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Health-specific optimism mediates between objective and perceived physical functioning in older adults

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Abstract Particularly in older adults, self-reports of physical health need not necessarily reflect their objective health status as they can be biased by optimism. In this study, we examine whether the effect of objective physical functioning on subjective physical functioning is modified by health-specific optimism and self-efficacy. A longitudinal study with three measurement points over 6 months and 309 older adults (aged 65–85) with multimorbidity was conducted. Subjective physical functioning was regressed on objective physical functioning, health-specific optimism and self-efficacy. Subjective physical functioning was predicted by both objective physical functioning and optimism as a mediator. Moreover, an interaction between optimism and self-efficacy was found: Optimism predicted subjective physical functioning only for individuals with low self-efficacy. Subjective physical functioning is as much based on objective physical functioning as it is on health-specific optimism. Older adults base their subjective physical functioning on objective indicators but also on optimism, when they are less self-efficacious.

Keywords Optimism · Self-efficacy · Physical functioning · Older adults · Multimorbidity

Introduction

When people report their physical well-being and fitness, they do not rely exclusively on objective information. Personality characteristics, mood, and social context also affect their judgment. We assume that, among others, perceived self-efficacy and health optimism may have an effect on perceived physical functioning (Umstadtd et al., 2007). In the following sections, we will address objective and subjective physical functioning in multimorbid older adults, and discuss the roles of risk perception and health-specific optimism as well as perceived self-efficacy.

Physical functioning in multimorbid older adults

Due to longer life expectancy and demographic change, the number of people with two or more chronic illnesses has increased in the last few decades (van den Akker et al., 1998). It has been estimated that more than 60% of the population over 60 years of age suffer from multimorbidity, i.e., two or more co-occurring diseases (van den Akker et al. 1998). This means that more and more people are affected by multimorbidity and associated problems such as treatment complications, taking multiple medications simultaneously and more frequent health care utilisation (Fortin et al., 2004; Gijzen et al., 2001). Multimorbidity is also associated with lower physical functioning that involves major losses in quality of life (Fortin et al., 2004). One task, therefore, is to identify the resources that enable older people with multiple illnesses to perceive high levels of physical functioning, which in turn enable an autonomous life with high quality of life. Perceptions of physical functioning rather than objective indicators of physical functioning are cognitive representations of ranges of action that enable individuals to actively shape their

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everyday functioning (Wittink et al., 2003). We claim that perceived physical functioning is probably not solely based on objective indicators of functioning (Ruthig & Chipperfield, 2007). In addition, health beliefs and personality factors might affect individual perceptions of physical functioning. In the present study, we examine the relationship between baseline objective physical functioning and subjective functioning later on while considering the possible influence of self-efficacy and health-specific optimism. We examine mediating and moderating effects to elucidate the mechanisms that might operate among these factors.

Optimism and health

There is a large body of literature that provides ample evidence that positive psychological resources such as optimism are associated with perceptions of physical functioning and associated quality of life, well-being, health, health behaviors, and all-cause mortality. Although most studies report positive effects, the size and even the direction of these associations is inconsistent (e.g., Aspinwall & Tedeschi, 2010; Diener & Chan, 2011; Hankonen et al., 2010; Rasmussen et al., 2009; Terrill et al., 2010). For instance, optimism was found to positively relate to longevity in some studies (e.g., Brummett et al., 2006; Giltay et al., 2006), whereas other studies found no relation (e.g., Lee et al., 2003; Schofield et al., 2004) and some even report detrimental effects of optimism (e.g., Friedman et al., 1993). For the relation between physical functioning and optimism, a recent meta-analysis found effect sizes to range from $-.13$ to $.42$, (Rasmussen et al., 2009). The main reason for such inconsistencies lies in diverse conceptualizations of optimism and corresponding diverse operationalizations (Davidson & Prkachin, 1997; Radcliffe & Klein, 2002; Schwarzer, 1994). A very important relation in this context is the relation between optimism and personal risk perceptions (Renner & Schupp, 2011).

Health-specific optimism and risk perception

Particularly in older adults, there are large differences in subjective estimates of the likelihood of worsening health (Waters et al., 2011). These individual differences reflect more or less optimism. In that age group and in individuals with multiple illnesses, expecting a decline in health status is realistic. Not expecting health decline might reflect “*unrealistic optimism*” in many. Underestimating one’s health risk has been conceptualized as the “*optimistic bias*” (Radcliffe & Klein, 2002; Weinstein, 1982). This biased perception of health risks (unrealistic optimism, positive illusion) has been interpreted as “*defensive*”

optimism as opposed to “*functional*” optimism (Schwarzer, 1994; Taylor & Brown, 1994). This indicates conceptual and functional analogousness between health risk perception and health-specific optimism. Health risk perception is a domain-specific construct, and the corresponding functional optimism is coined “*health-specific optimism*”. Health-specific optimism can be a positive predictor of health information processing and behavior (Aspinwall & Brunhart, 1996). Davidson and Prkachin (1997) have confirmed the discriminant validity of unrealistic and health-specific optimism while also implicating their joint importance as determinants of health-promoting behaviors. Not expecting a health decline in older adults reflects an optimistic outlook, whether realistic or not. In those who are careless or naïve, there is no perceived need of taking precautions. In others, the health-specific optimism may lead to preventive actions because they believe that they can do something to keep up their current health status (de Ridder et al., 2004; Schwarzer, 1999).

Perceived self-efficacy

According to Social Cognitive Theory (Bandura, 1997), human motivation and actions are regulated extensively by forethought. One of the prime factors that affect behavior is perceived self-efficacy, that is, people’s beliefs in their capabilities to produce certain effects by their actions. The construct is usually understood as being either task-specific or domain-specific, and usually, specific self-efficacy beliefs predict specific outcomes best (Bandura, 1997). However, some researchers have also conceptualized a generalized belief of self-efficacy that refers to a broad and stable sense of personal competence to master a large variety of stressful situations (Schwarzer & Jerusalem, 1995). General self-efficacy was found to be valid across various cultures (Luszczynska et al., 2005) and to be stable across time, which is why it is conceptualized as a trait rather than a state (Chen et al., 2000). This broad self-efficacy concept may explain a wider range of human behaviors and coping outcomes when studying the well-being of patients who have to adjust their life to multiple demands due to illness (Bonetti et al., 2001). People who had stronger general self-efficacy beliefs showed better adjustment to medical conditions, e.g., cancer (Schwarzer et al., 2005), or rehabilitation from heart surgery (Schröder et al., 1998). General self-efficacy was further found to be related to the performance of health behaviors (e.g., Luszczynska et al., 2005), to perceived functional ability in older and chronically ill adults (e.g., Luszczynska et al., 2007) and to control perceptions for multiple illnesses (e.g., Schüz et al., in press). Hence, a general sense of self-efficacy can be considered a resource factor for the adaptation to multiple chronic conditions.

Aims of the study

We hypothesize that perceived physical functioning is not only based on objective physical functioning but also on optimistic beliefs. We expect that baseline physical functioning is to some degree reflected in perceived functioning half a year later. However, according to our considerations, health-specific optimism should also contribute to these perceptions. Being in good shape is associated with various activities of daily living. Good fitness means that one can tackle the daily challenges without much limitation. Thus, we expect older adults, who are fit, to be more optimistic about their health status in the near future. We expect a mediating mechanism which is initiated by objective physical functioning at Time 1, affecting Time 2 health-specific optimism which, in turn, would have an effect on perceived physical functioning at Time 3. Moreover, different kinds of optimism may have a synergistic effect on quality of life in the sense of physical functioning. By including general self-efficacy in this mechanism, we expect a moderator effect in a way that older adults with high optimism would report good physical functioning scores, depending on their levels of self-efficacy.

Methods

Participants and procedure

Participants for the PREFER (Personal Resources of Elderly People with Multimorbidity: Fortification of Effective Health Behaviour) project were recruited from the database of the third German Ageing Survey (DEAS, Wurm et al., 2010)—a population-representative survey of adults aged 40 and over with a total N of 8,200, which also serves as Time 0 measurement point for PREFER. Participants of the DEAS were considered eligible for PREFER if they were (1) 65 years or older, (2) suffered from at least two chronic physical conditions, mentioned either in the Charlson Comorbidity Index (Charlson et al., 1994) or the Functional Comorbidity Index (Groll et al., 2005), and (3) had given consent to be contacted for further studies. Of totally eligible 443 participants, 309 (69.7%) gave informed consent to take part in the PREFER project and made an appointment for the first measurement point in time (Time 1; March 2009). Participants were visited at their homes by trained interviewers, completed a 30-min personal interview and additionally filled in a questionnaire with a prepaid return envelope. The second measurement point in time (Time 2; June 2009) was a questionnaire only that was completed and sent back by 252 individuals (81.6% of T1). The third measurement point in time (Time 3; September 2009) contained interview and questionnaire

that were completed by 277 individuals (89.6% of T1). In total, $n = 235$ participants completed all three measurement points of PREFER (76.1% of T1).

At Time 1, participants were on average 73.27 years old ($SD = 5.10$), and 41.7% of them were women. Participants were Caucasian, had German nationality and came from all regions of Germany, with $n = 108$ (35%), living in the eastern federal states (former German Democratic Republic). Around 12.6% indicated low (at most 9 years school education), 52.1% medium (secondary school), and 35.3% high education (qualifying for university admission) according to the International Standard Classification of Education (ISCED, Unesco, 1997). Participants had on average 5.49 chronic conditions ($SD = 2.86$) at Time 1, with hypertension (67.64%), osteoarthritis (63.11%), hyperlipidaemia (49.19%), arthritis (31.07%), and peripheral vascular disease (30.74%) being the five most prevalent conditions.

Measures

Objective physical functioning was measured with the Chair Rise Test from the Physical Performance Battery in the personal interview at Time 1 (Guralnik et al., 1994). The Chair Rise Test is an objective measure of both lower extremity strength as well as balance (Guralnik et al., 1994; Schenkman et al., 1996). It assesses the time in which participants can raise from a seated position without the aid of their arms. Participants had 60 s to complete 3 chair rises during which they folded their arms across their chests to ensure that the arms were not used to get up. Time taken (seconds) was assessed by the interviewer. Seconds were reverse scored (60-s taken), so that higher scores indicated better fitness.

Health-specific optimism was assessed in terms of perceived health risks in the questionnaire at Time 2. Two items were chosen, one of them reflecting absolute risk, the other relative risk ($r = .66$). The items were ‘How do you estimate the likelihood that your health status will worsen in the near future?’ and ‘If you compare yourself with an average person of your sex and age, then how likely is it for you that your health status will worsen?’ Answers ranged from (1) ‘very unlikely’ to (5) ‘very likely’ and (1) ‘substantially below average’ to (5) ‘substantially above average’, respectively. Risk items were then reverse scored and averaged to yield an indicator of health-specific optimism, with higher scores (ranging from 1 to 5) indicative of higher optimism.

Perceived physical functioning was assessed by the 10-item physical functioning subscale of the SF-36 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,

dressings, etc. was rated on a three-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.

General self-efficacy was assessed before the launch of the present study in the DEAS sample, hence at Time 0, with the four-item short form of the General Self-efficacy Scale (Schwarzer & Jerusalem, 1995). The items were (a) 'It is easy for me to stick to my aims and accomplish my goals', (b) 'I can usually handle whatever comes my way', (c) 'I can solve most problems if I invest the necessary effort', (d) 'If I am in trouble, I can usually think of a solution'. Possible responses ranged from (1) 'strongly disagree' to (4) 'strongly agree', yielding a total averaged score of one to four with a Cronbach's alpha of .72.

Control variables were participants' sex and age, as women with chronic conditions were often found to report lower levels of physical functioning than men with chronic conditions and age is known to affect subjective health as well (Beckett et al., 1996).

Analytic procedure

The analyses were performed with SPSS 18. Independent samples t-tests were performed for the dropout analyses. A moderated mediation model was applied to test the interplay of optimism, self-efficacy and objective physical functioning on physical functioning (Preacher et al., 2007). Hierarchical moderated regression procedures recommended by Hayes and Matthes (Hayes & Matthes, 2009) were used to examine the main and interaction effects of optimism and self-efficacy on physical functioning. Before testing interactions, variables were standardized. Missing data (max. 19.1%) were estimated cross-sectionally using all other variables in the dataset as predictors for the Expectation Maximization (EM) algorithm (Enders, 2001). This imputation method performs a two-step estimation of missing data by first forming a missing data correlation matrix and estimating the missing data under certain assumptions drawn from the observed data—the estimation step. After this step, the maximum likelihood step follows and tests the likelihood of the afore estimated values and adjusts them. These two steps are performed consecutively until the estimated values do no longer increase in fit. This method has proven more robust than regression imputation (Gold & Bentler, 2000).

Dropout analyses

The 74 participants who dropped out either at Time 2 or Time 3 were examined for significant differences on the

study variables at Time 1 against those 235 participants, who completed all three measurement points in time. Drop-outs were not different in terms of self-efficacy ($M_{Drop-outs} = 3.05$, $SD = .55$; $M_{Completers} = 3.01$, $SD = .45$, ns) and in objective physical functioning ($M_{Drop-outs} = 44.98$, $SD = 6.45$; $M_{Completers} = 46.13$, $SD = 6.36$, ns). However, participants who dropped out, reported slightly lower perceived physical functioning ($M_{Drop-outs} = 71.87$, $SD = 26.22$; $M_{Completers} = 78.53$, $SD = 23.17$, $p < .05$) and health-specific optimism ($M_{Drop-outs} = 2.99$, $SD = 0.94$; $M_{Completers} = 3.28$, $SD = 0.85$, $p < .05$). In longitudinal research on ageing (including the present study) this selective attrition is not problematic when examining associations between variables (e.g., Kempen & van Sonderen, 2002).

Results

Means, standard deviations, range, and intercorrelations are displayed in Table 1. The association between general self-efficacy and health-specific optimism was $r = .21$, $p < .001$, which underscores the discriminant validity of the two constructs. This suggests that the data is suitable for multiple regression analysis, as all predictors were correlated substantially with the criterion (perceived physical functioning). At the same time, the correlations amongst the predictors were lower than their correlations with the criterion.

The moderated hierarchical regression analysis accounted for 35% of the variance in perceived physical functioning with objective physical functioning, $B = 0.27$, $p < .001$, health-specific optimism, $B = 0.43$, $p < .001$, sex, $B = -0.31$, $p < .001$ and age, $B = -.03$, $p < .001$ contributing mainly to this amount whereas self-efficacy did not make a significant contribution, $B = -0.05$, $p > .05$. The indirect effect of objective physical functioning on perceived physical function via health-specific optimism was $B = .13$, $p < .001$, indicating that health-specific optimism served as a partial mediator. Adding the interaction between optimism and self-efficacy, however, yielded 3% of incremental variance, $B = 0.17$, $p < .001$ (see Table 2; Fig. 1).

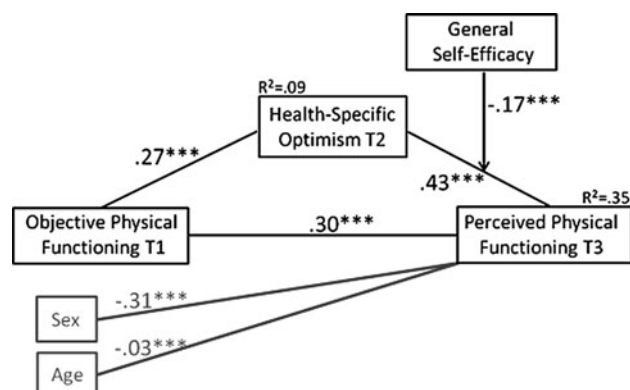
To illustrate this interaction effect, the interaction was decomposed using simple slopes analysis and the regression lines at three levels of the moderator (-1 SD, Mean, $+1$ SD of optimism) were plotted as recommended by Aiken and West (1991). At high levels of self-efficacy, there was no relationship between optimism and perceived physical functioning, whereas at low levels of self-efficacy, individual differences in optimism were responsible for the variation in perceived physical functioning (Fig. 2).

Table 1 Means (M), standard deviations (SD), percentages, ranges and correlations

	M	SD	Range	1	2	3	4	5
1. Sex (1 = male, 2 = female)	58% Male	42% Female						
2. Age	73.27	5.10	65–85	−.09				
3. T1 objective physical functioning	45.89	6.31	13–55	−.13*	−.27***			
4. T2 health-specific optimism	3.15	0.95	1–5	−.05	−.04	.29***		
5. T3 perceived physical functioning	77.50	25.68	0–100	−.18**	−.23	.45***	.49***	
6. T0 general self-efficacy	3.02	0.48	1–4	−.05	<−.01	−.08	.21***	.07

* $p < .05$, ** $p < .01$, *** $p < .001$ **Table 2** Moderated multiple regression analysis predicting T3 perceived physical functioning

	B	t
Constant	2.71***	3.89
Sex (1 = male, 2 = female)	−0.31***	−3.41
Age	−0.03***	−3.35
Objective physical functioning	0.27***	5.39
Health-specific optimism	0.43***	8.95
General self-efficacy	−0.05	−1.01
Interaction optimism*self-efficacy	−0.17***	3.94

*** $p < .001$, total $R^2 = .35$, $p(5, 303) = 33.34$, $p < .001$, $N = 309$ **Fig. 1** Optimism mediates between objective physical functioning and perceived physical functioning, moderated by general self-efficacy ($N = 309$), reported are unstandardized coefficients, T1 = Time 1, T2 = Time 2, T3 = Time 3

Discussion

This study examined the relationship between an objective physical functioning indicator and a quality of life indicator, namely perceived physical functioning in older adults with multiple diseases. The assumption was that this relationship may be mediated by optimistic beliefs. It was confirmed that health-specific optimism operated as a partial mediator between fitness and perceived physical functioning over a 6-month time period. Health-specific

optimism predicted physical functioning better than objective physical functioning did.

In addition, this mediation was qualified by general self-efficacy as a moderator. Individual differences in general optimistic self-beliefs were responsible for the strength of the mediation. General self-efficacy was unrelated to perceived physical functioning. It only had an effect through the interaction with health-specific optimism. Instead of the expected synergism between self-efficacy and optimism, it was found that individual differences in health-specific optimism only played a role when general self-efficacy was very low. For self-efficacious older adults it made no difference whether they harbored health-specific optimism or not. There is no close connection between general self-efficacy and health-specific optimism, but when self-efficacy is high, health-specific optimism does not make a difference in terms of perceived functioning. Harboring self-doubts about overall life competence (low self-efficacy) opens a door to let optimism (or health risk perception) be associated with subjective health. In old age, perceiving poor objective health in conjunction with low general optimism leads to the least favorable judgment of one's fitness.

A limitation of the present study may be that general self-efficacy had been measured only before Time 1 of this study. It had been recorded a year earlier when the older adults had taken part in the DEAS (Wurm et al., 2010). It is possible that results would have changed if this measurement would have been concurrent with Time 1 to Time 3 assessments. On the other hand, there is a large body of evidence that this construct reflects a stable personality trait (e.g., Chen et al., 2000).

In sum, the present findings contribute to our understanding of the mechanisms that might play a role when older adults perceive their physical functioning levels. They seem to use objective physical functioning indicators as a starting point for their judgments but rather independent optimistic beliefs could be as important or even more important for their subjective physical quality of life. People who are optimistic may be so in two ways: They may underestimate their vulnerability, but at the same time

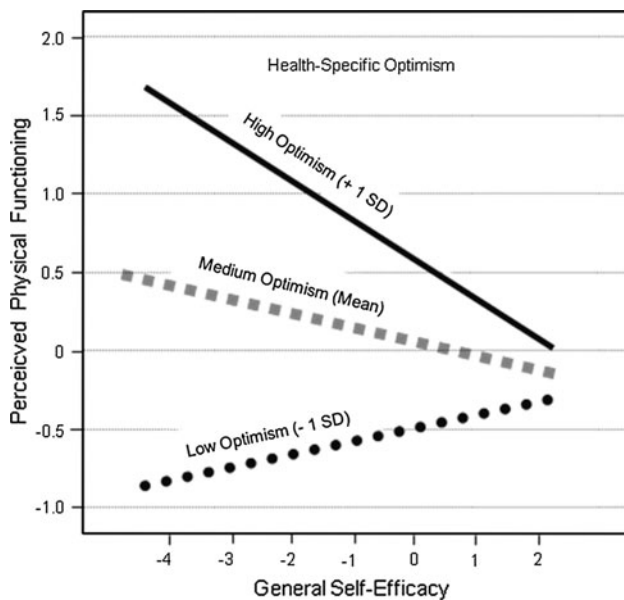


Fig. 2 Interaction between health-specific optimism and general self-efficacy on perceived physical functioning ($N = 309$), reported are centered values for general self-efficacy and perceived physical functioning

may be optimistic about their capability to take precautions (de Ridder et al., 2004; Schwarzer, 1999). Because self-efficacy and optimism may surface simultaneously, risk perceptions alone are often poor predictors of subsequent functioning. The family of optimism constructs need to be explicitly expanded by the notion of *conditional optimism*. Conditional optimism pertains to one's outlook in life while anticipating one's control over future events such as "I will stay healthy because I plan to begin a strenuous exercise regimen in the near future". The particular wording of risk perception or optimism items is of utmost importance when it comes to the prediction of health behaviors (Weinstein et al., 2007).

Optimism is conceptually closely related to happiness, well-being, and satisfaction with life, which are established predictors of health and longevity (Diener & Chan, 2011). Our study can serve to qualify this relation further: Our results suggest that at least in individuals with low self-efficacy, health-specific optimism mediates between objective and subjective physical functioning, an important resource for health behavior. This relation might be one of the working mechanisms underlying the predictive power of positive psychological resources on health and longevity. The more general question to which degree optimism serves as a resilience factor in the face of adversity, such as multimorbidity, requires more research into the diversity of optimism constructs and their interplay with related positive resources or human strengths and values (Aspinwall & Tedeschi, 2010).

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