Synergistic Effect of Social Support and Self-Efficacy on Physical Exercise in Older Adults

Lisa M. Warner, Jochen P. Ziegelmann, Benjamin Schüz, Susanne Wurm, and Ralf Schwarzer

The purpose of the current study was to examine whether the effects of social support on physical exercise in older adults depend on individual perceptions of self-efficacy. Three hundred nine older German adults (age 65–85) were assessed at 3 points in time (3 months apart). In hierarchical-regression analyses, support received from friends and exercise self-efficacy were specified as predictors of exercise frequency while baseline exercise, sex, age, and physical functioning were controlled for. Besides main effects of self-efficacy and social support, an interaction between social support and self-efficacy emerged. People with low self-efficacy were less likely to be active in spite of having social support. People with low support were less likely to be active even if they were high in self-efficacy. This points to the importance of both social support and self-efficacy and implies that these resources could be targets of interventions to increase older adults’ exercise.

Keywords: multimorbidity, social-cognitive theory, exercise-specific self-efficacy, exercise-specific social support, sources of exercise support

Increasing age is accompanied by a range of health problems that can accumulate and result in multimorbidity (van den Akker, Buntinx, Metsemakers, Roos, & Knottnerus, 1998). Older adults with multiple concurrent medical conditions at the same time report more frequent health care utilization, longer hospital stays, and more readmissions, treatment complications, and medication interactions (Fortin et al., 2004; Gijsen et al., 2001). They also have a higher risk for deterioration in quality of life and for disability and mortality (Fortin et al., 2004; Librero, Peiró, & Ordíñana, 1999). Hence, individuals with multiple conditions are often confronted with a downward spiral of worsening health. This process can be decelerated by regular physical exercise; even very old, frail, and chronically ill adults can maintain or improve their physical health and quality of life by regular moderate physical activity (Bassey, 2005; Chin A Paw, van Uffelen, Riphagen, & van Mechelen, 2008; Hinrichs & Trampisch, 2010; Rejeski & Mihalko, 2001). For this reason...
the American College of Sports Medicine and the American Heart Association formulated specific recommendations for older adults to engage in activities that increase heart rate and breathing three or more times per week for at least 20 min (Nelson et al., 2007). However, despite the various benefits of physical activity and the well-established recommendations, only 27% of German adults age 60 or older report regular exercise (2 or more hr/week), and only half of older adults who engage in a sedentary lifestyle intend to start a regular exercise program to increase their physical activity (Dishman, 1994; Robert Koch Institut, 2005).

Social cognitive theories of health behavior might enable understanding of individual intentions to exercise and actual performance of exercise behavior. Such theories integrate individual cognitions and social resources for specific health behaviors that help explain why some individuals become motivated and change their health behaviors and others do not. According to social cognitive theories, the most important individual cognitions for the development of an intention to exercise more often are individual beliefs in being able to perform the behavior even in the face of difficulties and individual anticipations of benefits from exercise, such as fitness gains or fun. Social resources that, according to such theories, affect individual intentions and behavior are constituted by physically active social networks that set social norms for exercising or provide direct social support for exercise. In theories such as the social cognitive theory of Bandura (1997), these individual and social resources are linked, and mechanisms for how they act together in enabling the initiation and maintenance of health behaviors such as physical exercise are described (Bandura, 1997; Biddle & Mutrie, 2008; Buckworth & Dishman, 2002; Schwarzer, Luszczynska, Ziegelmann, Scholz, & Lippke, 2008). Among the key resources for physical exercise in older adults—in accordance with a recent review—are self-efficacy and social support (van Stralen, De Vries, Mudde, Bolman, & Lechner, 2009). Theories of health behavior, in particular social cognitive theory, allow for formulating competing hypotheses about the interplay of individual and social resources. Our article therefore aims to examine both the main and interaction effects of self-efficacy and social support on exercise in older adults.

**Exercise Self-Efficacy**

Perceived self-efficacy is defined as individuals’ beliefs in their capabilities to perform a specific action required to attain a desired outcome and can be characterized as being competence based, prospective, and action related (Bandura, 1997). This means that people think about how likely it is that they will perform a specific behavior such as physical exercise in the immediate or more distant future. Self-efficacy beliefs affect which activities people choose to engage in, the amount of effort they expend in these activities, the extent to which they persevere in the face of difficulties, and the cognitive evaluations and emotional reactions brought about by successes and failures (Bandura, 1997). Besides general self-efficacy beliefs (broad and stable senses of personal competence to master a variety of stressful situations; Schwarzer & Jerusalem, 1995), individuals hold efficacy beliefs of varying strength across specific life domains or tasks (such as academic, managerial, or exercise self-efficacy; McAuley, Jerome, Elavsky, Marquez, & Ramsey, 2003; Usher & Pajares, 2006; Van Vianen, 1999) or for even more specific challenges (such as self-efficacy for bench-pressing or back-diving; Feltz, 1982; Wise & Trun-
nellt, 2001). Usually, specific self-efficacy beliefs predict specific outcomes best, whereas general self-efficacy beliefs better predict broader outcomes (Bandura, 1997; Schwarzer & Jerusalem, 1995). The current article examines a specific self-efficacy belief—exercise self-efficacy—because it focuses on exercise as the dependent variable. Exercise self-efficacy is an individual’s perception of his or her extent of feeling capable to perform physical exercise to achieve a certain outcome in the future. It constitutes an important personal resource that enables people to adopt and maintain physical exercise. Accordingly, individuals with higher levels of exercise self-efficacy also report higher levels of exercise (Lippke, Wiedemann, Ziegelmann, Reuter, & Schwarzer, 2009; Luszczynska, Mazurkiewicz, Ziegelmann, & Schwarzer, 2007; Renner, Spivak, Kwon, & Schwarzer, 2007). Several studies suggest that exercise self-efficacy is a crucial factor for long-term exercise adherence in older adults that can be effectively manipulated in psychological interventions (McAuley et al., 2005; McAuley et al., 2003).

Social Support for Exercise

Social support has been identified as an important factor in predicting physical exercise (e.g., Carron, Hausenblas, & Mack, 1996; McNeill, Kreuter, & Subramanian, 2006; Orsega-Smith, Payne, Mowen, Ho, & Godbey, 2007). It refers to the function and quality of social relationships, such as either perceived availability of help or support actually received. Perceived available support is usually prospective, whereas the recall of actually received support is always retrospective (Schwarzer & Knoll, 2007). In addition, the sources of support (spouse, colleagues, friends, etc.) can make a difference. For exercise in older adults, it has been shown that support provided by significant others (e.g., family, friends) is in many cases more effective than support provided by health care providers, because older adults tend to prioritize support from emotionally meaningful others (Carstensen, 1992; van Stralen et al., 2009). Within support from significant others, support provided by friends can be considered an especially important variable because most physical activities are performed in a social peer-group context (Eyler & Brownson, 1999; Sallis, Hovell, & Hofstetter, 1992). O’Brien Cousins (1995), for example, reported that support for exercise received from friends was the best resource of physical activity in women over age 70. Friend support for exercise was also found to be a better predictor than family support in older adults living in a care retirement community and community-dwelling older adults (Resnick, Orwig, Magaziner, & Wynne, 2002; Stevens, Lemmink, van Heuvelen, de Jong, & Rispens, 2003).

Interplay of Exercise Self-Efficacy and Social Support for Exercise

Social support and self-efficacy are not independent of each other. Social cognitive theory (Bandura, 1997) suggests various possible interactions of self-efficacy and social support: Self-efficacy could moderate the effects of social support on physical exercise in a synergistic manner, in that individuals with higher self-efficacy profit more from support because they are more likely to translate support into exercise. Alternatively, self-efficacy could also compensate for low social support: Those
who are supported in their exercise ambitions might rely less on their own abilities to overcome barriers for exercising, whereas unsupported individuals might exercise because of their strong optimistic self-beliefs and thus compensate the lack of support (Bandura, 1997; Dishman, Saunders, Motl, Dowda, & Pate, 2009). One study that tested this compensation hypothesis in younger adults did not find the proposed effect. Instead, social support for physical activity resulted in more exercise when combined with high self-efficacy beliefs (Dishman et al., 2009). Previous—although sparse—research thus favors the synergistic view (i.e., reflected by a synergistic interaction in which both resources combined have a stronger effect than only one) over the compensatory view (i.e., reflected by an interaction in which the effect of one resource only unfolds if the other resource is low). However, this was tested in younger adults only (Dishman et al., 2009).

In the current study, personal (self-efficacy) and social (social support) resources are expected to serve as facilitators for exercise frequency in older adults (65 years and older) with multiple morbidities. The question is whether (a) exercise self-efficacy and support for exercise received from friends are both needed to enable physical exercise (synergistic effect) or (b) one single resource is sufficient, which would reflect a compensatory effect of one for the other (Dishman et al., 2009). To investigate these questions, a longitudinal approach was chosen. Exercise frequency was expected to decline over the investigated period of half a year, because the presence of chronic conditions and worsening health status is negatively related to physical activity in older adults (Kaplan, Newsom, McFarland, & Lu, 2001; Lim & Taylor, 2005).

Methods

Participants and Procedure

Participants for this study were recruited from the third assessment wave of the German Aging Survey (Wurm, Tomasik, & Tesch-Römer, 2010), a population-representative survey of adults age 40 and over with a total N of 8,200. Participants were considered eligible for this study if they were 65 years or older, had given consent to be contacted for further studies, and suffered from at least two chronic physical conditions (e.g., cardiovascular diseases, diabetes, cancer, respiratory diseases, eye diseases) mentioned in the Charlson Comorbidity Index (Charlson, Szatrowski, Peterson, & Gold, 1994) and the Functional Comorbidity Index (Groll, To, Bombardier, & Wright, 2005).

Of a total eligible 443 participants, 309 (69.7%) gave informed consent for this study and made an appointment for the first point of measurement (Time 1; March 2009). Participants were visited in their homes by trained interviewers, completed a 30-min personal interview, and filled in a questionnaire with a prepaid return envelope. The second point of measurement (Time 2; June 2009) was a questionnaire only that was filled in and sent back by 252 participants. The third point of measurement (Time 3; September 2009) included interview and questionnaire that were completed by 271 participants. A longitudinal study without intervention was chosen as the research design, because knowledge on facilitating resources for exercise among older adults with multiple morbidities has to be extended before translating this knowledge into interventions. Table 1 provides the demographic information. Participants had on average 5.49 chronic conditions (SD = 2.86).
<table>
<thead>
<tr>
<th></th>
<th>M</th>
<th>SD</th>
<th>Range</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
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</thead>
<tbody>
<tr>
<td>1. Age</td>
<td>73.27</td>
<td>5.10</td>
<td>65–85</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>2. Sex (1 = male, 2 = female)</td>
<td>58% male</td>
<td>42% female</td>
<td>–.09</td>
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<td></td>
<td></td>
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<tr>
<td>3. Physical functioning</td>
<td>89.50</td>
<td>19.25</td>
<td>0–100</td>
<td>–.21***</td>
<td>–.18**</td>
<td></td>
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<tr>
<td>4. Time 1 friend support</td>
<td>1.82</td>
<td>0.93</td>
<td>1–5</td>
<td>.02</td>
<td>–.10</td>
<td>.15**</td>
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<tr>
<td>5. Time 2 self-efficacy</td>
<td>2.88</td>
<td>0.77</td>
<td>1–4</td>
<td>–.12*</td>
<td>–.07</td>
<td>.32***</td>
<td>.16**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Time 1 weekly frequency of exercise</td>
<td>1.19</td>
<td>2.01</td>
<td>0–7</td>
<td>–.10</td>
<td>–.01</td>
<td>.25***</td>
<td>.15**</td>
<td>.33***</td>
<td></td>
</tr>
<tr>
<td>7. Time 3 weekly frequency of exercise</td>
<td>1.26</td>
<td>1.91</td>
<td>0–7</td>
<td>–.11</td>
<td>–.03</td>
<td>.24***</td>
<td>.31***</td>
<td>.40***</td>
<td>.49***</td>
</tr>
</tbody>
</table>

**p < .01, ***p < .001.
Measures

Physical exercise frequency was assessed at Time 1 and Time 3 by asking participants in the interview, “On how many days of the past week have you exercised, e.g., hiking, football, aerobic, swimming?” Answers could range from 0 to 7 days (Craig et al., 2003). Exercise frequency was assessed because it was found to be related to physical functioning and well-being in older adults (McAuley et al., 2000; Nieuwland et al., 2000). The time frame of 1 week and the assessment of days instead of minutes per week were chosen to avoid memory biases that can occur in older adults (Rikli, 2000). The exercise frequency item was included in the standardized personal interview rather than in the questionnaire for two reasons. First, interviewers were instructed to help participants differentiate between exercise and other physical activities (such as for means of transportation or household chores). Second, interviews have been found to be more reliable for assessing physical activity than questionnaires (Washburn, 2000). Exercise frequency was assessed twice so we could control for baseline measures when analyzing exercise frequency at Time 3; slight decreases in exercise frequency over time were expected because of participants’ expected worsening health status.

Scales to assess exercise self-efficacy in previous studies appeared to be relatively difficult to answer for older adults with multiple morbidities, first because these items often pertain to an exercise criterion such as “three to five times a week for 30 min,” which is very challenging for most older people with multiple illnesses. Second, expressions such as to adopt a physically active lifestyle are more difficult to answer for older people with multiple illnesses, because older people often do not describe their lifestyle as physically active even if they exercise regularly. Finally, most existing scales have a large number of items and are therefore not recommended in a target group of older people with multiple illnesses. For these reasons, three items from previous studies (Bandura, 1997; Scholz, Sniehotta, & Schwarzer, 2005; Schwarzer et al., 2008) were adopted and pretested in a pilot study on 110 individuals age 65 and older. These items were then included in the Time 2 questionnaire of the study and read as follows: “I am confident that I can exercise on a regular basis,” “I am confident that I can exercise on a long-term basis,” and “I am confident that I can exercise on a regular basis, even if I have to do this on my own.” Responses could range from 1, not at all true, to 4, exactly true (Cronbach’s alpha = .94).

Received social support for exercise was assessed in the Time 1 questionnaire with the German short version of the Support for Exercise Habits Scale by Fuchs (1997). This short version derives from the original scale with 15 items (Sallis, Grossman, Pinski, Patterson, & Nader, 1987). Participants rated the frequency with which they received support for exercise from their friends in the past 3 months on a 5-point scale from never to always. Cronbach’s alpha was .78. The three items had the same stem: “In the last 3 months, friends, acquaintances, and neighbors . . .” followed by “exercised with me,” “gave me encouragement to stick with my exercise program,” and “helped me organize my exercise.”

Control variables were participants’ sex and age and their physical functioning at Time 1. Physical functioning was assessed by the 10-item physical-functioning subscale of the SF-36 in the questionnaire at Time 3 (Bullinger & Kirchberger, 1998; Ware & Sherbourne, 1992). The degree of limitation in activities such as lifting or carrying groceries, bending, kneeling, walking, bathing, or dressing was rated on a 3-point scale from 1, severely limited, to 3, not limited at all. Answers were
transformed into a standardized score ranging from 0 to 100 according to the SF-36 manual. Higher scores indicate better physical functioning. Cronbach’s alpha was .96.

**Analytic Procedure**

All analyses were performed with SPSS 18. Hierarchical moderated regression procedures recommended by Aiken and West (1991) were used to examine the main and interaction effects of social support and self-efficacy on physical exercise. Before interaction testing, variables were centered (Aiken & West). To examine the effects of social support and self-efficacy on changes in physical exercise, Time 1 exercise was statistically controlled for in all analyses. Further covariates were age, sex, and physical functioning at Time 1. Missing data (10.4% in total) were imputed using the expectation-maximization algorithm (Enders, 2001).

**Results**

Means, standard deviations, ranges, and intercorrelations are displayed in Table 1. Correlations among all variables were significant, which suggests their suitability for multiple-regression analysis (Table 1). With an average of 1.19 exercise days/week ($SD = 2.01$) at Time 1 and 1.26 exercise days/week ($SD = 1.91$) at Time 3, levels of exercise remained stable across time, $t(308) = –0.55, p > .05$.

Results from the moderated hierarchical-regression analysis show that baseline exercise, $B = .30, p < .001$; friend support, $B = .38, p = .002$; and self-efficacy, $B = .65, p < .001$, predicted exercise frequency at Time 3. Age, sex, and physical functioning at Time 1 had no significant effect. Most important, there was a significant interaction effect between support and self-efficacy, $B = .43, p = .007$ (see Table 2). Without baseline behavior, the amount of explained variance was 20%. Overall, 28% of the exercise variance was accounted for by this model (Cohen’s $f^2 = .39$); hence, baseline behavior added 8% to the explained variance.

To understand this interaction effect, it was deconstructed using simple slopes analysis. Regression lines at three levels of the moderator (−1 $SD$, $M$, +1 $SD$ of self-efficacy) were plotted in Figure 1 as recommended by Aiken and West (1991).

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Moderated Multiple-Regression Analysis Predicting Physical Exercise Frequency at Time 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>B</strong></td>
<td><strong>SE</strong></td>
</tr>
<tr>
<td>Constant</td>
<td>3.07</td>
</tr>
<tr>
<td>Age</td>
<td>−.03</td>
</tr>
<tr>
<td>Sex (1 = male, 2 = female)</td>
<td>−.06</td>
</tr>
<tr>
<td>Time 1 physical functioning</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Time 1 weekly days of exercise</td>
<td>.30***</td>
</tr>
<tr>
<td>Time 1 friend support</td>
<td>.38***</td>
</tr>
<tr>
<td>Time 2 self-efficacy</td>
<td>.65***</td>
</tr>
<tr>
<td>Interaction: Friend Support $\times$ Self-Efficacy</td>
<td>.43**</td>
</tr>
</tbody>
</table>

*Note. Total $R^2 = .28***$, Cohen’s $f^2 = .39$, $F(7, 301) = 17.03, p < .001, N = 309$.  
**$p < .01$. ***$p < .001$. 
At low levels of self-efficacy, there was no relationship between friend support and exercise ($B = .004, p > .05$), whereas at high levels of self-efficacy, friend support predicted physical exercise more substantially ($B = .67, p < .001$).

**Discussion**

This longitudinal study examined the joint effects of support for exercise provided by friends (including acquaintances and neighbors) and exercise self-efficacy as predictors of physical exercise frequency. Support received from friends and self-efficacy both had main effects on subsequent exercise at the 6-month follow-up: Individuals who reported more support from friends, as well as individuals who had higher levels of self-efficacy, were more active at 6-month follow-up.

The key finding here is the interaction between self-efficacy and social support. The simple slopes analysis provided further evidence for the notion that there is a synergistic effect, which is in line with the results of Dishman et al. (2009) in younger adults. In the current sample of older adults with multiple morbidities, social support predicted physical exercise better if combined with at least medium levels of self-efficacy. This contributes to the evidence that these factors are among the key predictors of physical exercise in older adults (Stevens et al., 2003; van Stralen et al., 2009). If individuals are very low in self-efficacy, they will less likely profit from support from friends in terms of exercise (lowest line in

![Figure 1 — Interaction between received friend support and exercise self-efficacy on physical exercise frequency.](image-url)
Figure 1). Vice versa, if there is no friend support, even high self-efficacy may not suffice to engage in frequent exercise (left side in Figure 1). There are several theoretically viable interpretations: Individuals low in self-efficacy could profit less from social support, because they are less likely to attribute social support to their own competence, which might impair their behavioral performance. On the other hand, individuals low in social support but high in self-efficacy might lack some necessary social cues to translate their efficacy beliefs into behavior. In other words, low levels of either friend support or self-efficacy make it less likely that older adults will engage in exercise.

**Implications**

Our study has several implications for research and practice. First, exercise self-efficacy and friend support for exercise are substantial predictors of physical exercise frequency in older adults with multiple illnesses. This is an important finding, because it suggests that even in a group that is at high risk for further deterioration in health status, changeable determinants of behavior exert strong effects on behavior. This corroborates findings of previous research (Stevens et al., 2003; van Stralen et al., 2009) and suggests that both resources—exercise self-efficacy and social support for exercise—are to be considered in theories of health-behavior change. It further suggests that future research should account for both resources. Not testing for an interaction between them might explain null findings, because we showed that they have a stronger association with exercise if both resources are at least moderately available (Casado et al., 2009; Oman & Duncan, 1995). These two resources are also promising candidates for future interventions to increase physical exercise in older adults, especially because studies that are based on the principle of group exercise showed that both self-efficacy and social support for exercise are amenable to interventions and mediate the intervention effects on exercise (Stevens et al., 2003). Van Stralen et al. (2009), however, note that social support from friends seems to be most effective for initiating exercise, with less evidence of its effectiveness in maintaining exercise in older adults. Because our study measured exercise with a 7-day recall, investigations of initiation versus maintenance could not be undertaken. Future experimental studies should aim to identify ways in which social support for exercise from friends and exercise self-efficacy might be effective in helping older adults maintain their level of exercise if once initiated and also take support from other sources such as family or physical therapists into account (Whaley & Schrider, 2005).

**Limitations and Strengths**

There are some limitations to our findings. It cannot be excluded that participants who reported low levels of exercise in our study were active in house and garden work, walking, or other light or moderate physical activities. A further limitation might lie in the fact that this analysis is restricted to the frequency of explicit exercise days per week instead of overall activity levels. However, measures of frequency have been found to relate to physical functioning and well-being of older adults (McAuley et al., 2000; Nieuwland et al., 2000). In addition, duration of exercise was not considered because we argue that support and self-efficacy are mainly relevant when it comes to scheduling more vigorous activities (McAuley et al., 2003;
Rodgers & Sullivan, 2001). Overall there was a slight but nonsignificant increase in exercise frequency from Time 1 to Time 3, which was contrary to our assumption that having multiple concurrent medical conditions would cause a downward spiral in older adults. However, this might be explained by seasonal effects—the first measurement was in March, when it is relatively cold for outdoor exercise in Germany, and the third in September, when it is warmer. A further shortcoming is the design of this study, due to which alternative explanations cannot be ruled out, for example, that sedentary individuals might choose social networks that are less supportive for being physically active. A particular strength of this study is that this is a unique sample of older adults having two or more medical conditions, drawn from a larger nationwide representative sample. This specific population is at high risk for deterioration in health and quality of life (Fortin et al., 2004; Gijsen et al., 2001) yet has been examined only rarely. Moreover, we have targeted the psychological mechanism that involves personal and social resources of exercise frequency over an extended time period.

Conclusion

The frequency of physical exercise in older adults was associated with psychological resources, in this case social support and self-efficacy. Our results suggest that in particular a synergistic effect of friend support and exercise self-efficacy is responsible for the likelihood that participants would exercise. Social support from friends was more effective for frequent exercise when older adults had strong self-beliefs in being capable of exercising. If social networks of older adults are to be encouraged to provide support for exercise, such interventions should account for age-related tendencies to prioritize emotionally meaningful social partners over acquaintances or novel social partners, as outlined in socioemotional selectivity theory (Carstensen, 1992; Lansford, Sherman, & Antonucci, 1998; Ziegelmann, Lippke, & Schwarzer, 2006). Intervention studies on older adults that target social support for the enhancement of physical exercise should consider cultivating exercise self-efficacy, as well as ensure that participants do not lack one of the resources necessary for frequent exercise.

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