a speculation. We could examine the direction of this relationship only on the time-variant level. There, the results pointed towards the cultivation hypothesis rather than the enabling hypothesis. In line with previous research (Hohl et al., 2016; Shoji et al., 2014), the recipient partner's self-efficacy seemed to activate the other partner's enhanced support provision over time. This effect may be explained by findings from research on prosocial behavior suggesting that these individuals who are perceived to be coping actively with a challenge or behavior change, are more readily provided with help (e.g., Silver et al., 1990). We assume that self-efficacious individuals may trigger their partners' continued assistance by for instance, preparing, planning, or performing the behavior.

Contrary to H2, one partner's provided support did not predict the other partner's self-efficacy later on. In a study with prostate cancer patients and their female partners, Hohl et al. (2016) proposed that partners were not the best role models to activate patients' behavior-specific self-efficacy via vicarious experience, as partners were not practicing the post-surgery rehabilitation exercises. Regarding the findings of the present study it may be argued that even though physical activity may be performed jointly, giving each supportive partner a chance to act as a role model for the support-receiving partner and thereby potentially increasing the latter's self-efficacy beliefs, women and men may have different interests and perform their physical activity separately (Kalmijn & Bernasco, 2001). For instance, in the context of outdoor activities, dual earner couples were found to follow different interests (Kingston & Nock, 1987). This may be the case also in our sample, as most of the couples were employed (around 70%) and had a relatively high socio-economic status.

Reciprocity of Support Provision on the Time-Stable Level Only?

The findings indicate that both partners' support provisions (to each other) covaried positively on the time-stable but not on the time-variant level. This is in line with previous

literature on predictors of support provision (Iida et al., 2008) which highlights beneficial effects of a balanced support transaction for both partners (Gleason et al., 2003). Even in intimate relationships, the norm of fairness in give and take is highly valued and only temporally neglected when one partner is severely limited by illness (Knoll et al., 2011; Kuijer et al., 2001). However, the immediacy in support reciprocity in relationships might vary as a function of expected relationship duration (e.g., Antonucci & Akiyama, 1987; Antonucci & Jackson, 1990). Using the support bank metaphor, Antonucci and Jackson (1990) proposed that individuals keep track of their balance of give and take in relationships. When relationships are expected to last for a long time (e.g., close relationships: parents and children; romantic partners), immediacy in supportive reciprocity is less important than when relationships are superficial and expected to be fleeting (e.g., loose acquaintances, co-workers). In line with this proposal, we assume that whereas couples in the present study had a stable history of interdependent support exchange as indicated by the association between time-stable components of provided support, occasion-specific or time-variant support reciprocity could be less immediate and therefore the association did not materialize.

Interdependence in Partners' Self-Efficacy

On both, the time-stable and the time-variant levels, findings confirmed the associations between partners' self-efficacy beliefs over time. However, on the time stable level, associations were positive, whereas on the time-variant level, associations were negative. Both associations may be explained by dyadic relationship theories (Kelley & Thibaut, 1978; Lewis et al., 2006). For instance, the positive association on the time-stable level might reflect a general similarity in partners' cognitions regarding health-relevant behaviors or other matters (Franks et al., 2012). Such congruency may be explained by assortative mating (e.g., couples having similar personality traits, Little et al., 2006) or by convergence due to being exposed to the same environment over an extended period of time

(average relationship duration was > 10 years) or due to other factors – such as, communication, reasoning, deliberate choice-- that facilitate convergence in partners' cognitions over time. Regarding the latter, Lewis et al. (2006) argued that couples often decide together whether they want to change their behavior or not. The negative association between partners' time-variant self-efficacy components, on the other hand, might signify temporary compensatory processes that are known from the dyadic coping literature (Berg et al., 2011; Revenson, 1994), in which one partner's self-efficacy balances out the other's decrease in self-efficacy.

Even though women differed in their self-efficacy from men at T0, we did not find any gender differences in associations between one partner's self-efficacy and the other partner's self-efficacy later on. Other studies, e.g., Falba and Sindelar (2008) also did not find gender-differential processes of health behavior change.

Strengths, Limitations, and Outlook

Featuring a longitudinal design with 6 measurement points over 1 year, our study allowed an insight into long-term interrelations between self-efficacy and partner support. We further distinguished stable and variable self-efficacy-social support associations from each other, showing that associations exist on both levels of resolution. This procedure ensured that detected changes were not biased by stable components. Another strength is the behavior specific assessment of both self-efficacy and provided social support that ensured that both constructs were on the same level of specificity. Finally, by applying a dyadic design and combining both partners' reports in one model, we accounted for the interdependence between both partners' perspectives on support provided and reports of self-efficacy.

A limitation of the design was that the measurement points were several weeks apart from each other, not allowing the assessment of immediate changes of the main variables. Future studies might use more fine-grained assessment tools (ecological momentary

assessment, diary data). Applied reactive recruitment strategies are likely to cause a selectivity bias (recruitment of healthy couples with an active lifestyle and high social-economic status). Further, as we focused on couples that were motivated to increase their physical activity, the findings may not generalize to populations that lack intention to change their health behavior. Future studies may focus on more heterogeneous samples, with varying intention levels.

Conclusion

Couples' social support-self-efficacy-exchanges over time may be divided into time-stable and time-variant components. Whereas stable components of self-efficacy and provided support were both positively associated, drawing conclusions about the direction of this relationship was not possible. On the time-variant level, higher self-efficacy-levels of one partner fostered support provision of the other partner, thus yielding evidence for the cultivation hypothesis and not the enabling hypothesis.

Authors and Contributors

DH, MS, AL and NK did all substantial contributions to the conception and design of the work; DH, JK, SH to the acquisition, DH and MS to the analysis of the work, MS, DH and NK to the interpretation of data for the work. DH, MS and NK supported drafting the work and DH, MS, NK, AL, JK and SH revised it critically for important intellectual content. DH, MS, NK, AL, JK and SH give their final approval of the version to be published and agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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Chapter 4

Inter-Relations Among Negative Social Control, Self-Efficacy and Physical Activity in Healthy Couples

Hohl, D.H., Lüscher, J., Keller, J., Burkert, S., Scholz, S., Luszczynska, A., & Knoll, N. (2018). Inter-relations among negative social control, self-efficacy and physical activity in healthy couples. *British Journal of Health Psychology*.

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⁶ The study included in the dissertation does not replicate the published version. It represents the submitted version of the manuscript. The original article is available on <https://onlinelibrary.wiley.com/doi/full/10.1111/bjhp.12305>. The language used in the article is British English. Please note that between the submission of this dissertation and its publication, the reference has changed to: Hohl, D.H., Lüscher, J., Keller, J., Heuse, S., Scholz, S., Luszczynska, A., & Knoll, N. (2018). Inter-relations among negative social control, self-efficacy and physical activity in healthy couples. *British Journal of Health Psychology*. 23(3), 580-596. [doi:10.1111/bjhp.12305](https://doi.org/10.1111/bjhp.12305) (Inter-relations Among Negative Social Control, Self-Efficacy, and Physical Activity in Healthy Couples, Diana Hilda Hohl, British Journal of Health Psychology, Copyright © [2018] British Psychological Society, Wiley).

Abstract

Objectives: Partners often exert control on each other to be more physically active, however, with mixed success. To elucidate this phenomenon, we examined reciprocal associations between provided negative social control and self-efficacy in couples motivated to enhance moderate-to-vigorous physical activity (MVPA).

Design: The present study had a longitudinal design, consisting of three data waves (spanning 7 weeks).

Methods: Actor-partner interdependence mediator models of 113 heterosexual couples (control condition of an RCT). Relations among both partners' physical activity specific-provided negative social control, physical activity-specific self-efficacy, and objectively measured MVPA were analysed.

Results: Prior partner-provided negative control enhanced recipient self-efficacy but did not translate into higher recipient MVPA later on. Moreover, women's prior self-efficacy predicted increased provision of negative control by men, whereas both partners exhibited lower MVPA when the other partner had previously controlled them.

Conclusions: This study clarifies the complex interrelations between negative social control and recipient self-efficacy in couples motivated to enhance their MVPA. Moreover, disjoint effects of partners' negative social control on recipients' self-efficacy and MVPA emerged.

Keywords: social control, self-efficacy, couples, actor-partner interdependence mediator model, moderate-to-vigorous physical activity.

Regular physical activity is a protective factor against several diseases (i.e., cancer, diabetes; WHO, 2016), however, being sufficiently active in daily life is challenging. As many individuals share their lives with a partner and because findings suggest that partners can change each other's health-relevant practices – for the better (Jackson, Steptoe, & Wardle, 2015) and the worse (Craddock, vanDellen, Novak, & Ranby, 2015) -- examining couples can shed new light on mechanisms of health behaviour change. Well-investigated pathways so far link social exchange processes, mostly partner support, with self-regulatory factors, including one (Hohl et al., 2016) or both partners' self-efficacy (Ayotte, Margrett, & Patrick, 2013). To date, less attention has been paid to another co-regulative mechanism in relationships, that is, partner control (Lewis & Rook, 1999). Evidence predominantly comes from the disease management literature, examining only one perspective: the effect of a healthy partners' control provision on patients' self-efficacy (e.g., Khan, Stephens, Franks, Rook, & Salem, 2013). With the present study, we extend this and investigate the between-partner inter-relations between physical activity, partner-provided social control and self-efficacy in healthy couples.

Social control refers to strategies that influence another persons' behaviour, independent of whether that person intends change or not (Lewis & Rook, 1999). Social control taxonomies distinguish different facets (Lewis & Butterfield, 2007): indirect (i.e., internalized norms) or direct control (i.e., explicit pressure to change; Craddock et al., 2015).

Due to its regulatory nature, direct social control of health-relevant behaviour can easily backfire (Craddock et al., 2015). As effects of control on health behaviour change remain inconsistent (Craddock et al., 2015), Okun, Huff, August, and Rook (2007) proposed to differentiate between positive and negative social control. With this differentiation in place, evidence points towards beneficial effects of *positive* control, (i.e., reminders, positive reinforcement) on health behaviour (Okun et al., 2007). However, because positive control

features a conceptual and empirical overlap with social support (e.g., Newsom, Shaw, August, & Strath, 2016), the uniqueness of these effects remains unclear. The more conceptually distinct form of social control, *negative control*, operates with confrontative strategies such as pressure, rebuking, or inducing guilt (Lewis & Butterfield, 2007), and is often associated with more risky behaviour (Okun et al., 2007). As mechanisms of this association, reactance and negative affect have been investigated (Logic, Okun, & Pugliese, 2009). Here, we focus on a different assumed mediator that may be more proximal to the behaviour itself, i.e., self-efficacy (Bandura, 1997).

Self-efficacy, the subjective belief in one's ability to enact a behaviour (Bandura, 1997), is a key factor in the behaviour change process (Sheeran et al., 2016). Bandura (1997) proposed four sources of self-efficacy: (a) mastery experiences (i.e., successful enactment); (b) vicarious experiences, (i.e., learning from role models); (c) verbal persuasion, (i.e., receiving reassurance of one's competence); and (d) perceived affective and physiological states. Most of these sources involve social encounters, connecting self-efficacy with social exchange processes. Indeed, a growing body of findings on the *enabling hypothesis* (Benight & Bandura, 2004) links social support with self-efficacy (Banik et al., 2017). Evidence even suggests a reciprocal relation among the two constructs (*cultivating hypothesis*) where self-efficacy enhances social support receipt (Hohl et al., 2016).

To date, findings on the inter-relations among social exchange processes, self-efficacy, and health behaviour change mostly involve social support; however, little is known about the role of social control (Khan et al., 2013), especially about negative control (Badr, Yeung, Lewis, Milbury, & Redd, 2015). Being rebuked, pressured, or induced with guilt to take up a healthier behaviour (i.e., decrease sedentary behaviours and increase MVPA) likely makes the recipient's present incapacity to change his or her behaviour salient. Receiving negative control may thus undermine self-efficacy and with it all sequential correlates,

including behaviour change (Badr et al., 2015). On the other hand, negative control from the partner may encourage receiving partners to step out of their comfort zone, scrutinize their ability to change behaviour, and spur some reactance leading to a lagged increase in self-efficacy.

Only few studies so far examined the relationship between social control and self-efficacy. A study with patients with diabetes and their spouses examined daily and lagged associations of social control, collapsing positive and negative strategies into one scale, with self-efficacy and physical activity. Controlling for spousal support, mixed control strategies were associated with less same-day physical activity but increased next-day physical activity-specific self-efficacy in recipients (Khan et al., 2013). Another observational study found that cancer-patients benefited from their spouses' positive, but not from negative control in terms of general self-efficacy (Badr et al., 2015). These findings, however, remain inconclusive in terms of the behaviour-specific negative control -- self-efficacy relationship, as either mixed behaviour-specific control strategies or general self-efficacy were assessed.

In addition to negative control as a putative predictor of recipients' self-efficacy, their failing to change behaviour or low self-efficacy may increase partners' provision of negative control as they might assume that more control is needed by recipients to change behaviour. On the other hand, a high level of self-efficacy could also inspire control provision by partners who might suspect that recipients underestimate the difficulty of behaviour change. To our knowledge, these questions have not been directly addressed so far.

The aim of this study was to examine associations between behaviour-specific provided negative social control, behaviour-specific self-efficacy of the receiving partner, and objectively assessed MVPA in healthy couples motivated to be more active. In light of inconclusive evidence, but the theoretical plausibility of a link between partner-provided negative control and subsequent self-efficacy in the recipient, we hypothesized a prospective

association (H1), but refrained from specifying the direction of this association. We also explored the alternative predictive direction, that is, one partner's earlier self-efficacy being associated with subsequently enhanced or reduced negative control from the other. Further, we hypothesized positive relations between earlier self-efficacy and later MVPA within the same person (H2) and explored effects on the other partner's later MVPA. Because of inconsistent prior findings, we explored putative effects of earlier provision of negative control on subsequent MVPA – both within and across partners. Matching indirect effects of partner-provided negative control (via recipient's subsequent self-efficacy) and self-efficacy (via partner's subsequent provided negative control) on both partners' MVPA later on were also explored. Finally, because an association between provided social support and the provision of negative social control cannot be ruled out (Khan et al., 2013), we furthermore investigated their competing effects on recipients' consecutive self-efficacy and MVPA later on.

Method

Procedure

The present study used data from the control group of a larger randomized controlled trial (Knoll et al., 2017; NCT01963494, <https://clinicaltrials.gov/>) investigating effects of a planning intervention with healthy heterosexual couples. In the RCT, an intervention session (T1) took place one week following baseline assessments (T0). During T1 all couples received a brief motivational treatment, partners were then randomly allocated to be target persons or partners and to one of three study groups (Knoll et al., 2017). Couples from the control group were asked to collaborate in interpreting a stone sculpture depicted on a photograph (Knoll et al., 2017). The current study focuses on the first 3 measurement points of the main study: baseline (T0 in the lab), one week (T2, postal assessment) and 6 weeks (T3 in the lab) following the intervention (T1) (Knoll et al., 2017). Also, at T0, T2 and T3,

couples were instructed to wear accelerometers (ActiGraph GT3X) for 7 days. Because couples in the control group were instructed to act according to their randomly assigned roles only during the brief sculpture interpretation task ($M = 21.46$ min, $SD = 7.99$ min), we omit the use of study-roles and instead distinguish partners by gender.

Overall, $N = 113$ couples were randomly assigned to the control group, of which $n = 2$ dropped out prior to T2. Couples were recruited from a large metropolitan area in Eastern Germany between March 2013 and December 2015. Largely reactive recruitment strategies were used (e.g., flyers; Knoll et al., 2017). Inclusion criteria were having a partner, being in a heterosexual relationship, and living together for at least 6 months. Exclusion criteria included being a minor, experiencing health-related restrictions on being physically active, being a competitive athlete, engaging in vigorous physical exercise for more than 3 hours per day, participating in other intervention programs targeting physical activity or weight-loss, being pregnant, having a body mass index below 17.5, and not having sufficient German language skills. Couples were asked to provide informed consent and received a compensation of €191.80 for full participation up to T3. An Institutional Review Board approved the study design.

Women's mean age was 35.81 years ($SD = 16.11$, range 18-77) and men's was 37.84 years ($SD = 16.23$, range 19 to 80). Relationship duration was on average 11.55 years ($SD = 13.41$). A total of 41 couples (36.30%) were married. Thirty-seven women (32.70%) and 38 men (33.60%) reported to have children. Eighty-eight women (77.90%) and 84 men (74.3%) had a high school diploma. Around half of the couples [women $n = 51$ (45.10%), men $n = 58$ (51.30%)] had a university degree. Sixty-eight women (60.20%) and 82 men (72.60%) were employed. Income varied highly, 45 women (39.80%) and 23 men (20.40%) reported incomes below €750, the rest reported higher incomes.

Measures

All data were assessed from both partners, at T0, T2 (one week after the intervention session, i.e., T1), and T3 (6 weeks after T1).

Physical activity. Seven-day moderate-to-vigorous physical activity (MVPA) was objectively assessed using triaxial accelerometers (ActiGraph GT3X, Pensacola, FL) and then summed up to yield a total minute of MVPA for one week per assessment occasion. Data were prepared using the Actilife 6.11.5 (ActiGraph, Pensacola, FL). Criteria for valid wear time were set to at least 600 min per day on at least 4 days of the 7-day assessment period (subsequent available MVPA data for women: $n_{T0} = 105$, $n_{T2} = 103$, $n_{T3} = 97$ and men: $n_{T0} = 106$, $n_{T2} = 108$, $n_{T3} = 100$). Activity was assessed by devices at a rate of at least 2690 counts/minute (Sasaki, John, & Freedson, 2011). Scores which exceeded ($z > |3.29|$) standard deviations above the mean were identified as univariate outliers and then winsorized to the next highest score of the range of the distribution (Tabachnick & Fidell, 2007).

The following variables were assessed using questionnaires. If not otherwise stated, item responses were scaled from 1 (*not at all true*) to 6 (*exactly true*). All item examples were translated from German.

Provided physical activity-specific negative control was measured with a 3-item scale adapted from Burkert, Scholz, Gralla, Roigas, and Knoll (2011), Lewis and Rook (1999) and Lewis and Butterfield (2007). Items read: “I rebuked her/him for not being sufficiently active”, “I pressured her/him to be more physically active.”, “I tried to make her/him feel guilty, when she/he was not sufficiently active”. Internal consistencies ranged between $.83 \leq$ Cronbach’s $\alpha \leq .90$.

Physical activity-specific self-efficacy was measured with 3 items adapted from Burkert, Knoll, Scholz, Roigas, and Gralla (2012) and Scholz, Sniehotta, and Schwarzer (2005): “I am confident, that I can increase my daily-life physical activity (e.g., using stairs,

doing household-/garden work”); “I am confident, that I can take more distances by riding my bike or by walking”; “I am confident, that I can be more active during my leisure time.” Internal consistencies ranged between $.61 \leq \text{Cronbach's } \alpha \leq .75$.

Covariate

Provided physical activity-specific support was measured with 6 items adapted from Burkert et al. (2011) and Schulz and Schwarzer (2003). Sample items read: “I complimented him/her for his/her perseverance in being regularly physically active”; “I reminded her/him of strategies to be physically active on a regular basis”. Internal consistencies ranged between $.79 \leq \text{Cronbach's } \alpha \leq .88$.

Data Analyses

Descriptive analyses were conducted using SPSS 23.0. All other analyses were conducted using Mplus 7.1. Where available, full information maximum likelihood (FIML) estimation was used to account for all available data.

We examined the change in the central variables separately for men and women by running two-level mixed models, with time points (level 1) crossed in individuals (level 2) and a linear time trend (centred at T0) as a single predictor. In addition, paired *t*-tests were performed to test for differences in means between partners.

To examine our central hypotheses, we ran Actor-Partner Interdependence Mediator Models (APIMeM; Ledermann, Macho, and Kenny, 2011), an extension of the Actor-Partner Interdependence Model (APIM; Kenny, Kashy, and Cook, 2006). The APIM distinguishes between two effect-classes: actor effects (the influence persons have on their own outcomes) and partner effects (partners' influence on persons' outcomes) (Kenny et al., 2006). By adding a mediator to this model, one can determine whether additional indirect actor- and partner effects emerge (APIMeM; Ledermann et al., 2011). As illustrated in Figure 1, there are 4 effects that can be mediated by further actor- and partner variables: (1) a woman actor effect ($\text{♀X T0} \rightarrow \text{♀Y T3}$); (2) a man actor effect ($\text{♂X T0} \rightarrow \text{♂Y T3}$); (3) a woman partner

effect ($\text{♂}X_{T0} \rightarrow \text{♀}Y_{T3}$), and a man partner effect ($\text{♀}X_{T0} \rightarrow \text{♂}Y_{T3}$). Because the potential indirect effect chains emerging from this constellation are quite technical, we refrain from using Ledermann et al. (2011) original nomenclature and instead describe emerging indirect effects in plain language.

As our approach involved testing associations between consecutive time points, we used T0 predictors, T2 mediators, and T3 outcomes and controlled for baseline assessments of mediators and outcomes (T0). We further estimated covariances among all predictors and the residuals of mediators and outcomes to account for non-independence. Models included repeatedly assessed manifest indicators of men's and women's provided negative social control to their partners (T0, T2), their own self-efficacy (T0, T2), and MVPA (T0, T3). Furthermore, in the first APIMeM model with negative social control as the predictor (T0) and self-efficacy as mediator (T2) we included provided social support as a covariate (T0).

In line with Ledermann et al. (2011) we simplified the unrestricted APIMeMs by restricting all pairwise direct effects to be equal across partners by gender (men vs. women) in a stepwise manner, starting out with sets of covariates and then all main structural paths, in each case first pairwise constraining actor effects and then partner effects. We performed stepwise comparisons of nested model fits by performing chi-square (χ^2) difference tests and accepting the more constrained model if $p > .05$. Criteria for acceptable model fits were RMSEA (root mean square error of approximation) $< .05$, CFI (comparative-fit index) $> .95$, and TLI (Tucker-Lewis Index) $> .95$ (Hu & Bentler, 1999). All reported model-parameters are unstandardized.

To account for the non-normal distribution of direct (Finney & DiStefano, 2006) and indirect effects (Ledermann et al., 2011), we used bias-corrected bootstrapping. According to Ledermann et al. (2011) bias corrected-bootstrapping (BC) leads to reliable estimates of the

indirect effect. We chose 5000 re-samples and a confidence interval of the 2.5th and the 97.5th percentile (CI_{BC}).

Results

Descriptives and Correlations

Compared to men, women reported higher self-efficacy to increase MVPA at T0 ($t(111) = 2.33, p = .05, d = 0.22$). No other significant differences between men's and women's same-time means emerged. Over 7 weeks (from T0 to T3), there were no significant changes in examined variables except for a linear decrease in women's self-efficacy ($b_{time} = -0.05, SE = 0.02, p < .01$) and a decrease in men's provided negative control ($b_{time} = -0.06, SE = 0.02, p < .01$). Men's and women's same time within-couple correlations for MVPA were moderate to high (range: $r = .34$ -. $46, p < .05$), the same was the case for the covariate provided social support (range: $r = .46$ -. $51, p < .05$), all other same-time within couple correlations were insignificant (Table 1). Notably, same-time actor-correlations between self-efficacy and MVPA were insignificant. Moreover, same-time correlations of partner-provided control and men's and women's MVPA were insignificant or negative and ranged between $r = .02$ and $r = -.21$ ($p < .05$) in men and $r = -.01$ and $r = -.05$ in women.

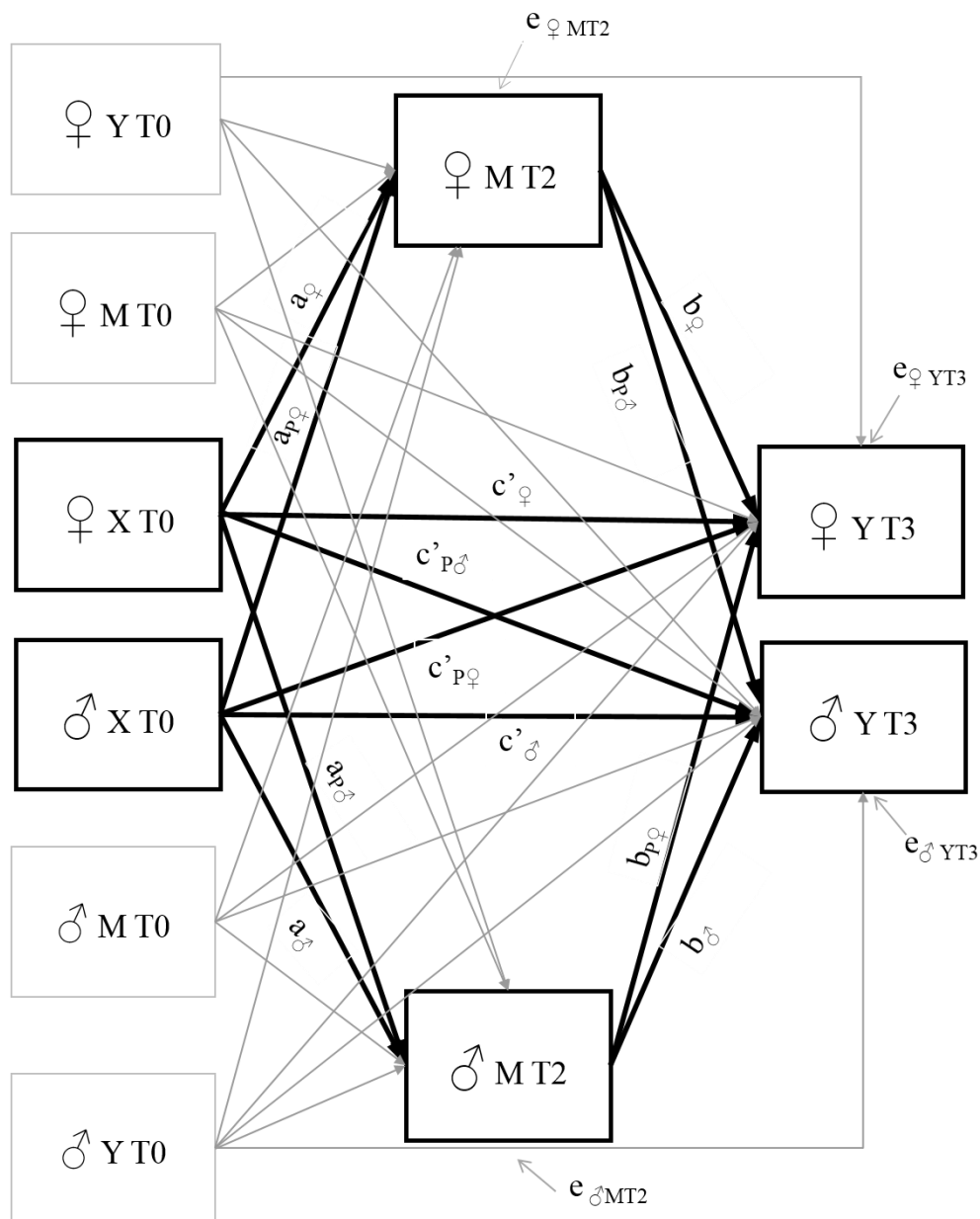


Figure 1. Conceptual model. Depicted amongst other effects, one hypothesized partner effect of the predictor on the mediator ($a_{p\delta}$, respectively, $a_{p\phi}$) and one possible subsequent actor effect on the outcome ($b_{p\delta}$, respectively, $b_{p\phi}$). X are the predictors, M T2 the mediators (controlled for M T0), and Y T3 the outcomes (also controlled for Y T0). Grey arrows represent the effect of control variables on mediator and outcome that had been controlled for. To simplify the model covariances between predictors and residuals are not depicted.

Table 1

Descriptive Statistics and Correlations

Scale	1	2	3	4	5	6	7	8	9	10	11	12	Women <i>M (SD)</i>	Men <i>M (SD)</i>
1 MVPA T0	.34*	.75*	.65*	-.01	-.04	.07	.08	.16	.15	-.01	.06	.00	60.76 (24.45)	61.06 (28.58)
2 MVPA T2	.63*	.46*	.72*	-.03	-.08	.02	.06	.04	.10	-.07	-.03	.07	61.11 (23.93)	62.07 (25.39)
3 MVPA T3	.60*	.56*	.40*	.03	-.03	-.06	.00	.00	.04	-.04	-.08	-.02	57.20 (25.70)	59.72 (25.94)
4 Self-efficacy T0	-.02	.10	.13	.01	.56*	.42*	.06	.08	.06	.02	.16	.13	4.60 (0.94)	4.26 (1.11)
5 Self-efficacy T2	.10	.16	.13	.45*	.06	.67*	-.01	-.05	-.00	.10	.11	.18	4.46 (1.08)	4.37 (1.03)
6 Self-efficacy T3	.00	.03	.11	.53*	.67*	.09	.12	.05	.14	.06	.14	.12	4.36 (1.23)	4.25 (0.10)
7 Provided negative control T0	.03	.19†	.09	-.12	.10	-.07	-.03	.61*	.47*	.41*	.35*	.15	1.86 (1.23)	1.99 (1.16)
8 Provided negative control T2	.13	.17†	.14	-.01	.19†	.00	.61*	.06	.40*	.35*	.48*	.21*	1.97 (1.26)	1.80 (1.03)
9 Provided negative control T3	.05	.16	.13	.03	.14	.08	.58*	.63*	.13	.10	.29*	.39*	1.88 (1.16)	1.72 (1.03)
10 Provided support T0	.18†	.15	.18†	.11	.22*	.15	.37*	.30	.25	.46*	.54*	.41*	2.75 (1.26)	2.73 (1.15)
11 Provided support T2	.14	.13	.25*	.09	.34*	.21*	.19†	.42*	.25*	.62*	.57*	.61*	2.80 (1.33)	2.77 (1.24)
12 Provided support T3	.15	.16	.24*	.17†	.34*	.33*	.23*	.30*	.36*	.56*	.68*	.51*	2.60 (1.24)	2.68 (1.33)

Note. n (couples) > 85 (due to missing values). † $p < .10$; * $p < .05$. MVPA = moderate-to-vigorous physical activity. Diagonal: Within-couple same time correlation. Below diagonal: correlations among women's indicators. Above diagonal: correlations among men's indicators.

Provided Negative Social Control as a Predictor of Self-Efficacy and MVPA

The first APIMeM (M1) included from both partners': provided negative social control (T0) as predictors, provided social support (T0) as covariates, self-efficacy (T2) as mediators, and MVPA (T3) as outcomes. All T0-indicators of mediators and outcomes were additionally controlled. Model comparisons (the upper half of Table 2) yielded a well-fitting final model (Figure 2) that indicated predominantly equal actor- and partner effects for men and women, except for the actor effect of provided negative control T0 on self-efficacy T2 and the partner-effect of self-efficacy T2 on MVPA T3.

In accordance with hypothesis H1 and controlling for competing effects of provided supports (T0), we found positive associations between one partner's provided negative social control (T0) and the other partner's later self-efficacy (T2). These partner effects did not differ between men and women. In contrast to hypothesis H2, no consecutive actor effects of self-efficacy (T2) on later MVPA (T3) emerged. However, a partner effect from men's self-efficacy (T2) on women's later MVPA (T3) was found.

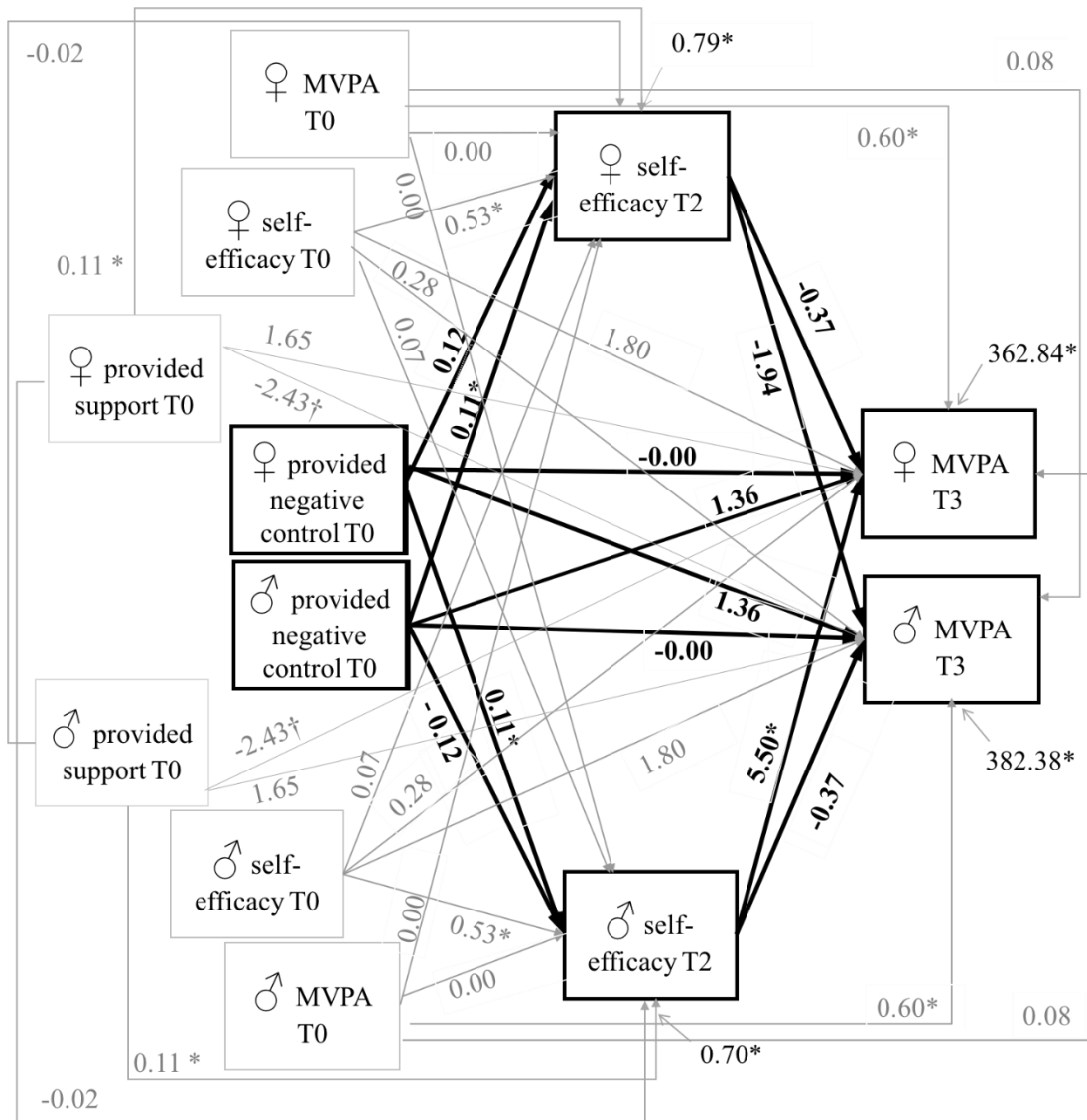
Also, a significant indirect effect emerged for women, where women's earlier provided negative control (T0) predicted increased MVPA in women at T3 via men's increased self-efficacy (T2) [$B = 0.59$; $SE = 0.35$; $CI_{BC} = 0.103, 1.615$ (95% bootstrap CI)]. Because the partner effect of women's self-efficacy (T2) on men's MVPA (T3) was non-significant, no matching indirect effect was found on men's MVPA (T3).

Table 2

Model Comparisons for the Simplification of the Actor-Partner Interdependence Mediator Models (APIMeMs)

M1	χ^2	<i>df</i>	$p(\chi^2)$	CFI	TLI	RMSEA	$\Delta\chi^2$	<i>df</i>	$p(\Delta\chi^2)$
M1.0	-	-	-	1.00	1.00	-	-	-	-
M1.1	2.89	6	.823	1.00	1.11	.00	2.89	6	.823
M1.2	8.62	12	.735	1.00	1.06	.00	5.73	6	.454
M1.3	10.04	14	.759	1.00	1.06	.00	1.43	2	.490
M1.4	12.31	16	.722	1.00	1.05	.00	2.27	2	.321
M2	χ^2	<i>df</i>	$p(\chi^2)$	CFI	TLI	RMSEA	$\Delta\chi^2$	<i>df</i>	$p(\Delta\chi^2)$
M2.0	-	-	-	1.00	1.00	-	-	-	-
M2.1	0.80	4	.938	1.00	1.11	.00	0.80	4	.938
M2.2	2.22	8	.974	1.00	1.10	.00	1.42	4	.841
M2.3	8.76	11	.645	1.00	1.10	.00	6.54	3	.088
M2.4	10.45	13	.657	1.00	1.03	.00	1.69	2	.429

Note. $N = 113$ couples. χ^2 = Chi Square; *df* = degrees of freedom; CFI = comparative fit index; TLI = Tucker-Lewis Index; RMSEA = root mean square error of approximation; $\Delta\chi^2$ = chi square difference; $p(\Delta\chi^2)$ = *p*-value for the chi square difference. M1.0 and M2.0: saturated models. Following, all pairwise direct effects were constrained to be equal across partners in a stepwise manner, starting out with sets of covariates (actor effects: M1.1 and M2.1; partner effects: M1.2 and M2.2), then all main structural paths, in each case first pairwise constraining actor effects (M1.3, M2.3) and then partner effects (M1.4, M2.4).



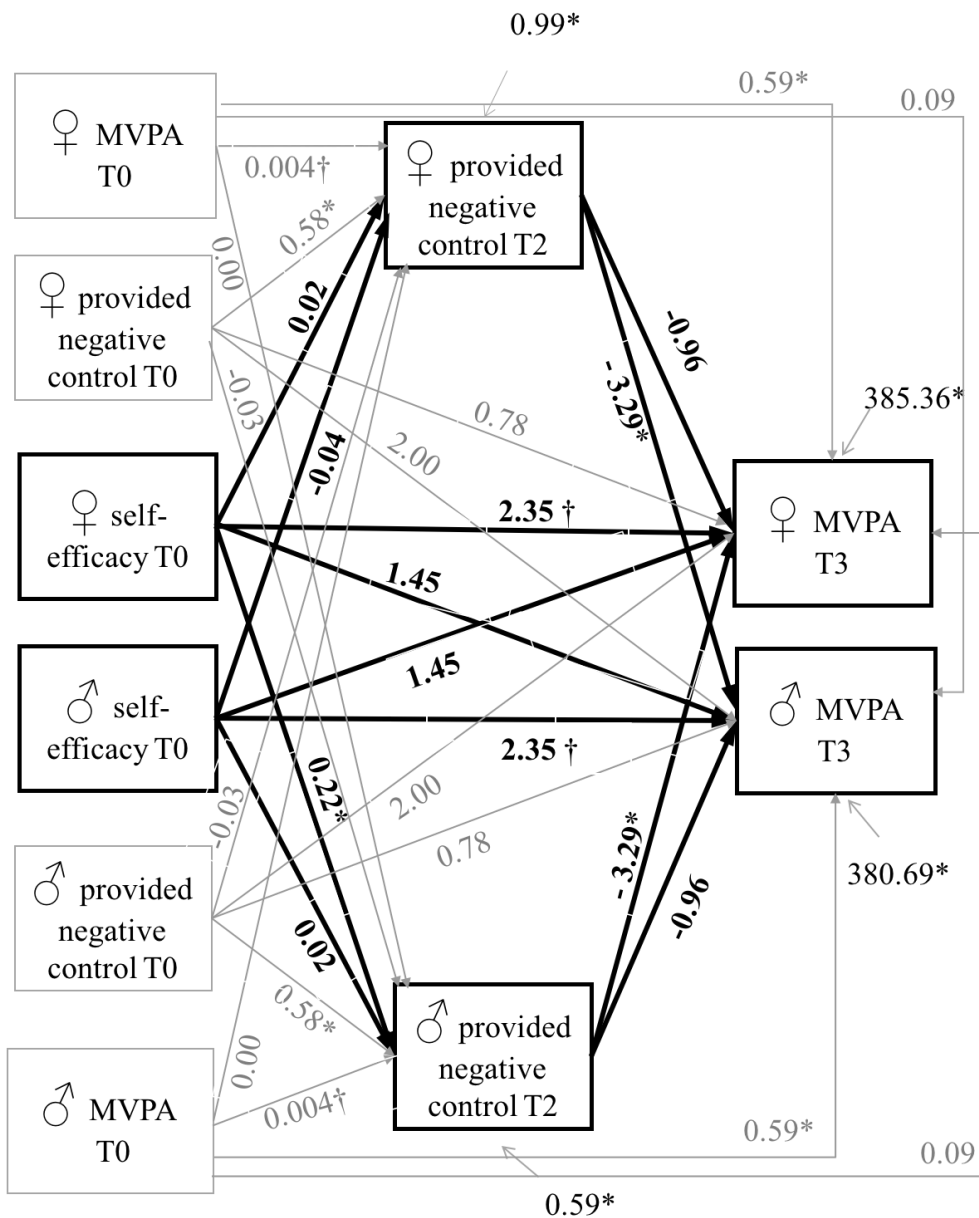
* $p < .05$; † $p < .10$; Model fit: $\chi^2(16) = 12.31, p = .722$; CFI = 1.00, TLI = 1.05, RMSEA = .00

Figure 2. APIMeM with provided negative social control (predictor), provided social support (covariate), self-efficacy (mediator) and MVPA (moderate-to-vigorous physical activity, outcome) for women and men. Residual variances and coefficients are unstandardized. Grey arrows represent effects of covariates on outcomes. Black arrows represent main structural paths. To simplify the model covariances between predictors and residuals are not depicted. Note that all direct effects are equal for men and women except for the actor effect of provided negative control T0 on self-efficacy T2 and the partner-effect of self-efficacy T2 on MVPA T3.

Exploring the Alternative Predictive Direction: Self-Efficacy as a Predictor of Provided Negative Social Control and MVPA

The second APIMeM (M2) explored the alternative predictive direction between self-efficacy (T0) and partner-provided social control (T2). Here, each partners' self-efficacy (T0) served as predictors, provided negative control (T2) as mediators (controlled for T0-indicators), and MVPA (T3) as outcomes (controlled for T0-indicators). Because provided negative control served as an endogenous variable in this model, provided social support was not included as a covariate here. Model comparisons (the lower half of Table 2) again yielded a well-fitting final model (Figure 3) that indicated predominantly the same actor- and partner effects for men and women, except for the partner effect of self-efficacy T0 on provided control T2.

Higher self-efficacy (T0) in women was associated with increased provision of negative control later on (T2) by men. There was no matching effect from men to women. However, regardless of the partners' gender, providing the other partner with more negative control (T2) was related with lower subsequent MVPA (T3) in that partner (partner effect). This constellation then yielded a significant indirect effect for women, where women's earlier self-efficacy (T0) was connected with higher subsequent negative control provision (T2) by men, which translated into women's lowered MVPA at T3 [specific indirect effect: $B = -0.71$; $SE = 0.46$; $CI_{BC} = -1.923, -0.054$ (95% bootstrap CI)]. In addition, a marginally significant positive actor effect of T0 self-efficacy on T3 MVPA emerged for men and women alike (see Figure 3).



* $p < .05$; $^\dagger p < .10$; Model fit: $\chi^2(13) = 10.45, p = .657$; CFI = 1.00, TLI = 1.03, RMSEA = .00

Figure 3. APIMeM with self-efficacy (predictor), provided negative social control (mediator) and MVPA (moderate-to-vigorous physical activity, outcome) for women and men. Residual variances and coefficients are unstandardized. Grey arrows represent effects of covariates on outcomes. Black arrows represent main structural paths. To simplify the model, covariances between predictors and residuals are not depicted. Note that all direct effects are equal for men and women, except for the partner effect of self-efficacy T0 on provided control T2.

Discussion

Extending previous research on co-regulation in the context of physical activity, this study investigated dyadic inter-relations among partner-provided activity-specific negative control, recipients' activity-specific self-efficacy and MVPA in couples. In line with H1, prospective associations between negative control and self-efficacy were found. Regardless of the gender of the provider, when partners provided more negative control, this was associated with higher self-efficacy in the recipient partner later on. A similar pattern of relationships was found by Khan et al. (2013). Also, evidence for the alternative predictive direction emerged as self-efficacy in women was positively related with provision of negative control from men later on. Findings were partially in line with H2 as weak positive actor effects of self-efficacy on MVPA emerged from T0 to T3 (at $p < .10$, see Figure 3), however, only after the other partner's provided negative control at T2 had been accounted for. Both men's and women's later MVPA (T3) was negatively related to their partners' prior provision of negative control (T2).

Positive (not Negative) Effects of Negative Social Control on Recipients' Self-Efficacy

Similar to the present findings, Khan et al. (2013) observed positive associations between spousal control and patient self-efficacy. Authors used a mix of positive and negative control strategies as predictors of recipients' exercise-specific self-efficacy, but also controlled for supportive exchanges, which were partially overlapping with the control measure used ($r = .49$). Net of support and thus likely net of at least some aspects of positive control, Khan et al. (2013) found positive lagged effects of spousal control on recipients' self-efficacy.

In the present study, negative control by partners involved rebukes, pressure, and inducing guilt (Lewis & Butterfield, 2007). Depending on its specific contents and wording, such negative control interaction could have increased the salience of control recipients'

current *incapacity* to be more active. This may have in turn inspired reactance in the recipient (Okun et al., 2007), thus contributing to a defiant sense of confidence that increasing MVPA is achievable. In a different scenario, negative control may have corrected recipients' attributions of being tired (physiological state) to inability. By taking recipients out of their comfort zones, negative control providers may have inadvertently freed up recipients' self-efficacy. Note that because we controlled for partners' concurrent support provision, it is unlikely that supportive verbal persuasion (Bandura, 1997), which may have co-occurred with negative control, could have increased recipients' self-efficacy. Also, partners' acting as role models (Bandura, 1997) was controlled for by the inclusion of both partners' earlier levels of MVPA in the model.

As suggested by Khan et al. (2013), being negatively controlled by one's partner might have been successful at some earlier point following the control interaction: control recipients might have temporarily increased their activity, which in turn could have enhanced their self-efficacy to do so. Although time lags in the present study were quite long and thus did not allow for the investigation of immediate responses to being controlled, our data do not support this explanation. Not even cross-sectional correlations suggested positive, but rather negative relations between negative control and MVPA in recipients. Moreover, actors' self-efficacy was not concurrently related with their own MVPA (Table 1).

Finally, partners' negative control attempts might have been expected and perhaps even to some extent appreciated by recipients, thus not damaging, but enhancing their confidence. Rook, August, Stephens, and Franks (2011) found that patients with type-2 diabetes who expected greater spousal involvement in their disease management, did not react with hostility to social control, but with appreciation and guilt or shame.

Scarce Actor-, but one Partner Effect of Self-Efficacy on MVPA

In light of robust evidence of the role of self-efficacy as a predictor of behaviour change (Sheeran et al., 2016), the present scarcity of actor effects of behaviour-specific self-efficacy on MVPA came as a surprise. Only marginal actor effects occurred in men and women, spanning the entire assessment time (7 weeks, T0 to T3) and only after consecutive negative control attempts by partners were partialled out. Actor associations among self-efficacy and MVPA between consecutive time points and even cross-sectional correlations were insignificant (see Table 1). A number of methodological explanations might account for this, including only low-to-moderate internal consistency of the self-efficacy measure or possibly restricted range of self-efficacy, as average levels were quite considerably above the theoretical midline of the response scale in men and in women.

On the other hand -- and preceded by women's own provided negative control at T0 -- a positive partner effect of men's earlier increased self-efficacy on women's later MVPA emerged. Because there was not much evidence of actor effects of self-efficacy on MVPA and because women's and men's self-efficacies were at no time significantly related (cf. Badr et al., 2015), this effect was likely not mediated through women's own increased self-efficacy. Note also, that these associations were unlikely to result from model learning, because both partners' baseline MVPA were controlled. Possibly, the partner effect of men's self-efficacy (T2) on women's MVPA (T3) signified some degree of one-sided competitive behaviour in the sense that their partners' confidence in increasing their daily physical activity might have inspired women to increase their own efforts. In an observational study with couples in marital group therapy, competitive verbal behaviour was found in some women's interaction with men, but not in men's interactions with women (McCarrick, Manderscheid, & Silbergeld, 1981). However, in this very different domain, more competitive interaction occurred with men other than women's husbands (McCarrick et al.,

1981). Further, although they did not find gender differences in these associations, Howland et al. (2016), reported partner effects of perceived behavioural control, a construct that shares a large conceptual overlap with self-efficacy, on the intention to increase physical activity in couples. Howland et al. (2016) argued that these partner effects might represent self-expansion (Aron, Aron, Tudor, & Nelson, 1991), that is, individuals' tendency to incorporate aspects of their partners' self into their own self-concept. Note that in our study, women's incorporated self-efficacy of the partner would have been a better behavioural predictor than their own self-efficacy. Moreover, in a recent comprehensive study on the assessment of self-expansion (Gachter, Starmer, & Tufano, 2015) no gender differences emerged.

Women's Self-Efficacy Associated with more Negative Control from Men

Also, evidence for the alternative predictive direction in the association between self-efficacy and negative control emerged. Women's higher initial self-efficacy was associated with more subsequent negative control provided by men. As women's levels of self-efficacy at T0 were slightly higher than men's, their partners' might have felt that they underestimated the difficulty of behaviour change and thus provided more control. The latter may also represent a form of provided confrontational encouragement to partners to continue to live up to their own self-efficacy beliefs (Beach & Tesser, 1995). We did not find evidence in the literature suggesting a higher likelihood for men to meet high confidence levels in partners with more challenging and confrontational social exchange interactions. Indeed, many observational studies on positive and negative (supportive) exchange between heterosexual partners did not even find simple main effects of sex (Verhofstadt, Buysse, & Ickes, 2007). However, when gender-roles were taken into account, higher proportions of negative forms of interaction by more masculine husbands in response to their wives' support mobilization have been observed (Verhofstadt & Devoldre, 2012). Masculine and feminine gender-role attributes such as 'acting aggressively' and 'yielding', respectively, may to some degree

explain why women's self-efficacy was met by higher negative control from men, but not the other way around. Nevertheless, all these accounts remain speculative and need to be empirically addressed.

Negative Control – Detrimental for Behaviour Change

In line with predictions by Okun et al. (2007), our findings showed that being negatively controlled by one's partner (T2) was subsequently associated with less MVPA (T3) in both men and women. Although this study set out to explore self-efficacy as a mediator for this effect, findings did not support this idea. Instead, an indirect effect indicated that high initial self-efficacy in women (T0) translated into higher negative control from their partners later on (T2) that in turn seemed to impede women's MVPA at T3. What comes after being negatively controlled then? Okun et al. (2007) proposed increases in negative affect causing control recipients to engage in risk behaviour which is hidden from the controlling partner. Another somewhat more behaviour-proximal factor that has often been discussed in the literature is reactance (Logic et al., 2009). Being pressured to increase physical activity by one's partner might well motivate recipients to increase their own perceived control by doing exactly the opposite (Craddock et al., 2015; Logic et al., 2009; Ungar et al., 2016) and reducing MVPA (Khan et al., 2013). Evidence for this comes from a study with cancer patients advised to increase MVPA (Ungar et al., 2016). Authors found that both higher levels of patient-perceived social control and relative-reported provided social control to patients were associated with higher reactance in patients. Additionally, the more reactant male patients were, the less MVPA they reported later on. This was not the case for female patients (Ungar et al., 2016).

Strengths, Limitations, and Outlook

This study added to current knowledge on the complex role of negative behaviour-specific social control in couples' change of MVPA by featuring a number of strengths rarely

encountered in studies on social control so far. These included objective assessment of the target behaviour, use of different data sources in models, control of important confounding processes, and the exploration of reciprocal predictive directions among proposed behaviour antecedents, i.e., negative control and recipient self-efficacy. However, a number of limitations also need to be considered. As became apparent in the discussion of findings above, negative social control strategies are diverse, complex, and may highlight different features of recipients' current behaviour and cognitions such as incapacity to act or indifference towards behaving in a risky manner. To better understand associations between provision of negative control and recipient self-efficacy in couples, a more fine-grained, possibly also qualitative assessment of strategies would be beneficial. Moreover, a comprehensive assessment of providers' and recipients' attributions surrounding the exchange of negative control (Craddock et al., 2015) in couples would elucidate this complex process. As noted before, our measurement lags of 2 to 5 weeks could not capture immediate reactions to control attempts and may have obscured important processes leading up to the present findings. Daily diary approaches (Khan et al., 2013) or even higher-resolution ecological momentary assessment should be beneficial. Furthermore, to address sex- and gender-role differences, both should be assessed; ideally, also including same-sex couples in the design. Finally, the present sample was already fairly active at baseline (T0), which might have created restricted-range problems not only in terms of the target behaviour, but also in terms of behaviour-specific self-efficacy. Recruitment strategies and inclusion criteria that specifically address sedentary couples might likely solve this problem.

Conclusion

Findings from this study indicated reciprocal relationships and disjoint effects of behaviour-specific provided negative social control and self-efficacy in couples motivated to increase MVPA in daily life: whereas positive effects of partner-provided negative control on

recipient-partners' self-efficacy emerged, these did not translate into more MVPA. On the contrary, provided negative control, apparently spurred in part by high levels of prior self-efficacy of the to-be recipient, showed detrimental effects on both partners' MVPA.

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Chapter 5

General Discussion

Although robust evidence suggests that marriage and longevity are positively correlated (Holt-Lunstad, Smith, & Layton, 2010), determinants underlying this association are manifold and thus not fully understood. Some recent findings by Jackson, Steptoe and Wardle (2015) emphasize the contribution that partners make in managing each other's health behavior, raising the question of potential determinants that could be triggered during interventions to facilitate not just one individual's health but also that of a close other. To facilitate the understanding of potential intervening individual and dyadic processes of health behavior change of individuals in romantic relationships, I investigated the reciprocal association between cognitive and social mechanisms. More precisely, I attempted to dismantle the association between social exchange processes (social support and social control) and self-efficacy beliefs over time in couples' health behavior changes by accounting for the potential bi-directionality of the association between support/control and self-efficacy and by using statistical models that allowed the investigation of both predictive directions: from support/control to self-efficacy as well as from self-efficacy to support/control. I considered different contexts (pelvic floor exercise and physical activity) and differentiated between an individual perspective, where one partner's health behavior (performing regular pelvic floor exercise) was of focus versus a dyadic perspective, where the attention was on both partners' health behavior changes (jointly increasing daily physical activity). Results from the three studies included in the dissertation thesis are summarized in Table 1.

Summary of the Findings

In Chapter 2, the focus was on prostate cancer patients and their partners. Couples dealt with patients' urinary incontinence after radical prostatectomy. Patients were advised to perform pelvic floor exercise (PFE) regularly to reduce urinary incontinence. I proposed social support and patients' self-efficacy as potential facilitators of PFE. Overall, my findings revealed that being self-efficacious in performing PFE positively related to patients receipt of

support from their partners, which predicted their adherence to regular PFE. This finding confirms the cultivation hypotheses (Benight & Bandura, 2004). Partner-provided support, however, also enhanced patients' self-efficacy, thus pointing toward the enabling hypothesis (Benight & Bandura, 2004; for more details, see Table 1).

In Chapters 3 and 4, findings of two secondary analyses of a randomized control trial (RCT) were presented. In contrast to study 1, in which couples were coming to terms with the sequelae of radical prostatectomy, here the focus was on preventive health behavior change. Healthy heterosexual couples who intended to increase their regular physical activity were examined. Since in study 1 roles were confounded by participants' genders (male patient; female caregiver), a fully dyadic and reciprocal approach (including patients' and caregivers' support and self-efficacy) could not be applied to the data. Accordingly, within study 2, I aimed to close this gap in knowledge by analyzing a dyadic model of the support-provision-self-efficacy relationship in healthy heterosexual couples. Here, I focused on both partners' provided social support and self-efficacy (both physical activity specifically assessed) and examined their association over time. To account for potential time-stable and time-variant aspects of the support-self-efficacy exchange between partners, I differentiated between the two within my analyses. I found on the time-stable level that partners' support attempts and self-efficacy beliefs were interrelated.

Table 1

Summary of the Findings

Chapter	Aims	Sample and Design	Results	Conclusion
2	Study 1 focused on the time-lagged reciprocal association between patient received support/partner provided support and patient self-efficacy and their association with patient-pelvic floor exercise (PFE).	$N = 175$ prostate cancer patients and their partners: patients' age: $M=63.53$ years, (46–77), partners' age: $M = 60.12$ years, (39–75). Design: Partially dyadic, correlational. Assessments: 1 month (T1), 3 (T2), 5 (T3), and 7 months (T4) after the onset of urinary incontinence.	The patient-centered model revealed that received support mediated the association between self-efficacy and PFE. In the alternative model, partner-provided support predicted both patient's self-efficacy and PFE.	Patients' self-efficacy facilitated support receipt from partners' and enhanced their PFE, which was in line with the <i>cultivation hypothesis</i> . In contrast to support receipt, partners' support provided increased patients' self-efficacy beliefs pointing towards the <i>enabling hypotheses</i> , the discrepancy potentially implying <i>invisible support processes</i> . Findings underlie the importance of involving partners' in patients' rehabilitation during a severe disease.
3	Study 2 aimed to disentangle the support provision–self-efficacy association over time in healthy couples' motivated to increase their physical activity. In contrast to Chapter 2, here both partners' perspectives were taken into account.	$N = 338$ heterosexual couples: women's age: $M = 36.88$ years, (18–77); men's age: $M = 39.19$ years, (19–80). Design: dyadic and correlational. Secondary analyses of a randomized controlled trial (RCT). Assessment: Baseline (T0), 1 week (T2), 6 weeks (T3), 19 weeks (T4), 26 weeks (T6) and 52 weeks (T7) after randomization (T1).	Men's and women's provided support and self-efficacy (both physical activity specific) were positively associated. Men's and women's self-efficacy beliefs predicted support provided from their partner. No gender differences emerged.	One partner's self-efficacy activated support provision from the other partner, confirming the <i>cultivation hypothesis of social support</i> . Partners' support exchanges with self-efficacy on a stable basis reflected the relevance of a relationship-specific view. The next step, accordingly, would be to take into account couple variables (e.g., dyadic self-efficacy) that were suggested by <i>dyadic theories</i> . In sum, results highlight the relevance of adopting a dyadic and reciprocal perspective when examining social and cognitive mechanisms underlying couples' health behavior changes.
4	Study 3 examined the bi-directional association between partner-provided negative social control, self-efficacy and their association with moderate to vigorous physical activity (MVPA) in healthy couples' motivated to increase their physical activity.	Secondary analyses of the control group from the RCT presented in study 2. $N = 113$ heterosexual couples: women's age: $M = 35.81$ years, (18-77); men's age: $M = 37.84$, (19 -80). Design: dyadic and correlational. Assessment: Baseline (T0), 1 week (T2), 6 weeks (T3) after randomization (T1).	Negative control provision enhanced recipient partners' self-efficacy. Women's self-efficacy predicted men's provision of control. Both partners' MVPA decreased when they were provided with negative control.	Provision of negative social control by one partner raised recipient partners' self-efficacy beliefs and decreased their MVPA. Mediating effects from one partner to another occurred for women's MVPA only. Thus, control may have enhanced self-efficacy beliefs by taking recipients' out of their comfort zone and at the same time provoked distress and reactance. Findings highlight negative social control's potential to backfire and suggest the need to further investigate in its beneficial effect on self-efficacy.

On the time-variant level the support-self-efficacy exchange was unidirectional, pointing from one partner's self-efficacy to the other partner's support provision. Similar to findings from study 1 regarding the association between patient-received support and patient self-efficacy, results from study 2 supported the cultivation hypothesis (Benight & Bandura, 2004).

As my focus in study 1 and study 2 was on social support's reciprocal relationship with self-efficacy, the question of how other social mechanisms, namely negative control, would be associated with recipient partners' self-efficacy was raised, in study 3. Negative social control was often found to have adverse effects on recipients' behavior change (Craddock, vanDellen, Novak, & Ranby, 2015; Fekete, Geaghan, & Druley, 2009). However, its relationship with recipients' cognitive mechanisms, specifically self-efficacy beliefs, was rarely examined (i.e., Badr, Yeung, Lewis, Milbury, & Redd, 2015; de Montigny et al., 2017; Khan, Stephens, Franks, Rook, & Salem, 2013). From these, only Badr et al. (2015) investigated partner-provided negative control's association with recipient's self-efficacy beliefs. Therefore, my aim with study 3 was to examine the negative-control-self-efficacy association in the context of healthy couples' behavior change. For this I focused on direct and indirect effects of partner-provided negative control and self-efficacy on recipient partners' moderate to vigorous physical activity (MVPA) within a dyadic longitudinal model. In sum, my results reveal that negative social control provided by one partner was positively related to the other partner's subsequent self-efficacy and negatively to her or his MVPA (see Table 1). In contrast to study 2 where no gender differences were found, here, women's MVPA was positively mediated by their partners' increased self-efficacy and negatively mediated by their partners' provided negative control. In line with study 1 (prostate cancer patients and their partners) and study 2 (healthy heterosexual couples), results from study 3

regarding the negative control-self-efficacy association suggested a beneficial link between social exchange processes and recipients' self-efficacy beliefs.

Integration of the Findings

Enabling or Cultivating? Examining the Predictive Direction between Social Support and Recipients' Self-Efficacy

The question of the predictive direction of the association between self-efficacy and social support was raised in study 1 (Chapter 2) and study 2 (Chapter 3). Findings on prostate cancer patients and their partners' (study 1) pointed to the cultivation hypothesis and the enabling hypothesis (Benight & Bandura, 2004). On the other hand, findings on healthy heterosexual couples (study 2) pointed solely to the cultivation hypothesis (Benight & Bandura, 2004). Accordingly, an increased sense of self-efficacy was found to coincide with supportive acts by partners, independent of whether couples were dealing with one partner's sequelae of major tumor surgery and recommended adherence to pelvic floor exercises (PFE) or were engaged in each other's physical activity facilitation. In the following section, evidence from the literature is presented and compared to the results of this thesis in regard to the cultivation and enabling hypothesis.

Cultivation hypothesis. Integrating findings from the literature. Few studies have found that self-efficacy predicts social support (i.e., Holahan & Holahan, 1987; Kim, Duberstein, Sorensen, & Larson, 2005; Schwarzer & Knoll, 2007; Shoji et al., 2014; Suorsa et al., 2016). For example, Suorsa et al. (2016) found in a sample of young adults who were dealing with asthma and allergies that their self-efficacy associated positively to their perceived support from friends and their self-reported MVPA. Furthermore, Kim et al. (2005) found that lung cancer patients' spouses' interpersonal self-efficacy and perceived general support related positively to each other and negatively to depressive symptoms. In contrast to study 1 of my thesis that is based on the social cognitive theory (SCT, Bandura, 1997) and uses a longitudinal design, neither of the above studies did explicitly test the cultivation

hypothesis but assumed this predictive direction without referring to a theoretical background. Contrary to the aforementioned studies, Holahan and Holahan (1987) and the studies mentioned in the empirical synthesis by Schwarzer and Knoll (2007) explicitly tested the cultivation hypothesis using the SCT (Bandura, 1997) as a theoretical backdrop and used for that a longitudinal design. Holahan and Holahan (1987) reported that older adults' self-efficacy to obtain social support predicted support availability and less depressive mood one year later. Schwarzer and Knoll (2007) exemplified two studies that found evidence for the cultivation hypothesis. One study focused on Costa Rican factory employees, demonstrating that self-efficacy positively related to received social support and negatively to depressive mood 6 months later (Schwarzer & Gutiérrez-Doña, 2005). The other study investigated East German migrants, who were coping with the aftermath of communism (Schwarzer, Hahn, & Schröder, 1994). Findings revealed that women's but not men's self-efficacy (assessed in 1989) related indirectly to less depressive mood (assessed in 1991) via received support (assessed in 1990). In all three cases, the design involved only two measurement points, thus not allowing to test how the relationship evolves over several time points. Furthermore, measurement lags were long (6 months, respectively one year). Schwarzer and Knoll (2007) raised the question of the potential bi-directionality of the support-self-efficacy association pointing towards the necessity of investigating both predictive directions in future studies. Since then Shoji et al. (2014) tested the cultivation hypothesis and the enabling hypothesis in two separate studies and analyzed their relationship over two assessment points. The authors examined healthcare providers working with survivors of traumatic events from two countries, the United States and Poland. They found in both samples evidence in support of a positive association between secondary trauma self-efficacy and subsequent perceived social support. The authors' findings underline the relevance of self-efficacy beliefs for the availability of support in times of need. What is important to note is that in most studies (Kim

et al. 2005; Holahan & Holahan, 1987; Shoji et al., 2014; Suorsa et al., 2016), the availability of support was assessed but not actual support received or provided by a significant other. This represents a discrepancy between many studies and study 1 and 2 of my thesis. As in study 1 I found evidence for the cultivation hypothesis with patient's received support for PFE and in study 2 with men's and women's provided support for physical activity. Perceived support is by definition rather stable, capturing an expectation that help will be available if needed, and is thus potentially less time-sensitive than actual support that has been given or received in a certain situation (Barrera, 1986; Schwarzer & Knoll, 2007). Since cultivation of support from the environment refers to the activation of others that results in their supportive attempts, solely assessing the expectation of support as implied by support perceived may not adequately capture this effect. Exceptions make the two studies exemplified by Schwarzer and Knoll (2007), in which received support was assessed. However, in the study by Schwarzer and Gutiérrez-Doña (2005) as well as that from Schwarzer et al. (1994) only support from the recipient's perspective was assessed. Contrary to that, in study 1 of my thesis, both perspectives of the supportive interaction (that of the support provider and that of the support recipient) were considered. Further, in study 2 of my thesis a dyadic approach was applied by involving both individuals' perspectives on support provided to each other. Also, in contrast to all studies thus far that mainly focused on well-being, study 1 and study 2 of my thesis provided evidence for the cultivation hypothesis in the context of health behavior change (study 1 for PFE and study 2 for physical activity).

In sum, many studies that showed evidence for the cultivation hypothesis did not focus on the support–self-efficacy association in a manner that allowed a direct comparison of the alternative direction within a single model or provided an insight into the support–self-efficacy exchange in the health behavior change context. In study 1 and 2 of this thesis, I discovered evidence favoring the cultivation hypothesis with actual support received in the

context of disease management (prostate cancer patients' PFE) and actual support provided in the context of health behavior change (healthy couples' physical activity). I advanced current knowledge by investigating the support–self-efficacy relationship within a longitudinal design, applying a statistical model that accounted for the reciprocity of the association and using a semi-dyadic (in study 1, the first model included patient-received support; the second model—partner-provided support; both included patients' self-efficacy and PFE) and dyadic approach (in study 2, the model included both partners' support provided and self-efficacy).

Enabling hypothesis. Integrating findings from the literature. Only in study 1 provided social support from female partners' and its association with patients' self-efficacy seemed to support the enabling hypothesis (Benight & Bandura, 2004). A number of studies show evidence for social support as a predictor of self-efficacy (Amir, Roziner, Knoll, & Neufeld, 1999; Banik et al., 2017; Cieslak et al., 2009; Cutrona & Troutman, 1986; Deno et al., 2012; Ernsting, Knoll, Schneider, & Schwarzer, 2014; Haugland, Wahl, Hofoss, & DeVon, 2016; Khan et al., 2009; Knoll, Scholz, Burkert, Roigas, & Gralla, 2009; Luszczynska & Cieslak, 2009; Luszczynska, Sarkar, & Knoll, 2007; Schröder, Schwarzer, & Konertz, 1998; Schwarzer & Knoll, 2007; Wang et al., 2015). However, as noted earlier, the majority of these studies examined cross-sectional associations between social support and self-efficacy (Amir et al., 1999; Cieslak et al., 2009; Deno et al., 2012; Ernsting et al., 2014; Haugland et al., 2016; Khan, et al., 2009, Luszczynska et al., 2007; Schröder et al., 1998; Wang et al., 2015), thus weakening the predictive power of the evidence. Only a few exceptions confirmed the enabling hypothesis using a longitudinal design (Banik et al., 2017; Cutrona & Troutman, 1986; Luszczynska & Cieslak, 2009; Schwarzer & Knoll, 2007). It is important to note that only Banik et al. (2017) examined time-lagged associations between social support and self-efficacy including residualized mediators and outcomes and thus provided reliable evidence for the lagged-predictive power of received support on recipient

self-efficacy. The authors examined the association between recipients' self-efficacy and received support from family, friends, other patients and medical staff in patients suffering from lung cancer. They found that support received related positively to patients' self-efficacy beliefs, which predicted their quality of life. Similar to Banik et al. (2017), in study 1 of my thesis I found evidence supporting the enabling function of social support, however, not for patient-received support from partners but for partner-provided support to patients. One explanation may lie in the difference between providers' and recipients' perspectives on the supportive act, a discrepancy that has also been noted by Dunkel-Schetter, Blasband, Feinstein and Benett (1992). In my study, provided support from partners may have been so sublime (partners taking over chores or giving patients room to prepare their PFE) that it enabled patients without them noticing it (invisible support; Bolger & Amarel, 2007; Bolger, Zuckerman, & Kessler, 2000), whereas in Banik et al.'s (2017) study, supportive acts may have been more explicit and thus encoded by recipients as such. However, since the authors only assessed support receipt, results cannot be compared. Another explanation for the discrepancy between my results and those from Banik et al. (2017) may lie in different operationalizations of social support. The authors assessed support from different sources (family, friends, other patients, medical staff), whereas I measured only support from partners. As such, it remains unclear which source contributed to the enabling effect the authors found. As noted by Dunkel-Schetter et al. (1992), the source of support matters, as some relationships are more intimate (partner, children, parents) than others (medical staff, friends, other patients). Furthermore, some individuals may be more acceptable for providing specific forms of support. For instance, partners were shown to be more helpful in providing emotional support whereas medical staff in providing informational support, when patients were dealing with cancer (Dunkel-Schetter, 1984). Moreover, fellow patients were shown to be successful in providing support to each other (Weber et al., 2007). In this way in Banik et

al.'s (2017) study, receipt of support may have been more successful in enhancing self-efficacy beliefs, as it involved help from different sources of support. Furthermore, receiving support from different people in the social network may have also triggered several sources of self-efficacy (such as vicarious experiences, verbal persuasion, perception of affective and physiological states). As a result of their expertise with caring for patients' disease, medical staff may be perceived as a competent source of verbal persuasion. The same could apply to fellow patients. Fellow patients may have been a suitable source of vicarious experiences because they underwent the same treatment and were dealing with similar disease-related aftereffects. For instance, an intervention study by Weber et al. (2007) provided evidence for the enabling effect of peer-to-peer support from trained fellow patients on prostate cancer patients' self-efficacy to manage symptoms of the disease. Further, perceived similarity with the model is an important aspect of observational learning, which increases the impact of vicarious experiences (Bandura, Ross, & Ross, 1963). This was the case in Weber et al.'s (2007) study and potentially also in Banik et al.'s (2017) study, but not in study 1 of my thesis. Accordingly, even though partners (from study 1), may have served as important sources for verbal persuasion, they may have been less adequate role models. In contrast to Banik et al. (2017) wherein social support and self-efficacy referred to overall disease management, including a variety of behaviors that can be supported in a number of ways, my focus in study 1 was on patients' health behavior change, namely adherence to regular PFE, which limits supportive acts from partners to the specific behavioral domain of PFE. As such, partners in study 1 had less flexibility in their support and potentially fewer opportunities to be supportive than providers in Banik et al.'s (2017) study.

To conclude, even though there is much evidence that buttresses the enabling hypothesis, the studies mentioned above generally tested one predictive direction and used a general measure of support perceived, often within cross-sectional designs. Furthermore, the

few exceptions exemplified above did not focus on both: partner-provided support and patient-received support within patients' health behavior change. Study 1 contributes knowledge to the understanding of the support–self-efficacy association within the disease management context by finding evidence for the enabling hypothesis in prostate cancer patients' health behavior change within a longitudinal, semi-dyadic design.

Cultivation and not enabling. In the first two studies, support for the cultivation hypothesis, but less consistently for the enabling hypothesis, was found. This may be due to the fact that recipients' average self-efficacy was well beyond the theoretical midpoint of the response scale. High self-efficacy levels were also reported by another study that confirmed the cultivation hypothesis (Shoji et al., 2014). The support-facilitating effect of self-efficacy beliefs may also be the byproduct of strong agentic beliefs.

Early studies reported that self-efficacious individuals showed more perseverance in overcoming obstacles (Bandura & Schunk, 1981; Brown & Inouye, 1978; Schunk, 1981; Weinberg, Gould, & Jackson, 1979) and thus felt more able to create a social environment that facilitates their development than those with low self-efficacy beliefs (Bandura, 1997). Therefore, self-efficacious individuals may, for instance, show coping efforts that elicit supportive behavior by potential providers (Silver, Wortman, & Crofton, 1990). This could also be valid for prostate cancer patients in study 1 and healthy couples in study 2. Convinced that they can change their behavior, prostate cancer patients' as well as healthy couples' may have activated partner support to achieve this goal. Schwarzer and Weiner (1991), for instance, found that individuals are inclined to offer help if the recipients are undertaking efforts to improve their conditions and if providers perceive that intended recipients were not responsible for the condition they are in. Both cases could be applicable to recipients in study 1, as patients suffered from the sequelae of prostatectomy. Furthermore, patients may have attempted coping efforts by making time to perform PFE or by planning their PFE. The same

may apply to couples from study 2, where recipients were highly motivated to enhance their physical activity and may thus have also begun preparations to behave accordingly. Self-efficacy was also shown to be closely associated with coping efforts. Lerner and Kennedy (2000) found that women who had suffered abuse and have built up strong self-efficacy beliefs showed problem-oriented coping strategies and had a higher likelihood to stay separated from abusers. Schwarzer, Boehmer, Luszczynska, Mohamed and Knoll (2005) showed that general self-efficacy was a precursor to problem-focused coping strategies (planning) as well as emotion-focused strategies (accommodation, humor, and acceptance) in patients who underwent a surgical removal of a malignant tumor. Their results supported the *resource-factor hypothesis*, which states that self-efficacy is a personal resource that enables coping (Schwarzer et al., 2005).

Another mediating mechanism of the cultivation effect triggered by self-efficacy beliefs may be *proxy control*, which describes a way of taking control over events indirectly by delegating work or demands to another person (Bandura, 1997). It is applied when individuals desire to stay in control even though their opportunities for action are limited. They achieve their goal through competent mediators who act on their behalf (Bandura, 1997). To exert influence over the social environment, people who apply proxy control require high self-efficacy (Bandura, 1997). Accordingly, prostate cancer patients from study 1 may have delegated the control over their regular PFE to their partners, by asking them for help to prepare their daily schedule for rehabilitation or by asking them to remind them to maintain their schedule when they feel they are unable to do so. The same may also be true for healthy couples from study 2, when they anticipated barriers for their planned physical activity: They may have asked each other to remind the other to be more active.

Why the enabling effects of social support only emerged in study 1 may be due to the disease context. Here, patients and partners dealt with a major stress factor: the aftermath of

prostate cancer surgery. Many studies underscore the central role that partners have in patients' disease management (e.g., Badr et al., 2015; Goodwin, Hunt, Key, & Samet, 1987; Lai et al., 1999; Langenbach, Schmidt, Neumann, & Zirngibl, 2003). More precisely, female partners as support providers were often reported to engage in the ill spouses' health and health behavior (e.g., August & Sorkin, 2010; Knoll, Burkert, Scholz, Roigas, & Gralla, 2012; Rook, August, Stephens, & Franks, 2011). Furthermore, female spouses were found to be more effective in doing so than male spouses (Cotter, 2012). One could therefore speculate that the enabling and cultivating effect that I discovered in study 1 may have been a byproduct of the demanding situation that couples were facing in combination with female partners being the supporters of male patients.

In contrast to study 1, in study 2, women and men were healthy and proactively engaged in enhancing their regular physical activity. Further, the targeted behavior was a different one. PFE represented a new behavior for many patients, signaling that they needed to learn; increase in physical activity in healthy couples represented a known behavior that couples were already engaging in. Different types of barriers and states of mind to manage behavior change may have been more prevalent in prostate cancer patients than in healthy couples. Stage-specific models of health behavior change such as the transtheoretical model (TTM; Prochaska & DiClemente, 1982) or the health action process approach (HAPA, Schwarzer, 2008) highlight the necessity of differentiating between those who initiate a behavior and those who are experienced actors, as the two may require different intervention approaches to succeed in their goals. While healthy couples may have already experienced successful mastery of physical activity goals, patients may have lacked such experiences. Accordingly, healthy couples already developed their self-efficacy beliefs sufficiently to activate support when needed, whereas patients may have also needed the enabling function of their partners' support to feel self-efficacious.

In sum, my findings support the conclusion that patients facing the aftermath of prostate cancer may require both enabling and cultivating processes to perform PFE, whereas for couples who are motivated to enhance their daily physical activity, cultivating processes may be more relevant.

Social Control Predicts Self-Efficacy

In study 3 (Chapter 4) where the control group of the sample from study 2 was examined, results suggest a beneficial control-self-efficacy relation between partners. Negative control attempts from women and men related positively to recipient partners' self-efficacy beliefs. Negative control encompasses strategies that either reflect the provider's negative affect or may induce negative affect in the recipient (Lewis & Butterfield, 2007). The strategies are used to encourage the person to act in a healthier manner and involve nagging, pressuring or making the recipient feel guilty. Thus, the self-efficacy enhancing effect in study 3 seems, at a first glance, counterintuitive. However, receiving negative control may also have a consciousness-raising function and may draw recipients attention to the need to be agentic and that they have the ability to do so. For instance, providers' correction of recipient partners' appraisal from inability to coping deficits (for example, unrealistic activity plans) may raise distress and reactance; however, this may make recipients realize that change is achievable, if more effort is invested.

The literature supports the supposition that negative control strategies are counterproductive in changing the partner recipient's health behavior (Craddock et al., 2015). It must be noted, however, that few studies have investigated self-efficacy as a predictor for control attempts (for an exception, please see Badr et al., 2015; de Montigny et al., 2017; Khan et al., 2013). From these, only Badr et. al. (2015) investigated negative control attempts by spouses and their association with cancer patients' self-efficacy and well-being, and they found negative control to be unrelated to patients' self-efficacy to manage their diseases.

Contrary to study 3 of this thesis (healthy couples physical activity), where both partners' self-efficacy and negative control were accounted for, findings from Badr et al. (2015) are limited by the disease management context, including only partners' provided control and patients' self-efficacy beliefs. As such, the contexts of both studies were different. Similar to study 1 of my thesis, where prostate cancer patients' PFE was the focus of partners' support attempts, here head and neck cancer patients dealt with a highly stressful situation, which may have affected their perception of their spouses' negative control attempts. To contrast, healthy couples may have perceived their partners' negative control attempts as an indication that they could do more than they currently believed; head and neck cancer patients might have acknowledged spousal negative control attempts as signs of concern, however due to limited resources did not feel enabled to act accordingly. Further due in the study by Badr. et al. (2015) partners may not have been competent advisors for patient's disease management and thus patients might have perceived spousal negative control attempts as inadequate. As such, Badr et al. (2015) emphasizes that partners' control attempts missed to target, self-care topics that were important for patients. In study 3 of this thesis, the provider of negative control was targeting recipient's physical activity facilitation, a behavior for which both partner's may have been perceived by the recipient as competent control providers. This presumption is also supported by two other studies. One, in which partner provided control (including positive and negative strategies) fostered diabetes patient's next day-physical activity specific-self-efficacy (Khan et al., 2013) and another, in which received positive control positively related to men's physical activity specific-self-efficacy (de Montigny et al., 2017).

Overall, with study 3 of this thesis I extended knowledge on the control-self-efficacy relationship by uncovering support for the predictive role of women's and men's provision of negative control on recipient partners' subsequent self-efficacy beliefs.

Social Exchange Processes Relate Positively with Recipients' Self-Efficacy

Independent of their predictive direction, the relationship between social exchange processes and self-efficacy beliefs was positive in all three studies of this thesis. In study 1, female partners' provided support and patients' received support correlated positively with patients' self-efficacy. This was also demonstrated in study 2 with healthy couples, for one partner's provided support and the other partner's self-efficacy. Moreover, in study 3 where again healthy couples were investigated, partner-provided negative social control showed a positive association with recipients' self-efficacy. Overall, these positive effects underline the advantageous relationship between social exchange processes and self-efficacy beliefs, independent of whether the couples from the three studies of this dissertation are dealing with one partner's disease or jointly trying to adopt a preventive health behavior.

However, support and control have also been reported to be double-edged swords—easily causing a threat to the self-esteem or restricting autonomy (Logic et al., 2009, Newsom et al., 2016). I will review factors that may be meaningful for understanding the overall positive interrelationships between control, support and self-efficacy.

One explanation may be the fact that prostate cancer patients and healthy couples were highly self-efficacious (see study 1, 2 and 3 for details), which might have led to the support-facilitative effect (cultivation effect) found in studies 1 and 2 and control-facilitative effect found in study 3 for women. High self-efficacy beliefs might have contributed to an overall positive mindset regarding receipt of support (study 1, enabling effect of support) and negative control (study 3, self-efficacy raising effect of control). For instance, partners' involvement, independent of whether supportive or controlling, might have been used as proxy control (Bandura, 1997), and as such, as a way to stay in control of the health behavior when resources are depleted (for example, feeling unable to perform regular exercises from exhaustion or laziness). In addition, partners' influence might have been further seen as a sign

of caring (Rook et al., 2011) or concern (Holmila, 1991) and thus welcomed, having a self-efficacy-enhancing effect.

Furthermore, as partners on average did not differ in the amount of support (see study 2) or the negative social control they provided to each other (see study 3), a balanced give and take between partners might have also contributed to an increased sense of fairness, ensuring an overall beneficial partner-involvement recipient-self-efficacy relationship. According to the equity theory (Hatfield & Traupman, 1979), the fairness in intimate relationships is relevant for the overall satisfaction with the relationship, which again could have contributed to a positive interpretation of controlling and supportive attempts. Knoll et al. (2012) found with a general measure of social control that patients with higher relationship quality benefitted from their partners' control attempts in terms of their PFE. In addition, Scholz et al. (2013) determined that positive social control received from the non-smoking partner related negatively to numbers of cigarettes smoked by smoking partners when consensus between partners was high. Consensus was defined as a mutual agreement with the partner, regarding different domains of living and as a subdomain of dyadic adjustment. Even though their study included positive control and Knoll et al.'s (2012) involved an overall measure of control, considering that social exchange processes are interpersonal in nature (Lewis & Butterfield, 2007; Lewis et al., 2006), the beneficial effect of relationship-specific factors (for example, relationship quality, consensus) might apply to negative control attempts from study 3 as well as supportive attempts from studies 1 and 2 of this thesis.

To conclude, high consensus between partners or an overall high relationship quality might have beneficially affected couples' supportive and controlling attempts as well as recipients' perception of these.

Gender Differences in the Negative Control-Self-Efficacy–MVPA Association

In study 3, women’s self-efficacy beliefs predicted increased negative control by men. Women’s provided negative control to men increased men’s self-efficacy beliefs, which related positively to women’s MVPA later on. Further, women’s MVPA was fostered through men’s self-efficacy beliefs. Contrary to evidence on gender differences in social control where women were found to be the operators of men’s health behaviors (August & Sorkin, 2010; Rook et al., 2011; Umberson, 1992), I found evidence suggesting that men’s provision of negative control and self-efficacy predicted women’s behavior. Helgeson (1994) proposed within her *trait-based model of gender differences* that women tend towards relational behavior (communion) and men towards individual behavior (agency). Consequently, women in study 3 may have adjusted their MVPA to their partners, rather than vice versa.

Social Exchange Processes, Self-Efficacy and Health Behavior Change

In study 1 social support facilitated patient’s PFE. In study 3 negative control hindered both men’s and women’s MVPA. In neither of the two studies did recipient’s self-efficacy directly predict behavior change. The beneficial effect of social support on health behavior was in line with previous evidence (Tay, Tan, Diener, & Gonzalez, 2013). Also, negative control’s detrimental effect on health behavior change has been documented before (Craddock, et al., 2015). In a study by Khan et. al. (2013), where both social control and support were investigated, partner provided support was positively associated and partner provided control negatively related or unrelated to diabetes patients’ same-day physical activity. In contrast to social support, negative control can easily provoke reactance or negative affect (Logic, et al., 2009; Newsom, et al., 2016; Okun et al. 2007; Tucker & Anders, 2001; Ungar et al., 2016). Accordingly, one could argue that supportive attempts in study 1 may have been successful, because they were more welcomed by recipient patients than negative control attempts in study 2 by healthy men and women. The fact that self-

efficacy beliefs did in neither of the two studies predict behavior change was surprising. In both studies reported self-efficacy beliefs were on average high. As Bandura (1997) pointed out, self-efficacy reflects *a belief* about an ability and not necessarily a person's actual ability to enact a behavior. Thus, prostate cancer patients in study 1 as well as healthy couples from study 3, may have overestimated their ability to adopt the targeted health behavior. However, also methodological issues may have contributed to the null effect of self-efficacy on PFE in study 1, MVPA in study 3 respectively. Both will be addressed in the limitations of this thesis.

This dissertation included three studies, each aiming to extend knowledge on the reciprocal relationship between social exchange processes and self-efficacy beliefs in the context of health behavior change. In the following section, I will outline strengths of the studies as well as weaknesses that limit my findings and should be addressed in future investigations.

Strengths

The studies included in this thesis showed several strengths: (1) the longitudinal design and allowing the investigation of both concurrent predictive directions; (2) the consideration of two perspectives on supportive/respectively controlling attempts (providing partner and recipient partner); (3) the treatment of couples as a dyad (in studies 2 and 3); (4) the differentiation between two health-related contexts and health behaviors: prostate cancer patients' PFE and healthy couples' physical activity (objectively assessed physical activity); (5) the assessment of all constructs in a behavior-specific manner; and (6) the consideration of enacted support/control as social exchange processes instead of perceived support/control. In the following sections, I will briefly reiterate the strengths of each study.

In study 1, to account for the theoretically plausible reciprocal association between social support and self-efficacy, as proposed by the social cognitive theory (Bandura, 1997), I

examined the data via autoregressive cross-lagged panel models. Autoregressive models allow the differentiation between an autoregressive effect (the predictive effect of the same variable on a later measurement of that variable), a cross-lagged effect (the predictive effect that one variable measured earlier has on another variable measured later) and a residual variance (variability that cannot be explained by either of these two effects). The procedure allowed the investigation of both the enabling and the cultivation hypotheses (Benight & Bandura, 2004) within one model. This approach was novel because studies so far tested this association in two different models (i.e., Banik et al., 2017; Shoji et al., 2014). Furthermore, I accounted for both the recipients' and the providers' perspectives on supportive acts, by applying one patient-centered model (with received support, self-efficacy and PFE) and one alternative model with partners' reports of support provided to patients instead of patients' received support from partners. In this way I could cross-validate findings from patient reports with partners' report.

To conclude, compared to other studies testing the cultivation and the enabling hypothesis (i.e., Banik et al., 2017; Shoji et al., 2014) study 1 gave first insight into the reciprocal support–self-efficacy association in the context of prostate cancer within a semi-dyadic design (as it examined partner support provided and patient support received) involving patients' health behavior change (PFE) as an outcome.

In the next two studies, a fully dyadic approach was used. Data from healthy heterosexual couples, involving both women's and men's reports of support and self-efficacy, were taken into account. In contrast to study 1 with prostate cancer patients and their partners, here the focus was on both partners' provided support and self-efficacy beliefs and their reciprocal association over one year. Accordingly, a fully dyadic and longitudinal model was needed, allowing for the investigation of reciprocal predictions within one model. The design was challenging; thus, a novel analytical approach was applied, the random-intercept

cross-lagged-panel model (RI-CLPM, Hamaker et al., 2015). The RI-CLPM allows for a closer inspection of the support–self-efficacy association over time, controlling for time-stable relationship-specific characteristics and unraveling potential dynamics of the association. By separating time-stable from time-sensitive components of self-efficacy and provided support, I ensured that cross-lagged associations were not biased by between-person stability and were entirely attributable to within-person variance. In this way, findings on the time-variant level reflected change in self-efficacy and support provided that occurred from one measurement point to the other.

To sum up, study 2 extended findings from study 1 and other comparable studies testing the cultivation and the enabling hypothesis (i.e., Banik et al., 2017; Shoji et al., 2014) by investigating the reciprocal support–self-efficacy fully dyadically (involving both: women and men) in the context of healthy couples’ physical activity and within a longitudinal design spanning one year.

Combining strengths from studies 1 (involving the behavior as an outcome) and 2 (application of a fully dyadic longitudinal model), in study 3, the actor-partner interdependence-mediator model (APIMeM; Ledermann, Macho, & Kenny, 2011) was applied. The APIMeM explored the predictive direction of the association between negative partner-provided control and recipients’ self-efficacy and MVPA over the first three assessment points of study 2. Furthermore, the statistical model by Ledermann et al. (2011) was extended for the application with longitudinal data. To approach evidence on predictive directions, mediators and outcomes were residualized by controlling for their baseline value. As partners are assumed to covary in their parameters, I controlled for each partner’s influence by adding each’s baseline values to the assumed associations and by allowing for covariance between partners’ variables. This methodological approach accounts for time-

effects as well as for the effect that partners had on each other (so-called partner effects, Kenny et al., 2006).

Study 3 extended current knowledge on the control–self-efficacy association, as it focused on negative provided control, self-efficacy and physical activity in a healthy sample of heterosexual couples. Compared to other studies (i.e., Badr et al., 2015; de Montigny et al., 2017; Khan et al., 2013), investigating this relationship, study 3 stands out in terms of its dyadic longitudinal design and its analytical approach. Another noteworthy strength of study 3 that needs mentioning involves its objectively assessed outcome measure (via accelerometry). The following section addresses limitations to consider when interpreting the results of this thesis. First, limitations of each of the three studies will be presented, then general limitations will be reviewed.

Limitations

In study 1, the fully reciprocal view on both partners' reports was not possible as patients and partners had set roles, and only patients were required to perform PFE to manage urinary incontinence. This limited health behavior change and spousal supportive acts to patients as targeted recipients. Roles were entirely confounded by gender since patients were male, and partners were female. Future research might explore the support–self-efficacy association in other contexts and with switched roles: female patient and male partner.

Data for all three studies represent secondary analyses of larger projects, accordingly their main goal was not testing the assumptions made within this thesis. This may have been a disadvantage: For instance, in the second project, from which study 2 and 3 were derived, time-intervals were conceptualized to capture changes triggered by the main intervention.

In study 2, the whole sample and all measurement points were taken into account. However, in study 3, only one-third of the sample (the control group only) and the first three measurement points were analyzed. This differentiation is necessary as it may limit

generalizability of the results and may make comparisons between the two studies difficult. Different assessment intervals were examined in study 2 (T0 up to T3) than from those in study 3 (T0 up to T7). Study 3's hypotheses were analyzed prior to those of study 2. Since the project was ongoing when analyses for study 2 were made, the measurement points were limited to seven weeks and could not be extended to one year. In study 3, data only from the control group were used. To make sure that results remain unbiased by the main intervention, prior to analysis of study 3, the decision was made to use data only from the control condition. The main hypotheses of the original RCT were not yet analyzed, thus a potential bias by the planning intervention was imaginable. Future research should address this limitation by examining experimentally the support–self-efficacy association.

Another limitation may be that in studies 2 and 3, the providers' and not the recipients' perspectives on supportive and controlling attempts were used, respectively. Thus, the effect of support/control on recipients' self-efficacy beliefs may have involved mediating processes, such as received support/control or invisible support/control. The latter refers to supportive/controlling attempts that are reported by the provider but not detected by the recipient (Bolger & Amarel, 2007; Bolger et al., 2000; Lüscher et al., 2014). This decision was made, because the focus of the studies were partner effects. Partner effects imply an influence from one person to another. The interpretation of partner effects within the APIM (Kenny, Kashy, & Cook, 2006) would have been counterintuitive with received support/control as a predictor. For instance, the effect from women's received support/control to men's self-efficacy would have implied the initial provision of support/control. Also, by using provided control/support instead of received support/control partner effects implied two distinct reports: that of the partner's provided support/control and that of the other person's self-efficacy and vice versa, which helped avoiding shared variance.

The measurement instruments used to assess the variables and their associations within each study had certain weaknesses. First, in study 1, self-efficacy was assessed with a two-item measure, one targeting regular performance and another targeting maintenance of PFE. Even though between-item correlations were high, the measure may have fallen too short to capture different facets of self-efficacy beliefs needed for PFE (such as PFE in different contexts). In studies 2 and 3, the self-efficacy measure was broader and referred to the increase in physical activity in daily life within varying domains/intensity levels. Likely due to the different activity domains and intensity levels addressed by the items, internal consistencies were relatively low. In addition, due to the assessment of self-efficacy, the correspondence with MVPA may not have been sufficient to capture assumed associations between the two (for more details, please see limitations in study 3). Study 3, which included healthy couples, may have been underpowered as only one-third of the overall sample has been examined and a complex model analyzed.

In all three studies, a longitudinal design and measurement lags that were weeks or several months apart were applied. Accordingly, the time intervals between the assessment points may have been too long to capture important changes. Specifically, social exchange processes may exert their effect in the short term, not just in the long term (for more details, please see limitations in studies 1, 2 and 3). To capture interpersonal processes and their relationship with cognitions and behavior more accurately, theoretical and experimental research targeting different “timings” is needed, as this unfortunately could not be conducted within this thesis. Furthermore, the design in all studies was correlational, which did not allow for any conclusions regarding the causality of findings.

Outlook

With this thesis, I sought to extend previous research on the relationship between social and cognitive determinants of health behavior change in couples. In the following

section, I will go beyond the research questions in this thesis and give some suggestions for future research.

Examining Joint Effects of Social Support and Social Control

Growing research suggests that social control might interact with social support in the prediction of health behavior change (Khan et al., 2013; Ochsner et al., 2015). Ochsner et al. (2015) found that smokers, who received less smoking-specific support and control from their non-smoking partners, remained abstinent over those who received more control and support. It was further suggested that moderating effects between social support and control might be predictive of self-efficacy beliefs as well as behavior change. Khan et al. (2013) investigated the joint effect of spousal control and support on diabetes patients' self-efficacy and physical activity. The authors found synergistic effects of spousal control and support on patients' same-day self-efficacy and next-day energy expenditure. Based on these studies, future investigations into reciprocal self-efficacy-social-exchange mechanisms might examine the joint effects of social control and support.

Exploring Moderators of the Support/Control-Self-Efficacy–Relationship

Whether a recipient benefits from social control/support in terms of her/his self-efficacy beliefs and behavior change may depend on her/his attribution processes as well as on her/his relationship with the provider. Literature on reactions to control attempts suggests that interpreting spousal control attempts as signs of concern or care and love may help avoiding spousal involvements backfiring effects (e.g., Rook et al., 2011). High relationship quality was also shown to moderate the control health behavior relationship (Knoll et al., 2012). Furthermore, the perception of a behavior as a shared responsibility might affect recipients' reactions to supportive and controlling attempts. Stephens et al. (2013) found that diabetes patients who perceived their dietary management as a responsibility shared with their spouses showed less diet-related distress as a reaction to spousal support but also less

adherence to spousal pressure (negative control). Future research might thus focus on the above described moderators of the support/control-self-efficacy relationship.

Exploring Mediators of the Support/Control-Self-Efficacy–Relationship

A mediating mechanism between one person's support/control provision and the other person's self-efficacy enhancement may be seen in invisible support/control. Invisible support was defined as help that is provided outside the recipient's awareness (Bolger & Amarel, 2007; Bolger et al., 2000; Lüscher et al., 2015). By assuming recipients' chores without informing them, providers might ameliorate recipients' distress, leaving them more confident about adhering to targeted behavior. By remaining unnoticed, potential self-esteem-threatening effects of support receipt may be avoided. Affective and physiological states as a source of self-efficacy beliefs might get downregulated as well. In this way, invisible support may have a bolstering effect on recipients' self-efficacy. Similar to invisible support, control that remains unnoticed by the recipient was also found to elucidate beneficial effects on well-being (invisible control; Lüscher et al., 2014). In smoking–non-smoking couples, the authors found a positive relationship between invisible social control and well-being for smoking female partners. These results are promising because they suggest that invisible negative control strategies might possibly operate as involvement without provoking annoyance or distress. Future investigations could focus on invisible social exchange processes as mediators between provided support/control and recipients' self-efficacy beliefs.

Since findings of the present dissertation emphasize the relevance of self-efficacy beliefs for the provision of partner support and control (cultivation hypothesis), the investigation of different coping mechanisms as a mediator could be another research topic that needs further consideration. Specifically, problem-oriented coping efforts (for example, scheduling exercises) were suggested to be strategies used by people with enhanced self-efficacy beliefs (Lerner & Kennedy, 2000). As another mediator, support and control

mobilization could be investigated to uncover whether higher or lower self-efficacy beliefs predict the solicitation of help/control from another person and how these relate to actual attempts at provision. An interesting idea for future research might also be the examination of proxy control (Bandura, 1997) as a means to support mobilization.

Examining Different Interpersonal Constellations

Even though a partner can be a strong influence on health behavior change, her/his capacity to enhance one's self-efficacy beliefs is limited. The social network consists of a variety of relationships that can associate synergistically or in a compensatory manner with intimate relationships and trigger different sources of self-efficacy. In Banik et al.'s (2017) study on lung cancer patients, support derived from different persons was found to facilitate patients' self-efficacy beliefs. Unfortunately, the authors did not investigate which sources of self-efficacy had been triggered by whom. Future investigations could use these findings to disentangle them by identifying sources of self-efficacy in the supportive and controlling attempts provided within different relationship constellations (for example, befriended dyads or functional dyads).

Moving from Self-Efficacy to Collective Efficacy

Special attention should be given in future research to collective forms of efficacy beliefs. They refer to a conviction in the *joint* ability to achieve a desired behavior change (Bandura, 1997; Beverly & Wray, 2010; Sterba et al., 2011). By investigating *joint coping* efforts as an intermediating mechanism of the association between social exchange processes and *collective* forms of efficacy beliefs, joint behavior change (special form: co-activity) could be investigated. An example for such collective forms of coping efforts includes *communal coping* (Lyons, Sullivan, Ritvo, & Coyne, 1995). In the context of intimate relationships, *communal coping* is defined as a function of couple efficacy, referring to behaviors, such as communication about the targeted health behavior as a joint goal, jointly

making the decision to change a behavior and formulating plans to enact the intended behavior together (Lyons et al., 1995).

Methodological Suggestions for Future Research

To overcome the limitations of self-efficacy measures, efficacy beliefs could be assessed in a manner that corresponds better to the targeted health behavior (such as MVPA-specific self-efficacy when the outcome is MVPA). Furthermore, multidimensional measures of efficacy beliefs could be used involving different aspects of the targeted outcome (for example, PFE-specific self-efficacy that includes different phases of the behavior change and contexts). The measurement intervals in which social-cognitive variables are examined could be assessed in a day-to-day or hour-by-hour resolution. In this way, immediate reactions to supportive or controlling attempts and their change pattern with self-efficacy beliefs could be examined. Additionally, as the timing of the effect of social exchange processes on recipients' self-efficacy and vice versa is not yet clear, a theoretical approach and consequently experimental manipulations of the effects within varying time intervals might be needed.

In the next section, I will provide practical implications for the findings of my thesis as well as the conclusion.

Practical Implications

From a practical perspective, the knowledge derived from this thesis could be used in interventions targeting couples' health behavior change. Such interventions could focus on improving partners' supportive and controlling attempts at health behavior change. To ensure that cultivation effects emerge, the intervention would first need to confirm that each partner is highly confident that she/he can change her/his behavior. To benefit from their self-efficacy beliefs in terms of their health behavior change in the next step, partners could be trained to provide effective support and to refrain from negative control. In the last step, the

couple's health behavior change would be assessed. To test the short- and long-term effects of the overall intervention, an experimental manipulation could be performed by randomly assigning couples to an intervention and a no-treatment control group.

The intervention could be conceptualized in the following way: First, in an individual session, each person's successful attempts to change her/his behavior could be explored. In this manner, sources of self-efficacy, such as mastery experiences, would be targeted to enhance partners' efficacy perceptions. Self-efficacy beliefs, social support and control as well as the targeted health behavior would be assessed before and after the session. Afterwards, partners would be asked to communicate about the targeted health behavior and discuss modalities to help each other in its implementation. More precisely, one partner could be asked about the techniques she/he would usually use to support or control the other partner in her/his behavior change. Following, the recipient partner could report which techniques she/he would consider self-efficacy enhancing and thus helpful for her/his behavior change as well as which are less helpful. Providers' attempts to support and control as well as recipients' judgements of their effectiveness would be filmed to support later discussions. Couples would additionally discuss different strategies and write down which could potentially be helpful. In this way, personalized strategies for each partner could be assessed. After the session, an interventionist would provide couples with feedback on their communication (thereby using the footage) and evaluate their notes. The couple and consultant will then discuss which techniques were considered helpful and which were not, and why. To prevent couples from using negative control techniques, such strategies would be separately discussed and their potential to hinder behavior change emphasized. In the last step, couples would make decisions about the techniques they agree to use in subsequent days to support each other in health behavior change. Categorized techniques would be provided as a printed booklet to couples, for later use. To follow up on the effect of the strategies on

the couple's behavior change, partners would be asked to make daily reports of the strategies applied to support and control each other, their self-efficacy beliefs and their health behavior over the next seven days. To make sure that effects of the intervention do not cease over time, internet-based booster interventions would be applied. These would follow the format of the initial intervention. Each booster session would be followed by a seven-day diary phase. In the diaries self-efficacy beliefs, collective efficacy beliefs, the targeted health behavior, social control and social support would be assessed together with potential moderators (e.g. considering health behavior change as a shared responsibility, relationship quality) and mediators (received and provided support/control to assess invisible social exchange processes, mobilized support/control, communal and individual coping efforts) of their relationship. The diaries would be completed by the intervention as well as the control group. Dyadic-longitudinal analyses could be used to examine how supportive and controlling attempts influenced recipient partners' self-efficacy beliefs as well as each partner's collective efficacy beliefs and vice versa. The support/control-self/collective-efficacy relationship would be compared between the intervention group and the control group.

Conclusion

Taken together, findings from the three studies included in this dissertation support the idea of self-efficacy beliefs being a facilitator of social exchange processes. Results less consistently pointed to an empowering effect of social exchange processes. Behavior change was fostered through partners' supportive attempts and hindered through their negative control attempts.

Results of this thesis highlight the importance of taking a dyadic and reciprocal perspective on the relationship between social exchange processes and self-efficacy beliefs. Findings may help to understand how partners could be supported in their efforts to improve each other's health.

In this thesis, I accounted for the complexity of the couple–behavior change process by (1) considering two different contexts (cancer patients’ PFE versus physical activity in healthy couples); (2) investigating two different social exchange processes; (3) moving beyond the individual as the unit of analysis (dyadic analyses); (4) examining reciprocal relationships between proposed mechanisms of change and (5) analyzing them within longitudinal frameworks.

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Appendix

Curriculum Vitae

Mein Lebenslauf wird aus Gründen des Datenschutzes in der elektronischen Fassung meiner Arbeit nicht veröffentlicht.

Mein Lebenslauf wird aus Gründen des Datenschutzes in der elektronischen Fassung meiner Arbeit nicht veröffentlicht.

Eigenständigkeitserklärung

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.

Berlin, den _____

Unterschrift: _____