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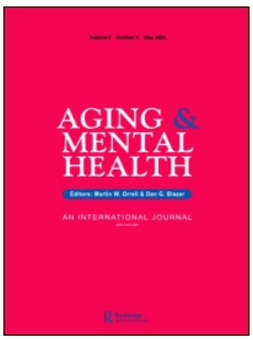

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Interventions based on self-management of well-being theory: pooling data to demonstrate mediation and ceiling effects, and to compare formats

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ABSTRACT

Objectives: Interventions based on self-management of well-being (SMW) theory have shown positive effects, but additional questions remain: (1) Are improvements in well-being, as induced by the interventions, mediated by improved self-management ability (SMA)? (2) Do the interventions show ceiling effects? (3) Is a particular format of SMW intervention (individual, group, or self-help) more effective?

Method: Data of three randomized controlled trials were pooled. The greater part of the sample ($N = 445$) consisted of single older females. A bootstrap analysis was performed to test for mediation. Regression analyses with interaction effects were performed to test for ceiling effects. Controlled and transformed effect sizes (proportion of maximum change) were calculated to compare formats.

Results: There was a full significant mediation of well-being by SMA. A significant interaction (ceiling) effect was found on well-being, but not on SMA. The controlled effect sizes of the raw scores were small to medium (.04–.49), and were small to large after transformation (.41–.73). None of the intervention formats was more effective.

Conclusion: Support for SMW theory was found, i.e. increasing self-management ability lead to improved well-being. Some ceiling effect was found. We conclude that various SMW interventions formats can improve self-management abilities and well-being with medium effects.

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Self-management ability; well-being; mediation

Introduction

By now it is well established that aging well is not only a matter of having the right genes, but also of the way in which individuals actively self-manage their own aging process. The concept of self-management is commonly being applied to the management of chronic diseases (e.g. Corbin, 1998; Lawn & Schoo, 2010; Lorig & Holman, 2003). However, coping with other health-related problems, like physical inactivity (Windle, Hughes, Linck, Russell, & Woods, 2010), or falls (El-Khoury, Cassou, Charles, & Dargent-Molina, 2013), basically also require self-management skills, as do psychosocial health problems, such as depression (Krishna et al., 2011; Samad, Brealey, & Gilbody, 2011), or loneliness (Masi, Chen, Hawkley, & Cacioppo, 2011). Moreover, many older adults do not just need to be able to cope with one specific physical or psychosocial health problem, but rather with multiple and interacting challenges (physical, psychological, and/or social) that need to be managed simultaneously. Consequently, many older people may benefit more from broad self-management interventions which focus simultaneously on the various factors which challenge the maintenance of overall well-being, rather than from interventions which focus on just one problematic aspect of physical or psychosocial health.

So far, broad interventions, focusing – in an integrated way – on maintenance or improvement of both physical and psychosocial well-being in older adults, are scarce. One of the few intervention approaches that does apply this integrated view is the intervention approach based on the theory of self-management of well-being (SMW theory; Steverink, 2014; Steverink, Lindenberg, & Slaets, 2005). SMW theory should be placed in the realm of theories on successful aging, which postulates that individuals who have better overall self-management ability will also be better able to achieve, maintain, or restore physical and psychosocial well-being, and subsequently overall psychological well-being (for an extended discussion of SMW theory and comparison with other theories on successful aging, see Steverink, 2014). SMW theory integrates – unlike most other theories on successful aging (see Steverink, 2014) – concrete domains of well-being, on the one hand, and concrete behaviors that are needed to adequately self-manage these domains, on the other hand. Regarding the domains of well-being, these are derived from basic human needs. SMW theory presumes two basic physical needs (i.e. the needs for comfort and stimulation), and three basic social needs (i.e. the needs for affection, behavioral confirmation, and status). The assumption is that the fulfillment of these physical and social needs yields overall well-being, making these five basic needs the five core domains of well-being (for an extended elaboration of these basic needs and how they compare to other basic human need approaches such as those of Deci and Ryan (2000), see Lindenberg (2013)).

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Regarding the behavioral part, SMW theory specifies six core self-management abilities, which are assumed to be important for managing one's physical and social resources in such a way that physical and social well-being are achieved and maintained, and that losses are managed optimally. The six abilities can be explicated most easily by an example, such as friendship being a resource for fulfillment of the need for affection (and thus for achieving social well-being). Prerequisites in achieving and maintaining friendship are *the ability to take initiative* in making friends and *the ability to be self-efficacious* with regard to one's own behavior in making friends and being a friend. The maintenance of a friendship, furthermore, requires *the ability to invest* in the friendship, which, in turn, is helped by *the ability to have a positive frame of mind* with regard to this friendship in the future. Moreover, *the ability to achieve and maintain multifunctionality* in a friendship means having friends who can fulfill one's need for affection, but at the same time fulfill other important needs such as the need for stimulation (e.g. by jointly participating in interesting activities). Finally, there is *the ability to take care of variety* with regard to friendship, which means that being able to have more than one friend will make one less vulnerable when a friend gets lost.

Regarding the integration of both the domains of well-being and the core self-management abilities, it is important to note that both are explicitly linked in SMW theory, because each of the six abilities needs to be applied to each of the five domains of well-being in order to yield overall well-being. This principle constitutes the 'blueprint' for the design of the SMW interventions (see Steverink et al. (2005) and Steverink (2014) for a detailed description of how these core aspects of SMW theory are translated into the concrete ingredients for the SMW interventions). The hypothesized mechanism is that higher levels of overall well-being should result from higher levels of overall self-management ability, the latter being explicitly taught in the SMW interventions.

In order to test this hypothesized mechanism from SMW theory, our research group developed three SMW interventions, and tested each in a randomized controlled trial (RCT). Because the three interventions were all based on SMW theory, they all contained the same theoretical background, and, therefore, also the same information and exercises. Yet, the interventions varied in format, in order to better suit different target groups, which varied in the extent to which physical and/or psychosocial losses were experienced. The individual SMW intervention targeted older adults who had experienced multiple physical and social losses (Schuurmans, 2004), the SMW group intervention targeted older women who experienced mostly social losses (Kremers, Steverink, Albersnagel, & Slaets, 2006), and the SMW self-help (bibliotherapy) intervention targeted older adults who experienced still minor physical and/or social losses (Frieswijk, Steverink, Buunk, & Slaets, 2006).

All three RCTs demonstrated that, compared to the control groups, the participants in the intervention groups had higher levels of self-management ability and well-being after completing the intervention (Frieswijk et al., 2006; Kremers et al., 2006; Schuurmans, 2004). Yet, although the three SMW interventions have been shown to be effective, three questions remain. First, it has not yet been demonstrated that the hypothesized mechanism from SMW theory, i.e. that well-being will be increased by improving self-management ability (thus self-management ability acting as mediator), is responsible for these effects. Second, it is not yet known whether the SMW interventions suffer from ceiling effects. If an intervention is affected by a ceiling effect, this implies that participants scoring relatively high at pretest would show smaller improvements after the intervention than those scoring low (Judd & Kenny, 1981). It would be needed to test whether higher baseline levels of self-management ability and well-being are associated with a smaller increase in self-management ability and well-being. Third, it is unknown whether one of the intervention formats is more effective than the others, because effect sizes were not calculated, and the intervention effects were not yet compared.

To address these remaining questions, we decided to pool the data of the three RCTs that we executed in the past. This approach generated a sufficient number of participants to allow us to investigate the following three research questions: (1) Is the change in well-being, induced by the SMW interventions, mediated by a change in self-management ability, as hypothesized by SMW theory? (2) Were the SMW interventions affected by ceiling effects? (3) Was one of the SMW intervention formats more effective than the others?

Method

For the purposes of the current study, we reanalyzed the three RCTs in which the efficacy of three SMW theory-based interventions had been tested. These three RCTs have been executed within our own research group, but we checked by a systematic literature search whether other RCTs may have been performed on SMW theory-based interventions. We searched for 'self-management of well-being' in 'all text', in the databases Web of Science, CINAHL, SocINDEX, SmartCat, PsycINFO, and PubMed. We also executed forward reference searching of the source paper on SMW theory by Steverink et al. (2005) in the same databases, and backreference searching on the three RCTs. The search retrieved 77 hits, 34 double records, 35 non-intervention studies, five intervention studies that were non-RCTs or not (or partially) based on SMW theory, and our own three RCTs evaluating the SMW interventions. The first RCT tested the individual SMW intervention (Schuurmans, 2004), the second RCT investigated the group SMW intervention (Kremers et al., 2006), and the third RCT tested the SMW self-help intervention (Frieswijk et al., 2006). In all three RCTs, the control group did not receive the intervention, but completed the assessments according to the time frames of the intervention group. The ethics committee of the University Medical Center Groningen approved the studies, and all of the participants gave informed consent.

SMW interventions

All three interventions were based on SMW theory, and taught participants to apply the six management abilities to the five domains of well-being. The content and the exercises of all three interventions were the same. In the first session, the five domains of well-being were explained to the participants. The participants were then asked to evaluate their own situation along the five domains of well-being by indicating in which of the domains they were experiencing deficits or wanted to change something. In the following sessions, participants were taught how to set goals and to take initiative in changing aspects of one or more of the domains of well-being which were of concern to them. Realistic goal setting

Table 1. Description of the three SMW intervention trials.

	Individual SMW intervention	Group SMW intervention	Self-help SMW intervention
Recruitment	Older participants were recruited between May 2001 and March 2003 in two settings: Department of Internal Medicine of University Medical Center Groningen (65 years or older) and a GP's practice (75 years or older)	Participants were recruited in 2004 through advertisements in local newspapers	In 2001, a random sample of 3000 community-dwelling older people (65 years or older) received a questionnaire
Inclusion and exclusion criteria	Participants had to be frail, as indicated by a score of three or higher on the Groningen Frailty Indicator (Steverink et al., 2001). Other exclusion criteria were (1) having cognitive impairments or dementia, (2) being delirious, (3) having a psychiatric disorder, (4) having a short life expectancy, (5) receiving other therapy, (6) being too ill, (7) not being able to speak Dutch	Single community-dwelling women aged 55 or older were asked to respond if they missed having people around them, wished to have more friends, participated in very few leisure activities, or had trouble initiating activities	Respondents who were slightly to moderately frail, as indicated by a score of one to five on the Groningen Frailty Indicator, were approached to participate
Format of SMW intervention	Individual, home-based	Group	Self-help
Supervision	Yes, one-to-one	Yes, two supervisors per group	Unsupervised
Duration of SMW intervention	Five to six weekly sessions lasting 1−1.5 hours each	Six weekly meetings, each lasting 2.5 hours	Five modules were sent to the participant, one module every two weeks
Baseline sample sizes	$N = 110$ (46 hospital patients and 64 GP patients) Intervention: $N = 56$ Control: $N = 53$	$N = 142$ Intervention: $N = 63$ Control: $N = 79$	$N = 193$ Intervention: $N = 97$ Control: $N = 96$
Post-intervention sample sizes	Intervention: $N = 49$ Control: $N = 50$	Intervention: $N = 46$ Control: $N = 73$	Intervention: = 79 Control: $N = 86$

GP = general practitioner; SMW = self-management of well-being.

and achievement of set goals were aimed to improve their self-efficacy. In the subsequent sessions, participants were taught how to combine various domains of well-being (multi-functionality), and how to build up a variety of resources for each of the domains. The final session focused on how to maintain what was achieved by investing in future activities and social contacts. Throughout the interventions, attention was paid to building a positive frame of mind (e.g. challenging negative thoughts and replacing them with positive thoughts). Although the three interventions had the same theoretical basis and similar exercises and homework, the three interventions varied in mode of delivery. The individual SMW intervention was delivered in a dyadic way; the group SMW intervention was delivered in groups of 8−10 participants with two teachers; the self-help SMW intervention was a bibliotherapy, which participants worked through independently at home. In addition to the various formats, also the target groups and recruitment procedures varied on various aspects, as described in Table 1.

Study instruments

The demographic variables of age, sex, and marital status were collected using a self-report questionnaire. Self-management ability was measured using the Self-Management Ability Scale (SMAS) (Schuurmans et al., 2005). The SMAS consists of six subscales assessing the six self-management abilities: taking initiative, self-efficacy, investment behavior, positive frame of mind, multi-functionality, variety, and a total score. The SMAS consists of 30 items on four- and five-point Likert scales. Scores on the subscales and the total score are transformed into scores ranging from 0 to 100. In the current study, we only report the total score. Two slightly different versions of the SMAS were used, but both have been validated and are considered highly reliable (Cronbach's alphas are .91 and .90, respectively; see Schuurmans et al., 2005; Steverink, 2009). In the second version the five items of the subscale 'positive frame of mind' were adapted to better fit the underlying SMW theory (Steverink, 2009), and two items of the subscale 'multifunctionality' and one item of the subscale 'self-efficacy' were rephrased slightly without changing the content. The original version of the SMAS was used in the studies which evaluated the self-help and the individual SMW interventions, while the second version was used in the study which evaluated the SMW group intervention.

Well-being was assessed using the short version of the Social Production Function Index Level scale (SPF-ILs) (Nieboer, Lindenberg, Boomsma, & Van Bruggen, 2005). The SPF-ILs consists of five subscales which assess the five domains of well-being (i.e. comfort, stimulation, affection, behavioral confirmation, and status), with three items each on a four-point Likert scale. The total score of the SPF-ILs can range from 0 to 45. In the current study, the Cronbach's alpha was .87.

Loneliness was assessed using three items. In the study which evaluated the group SMW intervention, three items of the Loneliness Scale developed by De Jong Gierveld (De Jong Gierveld & Kamphuis, 1985; De Jong Gierveld & Van Tilburg, 1999, 2011) were used: 'I experience a general sense of emptiness,' 'I miss having people around,' and 'Often, I feel rejected.' In the studies which evaluated the individual and the self-help SMW interventions, the three loneliness items of the Groningen Frailty Indicator (GFI) (Steverink, Slaets, Schuurmans, & van Lis, 2001) were used, which were in turn taken from the loneliness scale of De Jong Gierveld, and were rephrased slightly: 'Do you sometimes experience an emptiness around you?' 'Do you sometimes miss people around you?' and 'Do you sometimes feel rejected?' The score on each of the three items was zero or one, and a total score ranging from zero to three was computed. The reliability of the scale was sufficient, with a Cronbach's alpha of .69.

Statistical analyses

Descriptive statistics were performed to describe the demographic variables at baseline. To investigate whether self-management ability is a mediator of well-being, we executed two steps. In the first step, we tested whether the changes in self-management ability and well-being were significantly larger in

the intervention group as compared to the control group using *t*-tests, and whether the changes in self-management abilities and well-being were significantly related using Pearson correlations. If all three tests were found to show significant results, the second step, a bootstrap analysis, could be performed. A macro expansion consisting of a syntax file for SPSS was introduced by Preacher and Hayes (2008) to test for mediation according to the guidelines of Baron and Kenney (1986). The macro generated a mean mediation effect with a 95% confidence interval (CI) by randomly re-sampling the observed dataset 5000 times with replacement. The mediation hypothesis would be accepted if the 95% CI did not include zero.

To investigate whether the SMW interventions showed ceiling effects on self-management ability and well-being, we performed regression analyses with interaction effects. In the first regression analysis, change scores on self-management ability were entered as dependent variables. *Z*-scores of self-management ability, the condition (intervention group coded 1 versus control group coded −1), and the interaction between the condition and the *z*-scores of self-management ability were entered as dependent variables, with sex, marital status, cohabiting, and loneliness as covariates. In the second regression analysis, the same procedure was followed for well-being. This procedure identifies not only the interaction effects, but also the main effects of self-management ability and well-being. The presence of the main effects might be an indication of regression to the mean.

In order to investigate whether one of the SMW interventions was more effective than the other two, controlled effect sizes were calculated (Cohen, 1998) of SMAS and SPF-ILs scores. Effect sizes, Cohen's *d*, were calculated by mean T1 − mean T0/sd_{pooled}, where $sd_{pooled} = \sqrt{[(sd\ T1^2 + sd\ T0^2)/2]}$ for the intervention and the control groups. Controlled effect sizes were calculated by subtracting the effect size of the control group from the effect size of the intervention group. Effects sizes of 0.2 were considered small, while effect sizes of 0.5 medium and 0.7 were considered large (Cohen, 1998). To correct for possible ceiling effects and dependencies of baseline values on the SMAS and the SPF-ILs scores, two actions were taken. First, transformation of the scores was performed. The change score of each participant was calculated as a proportion of its maximum change (Rietveld & Van Hout, 1993). The formula for improvement was T1 − T0/maximum − T0, while the formula for deterioration was T1 − T0/T0 − minimum. As the minimum and the maximum values were different for each study, three different formulas were used. Second, the minimum and maximum baseline values of the three studies were made equal by selecting participants with baseline scores on the SMAS between 15 and 85, and on the SPF-ILs between 8 and 33. Subsequently, transformed controlled effect sizes, Cohen's *d*, were calculated by a mean proportion of change in the intervention group, minus the mean proportion of change in the control group, divided by the pooled standard deviation. The pooled standard deviation is calculated by $\sqrt{[(sd(\text{proportion of change in the intervention group})^2 + sd(\text{proportion of change in the control group}^2)/2]}$.

On both outcome measures, specifically on the SPF-ILs, data were missing. Because paper-and-pencil questionnaires were used, and some of the participants dropped out, there is a fair chance that the data were not missing at random. As we have no clear assumption about missing data, we tested our hypotheses based on available data, and decided not to impute missing data.

Results

Description of the sample

A total of 445 individuals participated: 110 in the individual SMW intervention study, 142 in the group SMW intervention study, and 193 in the self-help SMW intervention study. At baseline, the majority of the sample were female (77%) and living alone (not cohabiting) (59%). The mean age of the sample was 71 years with a standard deviation (sd) of eight years (see Table 2). Four participants were one to six years younger than set in the inclusion criteria. The three studies varied significantly on all of these baseline variables ($p < .001$).

When pooling the data, the baseline characteristics did not differ significantly between the intervention group and the control group, except for the SMAS total score. The intervention group scored significantly lower (57.9 ± 13.7 (208) than the control group (60.9 ± 13.4 (221), $p = .022$).

Table 2. Baseline variables of all three SMW intervention studies.

	Individual % (*n*)	Mean ± sd (*n*) (min − max)	Group % (*n*)	Mean ± sd (*n*) (min − max)	Self-help % (*n*)	Mean ± sd (*n*) (min − max)
Sex						
Male	24% (27)		0% (0)		40% (76)	
Female	76% (83)		100% (142)		60% (113)	
Cohabiting						
Yes	53% (58)		0% (0)		65% (123)	
No	47% (52)		100% (142)		35% (65)	
Age (years)		75 ± 7 (110) (65−91)		64 ± 7 (142) (52−80)		73 ± 6 (193) (59−90)
SMAS total score		58.4 ± 15.8 (104) (11−90)		53.3 ± 11.3 (142) (9−85)		64.8 ± 11.6 (183) (15−95)
SPF-IL total score		27.6 ± 8.7 (69) (8−45)		20.2 ± 5.8 (130) (1−33)		27.5 ± 6.1 (170) (4−45)
Loneliness		1.6 ± 1.1 (110) (0−3)		2.2 ± 1.1 (142) (0−3)		1.3 ± 1.0 (186) (0−3)

sd = standard deviation; *n* = number of participants (sample sizes differ due to missing data); SMAS = self-management ability scale; SPF-IL = Social Production Function Index Level.

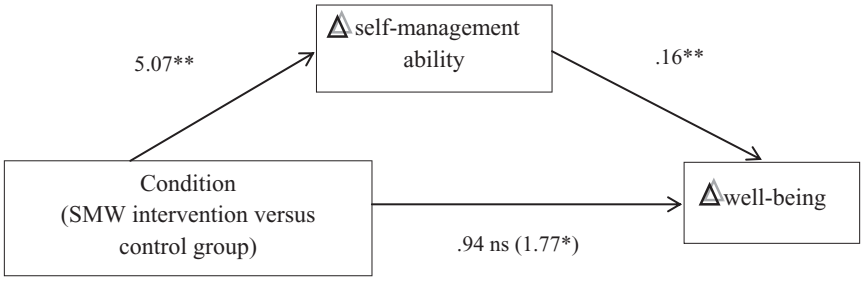

Figure 1. Indirect effect of the SMW interventions on well-being through self-management ability. Coefficients: $^{**}p < .01$, $^{*}p < .025$.

Does the change in self-management ability mediate the change in well-being induced by the SMW interventions?

The results indicated that all three of the factors considered – i.e. condition (SMW theory-based intervention versus control group), change in self-management ability and well-being – were related to each other. There was a significant difference between the intervention and the control group on the change in self-management ability (mean 2.48, sd 7.45 vs. mean −0.87, sd 7.59, $p < .001$) and the change in well-being (mean 0.74, sd 4.94 vs. mean −1.07, sd 3.95, $p = .001$). The change in self-management ability was significantly correlated with the change in well-being.

The bootstrap analysis confirmed the mediating role of self-management ability in the effect of the interventions on well-being ($B = .83$; CI = .43−1.39). In addition, the results indicated that the direct effect of the SMW interventions on the change in well-being became non-significant ($B = .94$, $t(274) = 1.70$, $p = .090$) after controlling for the change in self-management ability, which indicates full mediation. The results are illustrated in Figure 1.

Did the SMW interventions show ceiling effects on self-management ability and well-being?

The results of the first regression analysis showed no interaction effect of the condition, the intervention versus the control group, on the change in self-management ability (see Table 3). The finding of no *interaction effect* indicates that the SMW interventions did not show a ceiling effect on self-management ability. In other words, the participants with higher baseline scores on the SMAS did not benefit less from the intervention than the participants with lower baseline scores. The results of this regression analysis did, however, show a significant *main effect* of self-management ability, indicating that the change scores on self-management ability depended on the baseline scores.

The second regression analysis showed a significant interaction and main effect on well-being (see Table 3). The main and the interaction effects indicate that participants with lower scores on well-being at baseline had larger positive change scores on well-being than participants with higher scores. Although this association was present in both conditions, it was stronger in the intervention condition. The interaction effects indicate a ceiling effect of the intervention on well-being.

Was one form of the SMW intervention more effective than the other two forms?

Based on the uncorrected effect sizes of the self-management ability scores, there appear to have been no differences between the three interventions. The effect sizes ranged from 0.3 to 0.5, and were thus small to medium. The effect sizes of the well-being scores were also small to medium, and ranged from 0.04 to 0.5 (see Table 4).

To correct for ceiling effects and dependencies of baseline values, we calculated the change as a proportion of the possible change. Transforming the controlled effect sizes changed the results on the effectiveness of the interventions. Overall, the transformed controlled effect size of the SMW interventions became medium to large instead of small to medium on both self-management ability and well-being. The effects of the self-help SMW intervention on self-management ability remained small to medium (see Table 4). The transformation of the data did not reveal large differences between the three formats of SMW interventions.

Table 3. Interaction effects of condition on the change in self-management ability and well-being.

					95% Confidence interval	
	B	Std. error	*β*	*p*-Value	Lower	Upper
SMAS						
z-Score SMAS (T0)	−3.2	.38	−.41	<.001	−4.0	−2.5
Condition (intervention versus control)	1.4	.36	1.8	<.001	.68	2.1
Marital status	−1.4	.84	−.09	.098	−3.06	.26
Sex	1.0	.90	.06	.259	−.76	2.8
z-Score loneliness	.07	.40	.01	.865	−.71	.84
z-Score SMAS (T0) × condition	−.58	.36	−.07	.113	−1.3	.14
SPF-IL						
z-Score SPF-IL (T0)	−2.0	.26	−.44	<.001	−3.5	1.3
Condition (intervention versus control)	.86	.24	.19	<.001	−2.5	−1.5
Marital status	−.82	.59	−.09	.164	.39	1.3
Sex	1.3	.64	.12	.045	−2.0	.34
z-Score loneliness	−.21	.27	−.05	.429	.03	2.5
z-Score SPF-IL (T0) × condition	−.75	.24	−.17	.002	−1.2	−.28

SMAS = total score on the Self-Management Ability Scale; SPF-IL = total score on Social Production Function Index Level Scale; T0 = baseline.

Table 4. Controlled and transformed effect sizes of the three different formats of the SMW interventions.

	Form	Individual		Group based		Self-help	
Instrument	Condition	Control	Intervention	Control	Intervention	Control	Intervention
SMAS							
	T0 mean (sd)	62.2 (16.9)	55.2 (15.3)	55.6 (9.0)	51.9 (10.7)	65.7 (11.7)	63.9 (11.6)
	T1 mean (sd)	63.6 (15.9)	57.1 (14.6)	54.8 (8.9)	56.0 (9.6)	63.5 (12.1)	65.9 (9.0)
	Controlled effect size (*n*)	0.04^{S} (92)		0.49^{M} (115)		0.37^{SM} (183)	
	Transformed controlled effect size (*n*)	0.61^{ML} (41)		0.73^{L} (105)		0.41^{SM} (133)	
SPF-IL							
	T0 mean (sd)	29.9 (8.0)	24.6 (8.9)	20.8 (5.5)	19.4 (6.1)	27.5 (5.7)	27.5 (6.4)
	T1 mean (sd)	29.8 (8.3)	28.6 (8.4)	20.3 (4.9)	21.7 (5.1)	25.4 (6.1)	27.5 (4.8)
	Controlled effect size (*n*)	0.47^{M} (55)		0.49^{M} (104)		0.34^{SM} (129)	
	Transformed controlled effect size (*n*)	0.70^{L} (36)		0.63^{ML} (103)		0.58^{ML} (105)	

n = number of participants; sd = standard deviation; S = small; SM = small medium; M = medium; ML = medium large; L = large.

Discussion

Three randomized controlled trials, which were executed separately in the past, demonstrated that older adults who are facing some or more physical, psychological, and/or social losses can benefit from interventions based on SMW theory (Frieswijk et al., 2006; Kremers et al., 2006; Schuurmans, 2004; Steverink et al., 2005). Despite these positive results, additional questions remained which we have investigated in the current study. First, pooling the data of the three trials yielded enough power to allow us to perform a mediation analysis, which confirmed that the change in well-being induced by the SMW interventions was fully and significantly mediated by the change in self-management ability. This finding provides support for SMW theory, and underscores the usefulness of SMW theory-based interventions. Although these results are very promising, additional studies are needed to confirm the robustness of SMW theory, and its usefulness for designing effective interventions. Future research may also apply larger scale longitudinal survey studies, in order to contribute to the empirical basis for SMW theory.

Second, we examined the SMW interventions for ceiling effects. Ceiling effects were found on well-being, but not on self-management ability. Intervention participants with lower levels of well-being at baseline improved, while participants with higher levels of well-being at baseline did not change compared to the control group. A possible explanation for this difference is that fewer participants scored in the highest decile of the SMAS (0.5%) than of the SPF-ILs (2.4%). For these participants, it might have been difficult to further improve on well-being. We are not the first to find a ceiling effect of an intervention on well-being in older adults (Perrig-Chiello, Perrig, Ehrsam, Staehelin, & Krings, 1998). Future studies might consider to select participants based on their level of well-being, excluding individuals with higher levels of well-being. However, this would require clear cut-off points on well-being measures, which are unavailable to our knowledge.

Third, the pooled data gave us the opportunity to investigate whether one format of the SMW interventions was more effective than the others, by examining the controlled effect sizes. Overall, the effects of the interventions on both self-management ability and well-being were small to medium in size. A difficulty we faced in comparing the SMW interventions was the fact that the baseline values differed significantly among the three RCTs, and the post-intervention scores thus depended to a large extent on baseline values. To tackle this difficulty, we also considered matching the participants across the studies, but this procedure would reduce the sample size considerably, to about 20 participants per condition. We, therefore, chose to correct for baseline dependency by transforming the data, equalizing the minimum and maximum values, and then recalculate the controlled effect sizes.

This recalculation of the controlled effect sizes, to correct for baseline dependencies, changed the outcomes. The controlled effect sizes of the SMW interventions generally became medium to large instead of small to medium on both self-management ability and well-being. The transformation of the data did not, however, reveal large differences between the three SMW interventions, indicating that the benefits of the SMW interventions are relatively independent of the format.

Although there were no large differences between the three SMW interventions, we did observe a smaller effect size on self-management ability of the self-help SMW intervention, as compared to the effect sizes of the individual and the group SMW interventions. A potential explanation is the variation in the delivery modes of the interventions. The effects of the self-help SMW intervention might have been smaller because this intervention was unsupervised. Participants of this format did not have the opportunity to ask for clarification, nor were they stimulated by supervisors. Conversely, participants in the group SMW intervention might have benefitted from group dynamics, and support from group members. Yet, we did not investigate this possibility, so it remains speculative.

The study also has some limitations. First, although we corrected for baseline dependency as much as possible in comparing the SMW interventions, other effects which may have influenced our results cannot be ruled out, such as the differences in recruitment procedures and inclusion criteria. Regarding the recruitment procedures, participants for the individual and the self-help SMW interventions have been personally approached, partially in a medical setting, whereas participants for the SMW group intervention were recruited in an open manner, i.e. they had to apply for participation themselves. The latter group might, therefore, have had a stronger motivation to participate, which could have had an influence on the effectiveness of the SMW group intervention. Regarding inclusion criteria, sex differences may have influenced our results, because we found a main effect of sex. Females showed a larger positive change on well-being than males. However, it is difficult to say whether females or males would benefit more from a particular format of SMW intervention, because the group SMW intervention was given to women only.

Another limitation of this study is that two versions of the SMAS were used in separate studies. Still, because the two

versions have comparable Cronbach's alpha values (Schuurmans et al., 2005; Steverink, 2009), we deemed it justified to pool the data of the total scores on the SMAS. Another limitation is that there were no data collected about education, income, or ethnicity. Our findings are, therefore, difficult to generalize to certain subgroups of the older population.

Overall, in this study, we found support for the main mechanism of SMW theory, which is also the core mechanism of the SMW interventions. Moreover, we did not find large differences between the various formats of SMW interventions, and therefore, a specific format of SMW intervention can be offered to potential participants depending on their preference. Concerning the ceiling effect, it is important to communicate about the benefits of the SMW interventions, especially regarding the possible improvement of well-being. Among participants who already have fairly high levels of well-being, the SMW interventions might not lead to further improvements on well-being. The main message should be that for older adults, who experience some or more losses on physical, psychological or social domains of functioning, the SMW interventions can help to improve their self-management ability, which then also will improve their well-being. As such, the SMW interventions can help older adults in continuing to live independently for longer periods of time, and therefore may support healthy and successful aging.

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The authors have no financial benefit or interest to report.

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References

Baron, R.M., & Kenny, D.A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology, 51*, 1173–1182.

Corbin, J.M. (1998). The Corbin and Strauss chronic illness trajectory model: An update. *Scholarly Inquiry for Nursing Practice, 12*, 33–41.

Cohen, J. (1998). *Statistical power analysis for the behavioral sciences*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Deci, E.L., & Ryan, R.M. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry, 11*, 227–268.

De Jong Gierveld, J., & Kamphuis, F. (1985). The development of a Rasch-type loneliness scale. *Applied Psychological Measurement, 9*, 289–299.

De Jong Gierveld, J., & Van Tilburg, T.G. (1999). *Manual of the loneliness scale*. Amsterdam: VU University.

De Jong Gierveld, J., & Van Tilburg, T. (2011). Manual of the loneliness scale 1999. Retrieved September 9, 2014, from http://home.fsw.vu.nl/tg.van.tilburg/manual_loneliness_scale_1999.html

El-Khoury, F., Cassou, B., Charles, M.A., & Dargent-Molina, P. (2013). The effect of fall prevention exercise programmes on fall induced injuries in community dwelling older adults: Systematic review and meta-analysis of randomised controlled trials. *British Medical Journal (Clinical Research Ed.), 347*, f6234. doi:10.1136/bmj.f6234

Frieswijk, N., Steverink, N., Buunk, B.P., & Slaets, J.P. (2006). The effectiveness of a bibliotherapy in increasing the self-management ability of slightly to moderately frail older people. *Patient Education and Counseling, 61*, 219–227. doi:10.1016/j.pec.2005.03.011

Judd, C.M., & Kenny, D.A. (1981). *Estimating the effects of social interventions*. New York, NY: Cambridge University Press.

Kremers, I.P., Steverink, N., Albersnagel, F.A., & Slaets, J.P. (2006). Improved self-management ability and well-being in older women after a short group intervention. *Aging & Mental Health, 10*, 476–484. doi:10.1080/13607860600841206

Krishna, M., Jauhari, A., Lepping, P., Turner, J., Crossley, D., & Krishnamoorthy, A. (2011). Is group psychotherapy effective in older adults with depression? A systematic review. *International Journal of Geriatric Psychiatry, 26*, 331–340. doi:10.1002/gps.2546

Lawn, S., & Schoo, A.M. (2010). Supporting self-management of chronic health conditions: Common approaches. *Patient Education and Counseling, 80*, 205–211.

Lindenberg, S. (2013). Social rationality, self-regulation and well-being: The regulatory significance of needs, goals, and the self. In R. Wittek, T.A.B. Snijders, & V. Nee (Eds.), *Handbook of rational choice social research* (pp. 72–112). Stanford: Stanford University Press.

Lorig, K.R., & Holman, H.R. (2003). Self-management education: History, definition, outcomes, and mechanisms. *Annals of Behavioral Medicine, 26*, 1–7.

Masi, C.M., Chen, H., Hawkley, L.C., & Cacioppo, J.T. (2011). A meta-analysis of interventions to reduce loneliness. *Personality and Social Psychology Review, 15*, 219–266.

Nieboer, A., Lindenberg, S., Boomsma, A., & Van Bruggen, A.C. (2005). Dimensions of well-being and their measurement: The SPF-IL scale. *Social Indicators Research, 73*, 313–353.

Perrig-Chiello, P., Perrig, W.J., Ehrsam, R., Staehelin, H.B., & Krings, F. (1998). The effects of resistance training on well-being and memory in elderly volunteers. *Age and Ageing, 27*, 469–475.

Preacher, K.J., & Hayes, A.F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods, 40*, 879–891.

Rietveld, T., & Van Hout, R. (1993). *The impact of transformations. Statistical techniques for the study of language and language behaviour* (pp. 124–128). Berlin: Mouton de Gruyter.

Samad, Z., Brealey, S., & Gilbody, S. (2011). The effectiveness of behavioural therapy for the treatment of depression in older adults: A meta-analysis. *International Journal of Geriatric Psychiatry, 26*, 1211–1220. doi:10.1002/gps.2680

Schuurmans, H. (2004). *Promoting well-being in frail elderly people: Theory and intervention*. Veenendaal: Universal Press. Retrieved March 5, 2014, from http://dissertations.ub.rug.nl/faculties/medicine/2004/j.e.h.m.schuurmans/

Schuurmans, H., Steverink, N., Frieswijk, N., Buunk, B.P., Slaets, J.P.J., & Lindenberg, S. (2005). How to measure self-management abilities in older people by self-report: The development of the SMAS-30. *Quality of Life Research, 14*, 2215–2228.

Steverink, N. (2009). Self-management ability scale: SMAS-30/versie 2. achtergrond, handleiding en scoring [Self-management ability scale: SMAS-30/version 2. background, manual and scoring]. Retrieved on April 4, 2013, from www.nardisteverink.nl

Steverink, N. (2014). Successful development and aging: Theory and intervention. In N.A. Pachana & K. Laidlaw (Eds.), *The oxford handbook of geropsychology*. Oxford: Oxford University Press.

Steverink, N., Lindenberg, S., & Slaets, J.P.J. (2005). How to understand and improve older people's self-management of wellbeing. *European Journal of Ageing, 2*, 235–244.

Steverink, N., Slaets, J.P.J., Schuurmans, H., & van Lis, M. (2001). Measuring frailty: Development and testing of the Groningen frailty indicator (GFI). *The Gerontologist, 41*(special issue 1), 236–237.

Windle, G., Hughes, D., Linck, P., Russell, I., & Woods, B. (2010). Is exercise effective in promoting mental well-being in older age? A systematic review. *Aging & Mental Health, 14*, 652–669. doi:10.1080/13607861003713232