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# Long-term adherence to a physical activity intervention: The role of telephone-assisted vs. self-administered coping plans and strategy use

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**Objective:** This study investigated the role of coping plans and the use of selection, optimisation and compensation (SOC) strategies within an experimental evaluation of a 26-week physical exercise intervention.
**Methods:** Older women ($N = 86$, $M_{age} = 73.7$ years) were randomly assigned to a telephone-assisted or a self-administered coping planning intervention after 6 weeks' participation in an exercise programme. The number of different coping plans formulated, exercise-specific SOC strategy use and their interaction were used to predict objectively measured long-term adherence to the intervention.
**Results:** The number of coping plans formulated ($\beta = 0.28$) and goal-pursuit strategies reported (sum score of optimisation and compensation strategies, $\beta = 0.39$) predicted adherence to the exercise programme over 20 weeks. The predictive strength of coping plans increased with decreasing numbers of goal-pursuit strategies ($\beta = -0.21$). Women supported via telephone reported significantly more coping plans than did women in the self-administered coping planning group, $F(1,80) = 9.47$, $p = 0.003$.
**Conclusion:** Coping plans have a buffering effect on adherence levels when use of SOC strategies is low. Older women's adherence to physical activities may be improved if they are given direct support in generating coping plans involving strategies of selection, optimisation and compensation.

**Keywords:** adherence; activity intervention; coping plans; strategy use

## Introduction

Promoting regular physical activity in older people is important for various reasons: physical exercise is beneficial for physical (Malbut, Dinan, & Young, 2002) and cognitive health (Etnier, Nowell, Landers, & Sibley, 2006; Heyn, Abreu, & Ottenbacher, 2004), it is thought to reduce the risk of dementia (Larson et al., 2006; Laurin, Verreault, Lindsay, MacPherson, & Rockwood, 2001), and it enhances psychological well-being (Motl & McAuley, 2010; Netz, Wu, Becker, & Tenenbaum, 2005).

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However, due to the intention–behaviour gap – a well known phenomenon in high-intenders who do not take action (Godin & Conner, 2008) – even volunteers in physical activity interventions may be poorly adherent. Volunteers can be considered to be in a post-intentional volition phase, that is, they have already formed an intention (Schwarzer, 2008). At this point, they need to apply self-regulatory skills and strategies to initiate and maintain the recommended activity over the course of the intervention.

Planning when, where and how an action is to be performed, specified as implementation intentions ('*When situation X arises, I will perform response Y*') is known to help initiating health behaviours (Gollwitzer, 1999). In randomised controlled trials with standardised group training programmes it is important to give detailed instructions on *when* and *where* to perform the activities to compare study outcomes. Describing this structured environment might help intenders to utilise this structure for their personal action plans on when, where and how to get started.

Specifically, coping planning, which is mental anticipation of critical situations combined with possible coping solutions (i.e. *if obstacle XY occurs, I will do Z*), can establish a strong cue–response linkage, which is easily accessible if the situation actually occurs (Webb & Sheeran, 2008). Such self-regulation strategy was recently termed 'mental contrasting with implementation intentions' by Bargh, Gollwitzer, and Oettingen (2010). The authors argue that strong goal commitments are required to make implementation intentions work and mental contrasting (i.e. anticipating obstacles that hinder a desired future) results in the required strong goal commitment (Oettingen, Pak, & Schnetter, 2001). Coping planning interventions can help people to shield their goals from distractions (Arbour-Nicitopoulos, Ginis, & Latimer, 2009; Sniehotta, Scholz, & Schwarzer, 2006) and help maintain the behaviour.

Benefits of coping planning on physical activity have been observed in older people, in particular (Reuter et al., 2010). It has been shown that these benefits can be enhanced by assisting participants with their planning (Ziegelmann, Lippke, & Schwarzer, 2006), and that interventions to promote physical activity can be delivered economically and effectively by phone or by post; face-to-face contact is not a necessary condition (Humpel, Marshall, Iverson, Leslie, & Owen, 2004; Marcus et al., 2007).

According to Das, Kar, and Parrila (1996), planning is an anticipatory and conscious process facilitating the achievement of a defined goal. It has been shown that planning can be embedded in an action-theoretical conceptualisation of the model of selection, optimisation and compensation (SOC; Freund & Baltes, 2002). Freund and Baltes suggested that strategies of SOC work in concert with positive developmental processes. Selection or *goal-setting* processes may have different causal and functional origins: whereas elective selection focuses on developing and committing to a hierarchy of personal goals, loss-based selection involves the restructuring of one's goal system when losses in resources occur. Means of compensation may no longer be available and resources may instead be reallocated to more appropriate goals. Optimisation and compensation are both *goal-pursuit* processes involving behaviours such as investing time and effort in achieving a selected goal, but they have different foci. Whereas optimisation strategies focus on achieving higher levels of functioning, compensation strategies focus on the maintenance of goal achievement in the face of declining personal resources, e.g. social network, intellectual functioning or health resources (Jopp & Smith, 2006).

SOC strategies have been found to act as an intervening variable between planning and physical exercise (Ziegelmann & Lippke, 2007b) and to explain age-differential effects of planning (Reuter et al., 2010). However, these results have yet to be replicated in a sample of individuals aged above 64 years, at which time resources are likely to decline (Baltes & Smith, 2003). This study, therefore, investigated the role of coping planning and strategy use within an experimental evaluation of a 26-week exercise programme designed to improve cognitive fitness in older women (>70 years).

**Purpose of the study**

The aim of this study was two-fold: first, we investigated the effect of telephone-assisted vs. self-administered coping planning in the context of a physical activity intervention. In view of previous findings on the positive effects of interviewer-assisted planning interventions (Ziegelmann et al., 2006), our first hypothesis was as follows:

(*H*1) Women in the telephone-assisted planning condition report more coping plans than those in the self-administered condition, and coping plans predict long-term adherence (20 weeks after the planning intervention).

Second, we examined the power of the number of coping plans formulated, self-reported SOC strategy use and their interaction to predict long-term adherence to the intervention, thus disentangling their specific influences (Jopp & Smith, 2006).

We expected that *goal-pursuit* strategies (i.e. optimisation and compensation) would be positively associated with long-term adherence. During the ongoing intervention, participants may also have been involved in *goal-setting* processes (i.e. elective and loss-based selection), which may have influenced their long-term adherence. In particular, we expected loss-based selection to negatively predict adherence. Because, the randomised controlled trial in which this study was embedded tested the effect of a group-based standardised activity intervention on participant cognition, no alternative behaviours (e.g. home-based exercise) were intended. Thus, our second hypothesis was as follows:

(*H*2) Self-reported goal-pursuit strategies are positively associated with adherence when selection strategies are controlled. Loss-based selection is negatively associated with adherence.

We further tested the predictive strength of coping plans for participants with low, mean and high levels of goal-pursuit strategies.

Finally, given that a significant interaction was found between coping plans and goal-pursuit strategies, we combined both hypotheses (*H*1, *H*2) and tested whether the indirect effect of planning treatment (telephone vs. self-administered) via coping plans was moderated by strategy use (moderated mediation model, Figure 1).

As Freund and Baltes (2002) proposed the SOC model to be an integrated system, we additionally tested this moderated mediation model using a composite score of all SOC strategies.

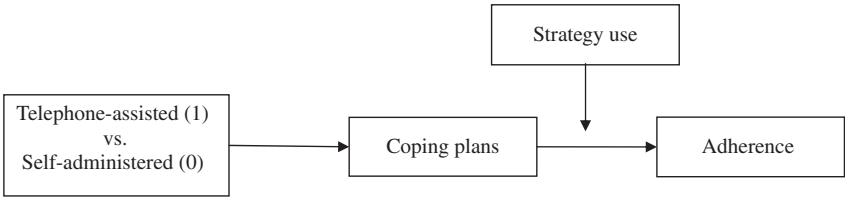


Figure 1. Hypothesised structure of the moderated mediation model. The indirect effect of treatment on adherence via coping plans is moderated by strategy use (goal-pursuit or SOC strategies).

## Method

### *Participants and procedure*

Within a study aiming to improve cognitive fitness in older women, 86 women participated in a physical activity intervention programme. The group-based programme, that involved three 90-min standardised exercise training sessions per week for 26 weeks, combining cardiovascular, strength, flexibility and balance training, is described in detail elsewhere (Klusmann et al., 2010). Participants were recruited by advertisements in newspapers and public transport and through flyers. Prior to randomisation, all participants were comprehensively screened to rule out medical conditions that would preclude their participation. A further eligibility criterion was exercising for less than 1 h per week, with exercise being defined as sports or other types of leisure time physical activity involving increased pulse and perspiration.

In total, seven groups of about 12 women ($N = 86$; $M_{age} = 73.7$ years; standard deviation, SD = 4.1; and age range, 70–90) successively started the physical activity intervention in different locations throughout Berlin. Of the 86 participants, 28% were married, 28% divorced, 34% widowed and 10% single or separated. During the 26-week intervention, on average, 73 exercise sessions (range: 70–74 units) were offered.

After 6 weeks (T1; after about 18 exercise sessions) participants were randomly assigned to either a telephone-assisted ($n = 43$) or a self-administered ($n = 43$; control group) coping planning intervention. All participants ($N = 86$) received the same kind of letter with a coping planning instruction: first, pointing out that formulated plans should be as concrete and unique as possible; second, asking to imagine up to three situations that might prevent exercise participation; and finally, asking to formulate coping plans to overcome those barriers and continue exercise participation. All participants were asked to copy their formulated barriers and plans on an additional sheet and keep this as a reminder. The original planning sheet had to be returned in a postage-paid envelope. We used code numbers instead of participants' names to ensure anonymity.

Additionally, in the telephone-assisted condition, participants were contacted by the first author mostly within 2 days after sending the planning letter. The telephone counselling was based on the same instructions that all participants received with the planning sheet. Participants were helped to identify barriers and how they might be overcome, especially after motivational setbacks, using the technique presented in Ziegelmann et al. (2006; empathetic listening, eliciting self-motivating statements, responding to resistance). The purpose was to elicit if-then conditions from the

Table 1. Coping plans, adherence (as percentage) and strategy use: intercorrelations and descriptive statistics.

| | 2 | 3 | 4 | 5 | 6 | 7 | *M* | *SD* |
|---|---|---|---|---|---|---|---|---|
| 1. Coping plans | 45*** | 0.24* | −0.01 | 0.14 | 0.17 | 0.02 | 1.35 | 1.17 |
| 2. Adherence (20 weeks) | | 0.45*** | 0.01 | 0.31** | 0.35** | 0.03 | 65.27 | 31.38 |
| 3. Goal-pursuit strategies | | | 0.50*** | 0.55*** | 0.89*** | 0.08 | 2.93 | 0.61 |
| 4. Loss-based selection | | | | 0.30** | 0.74*** | −0.16 | 2.11 | 0.93 |
| 5. Elective selection | | | | | 0.76*** | −0.20 | 3.16 | 0.91 |
| 6. SOC strategies | | | | | | −0.10 | 2.78 | 0.62 |
| 7. Age | | | | | | | 73.51 | 4.03 |

Note: *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

participants (e.g. 'If I feel tired, I will focus on how satisfied and proud I will feel after the workout'). Finally, participants were encouraged to fill out and return the planning sheet.

After completion of the 26-week physical activity intervention (T2), 80 women participated in a follow-up assessment. The key outcome variable considered in this article is adherence to the physical activity intervention after assessment of coping plans (i.e. over 20 weeks). Means, SDs and intercorrelations are presented in Table 1.



### *Measures*

*Adherence* was defined as the percentage ratio of exercise sessions attended to exercise sessions offered. Attendance was recorded by trainers in each course unit. The outcome measure in this article was long-term adherence (20 weeks) after assessment of coping plans.

*Coping plans* were measured as a continuous variable, with one point being awarded for each coping plan formulated (range: 0–4). Examples of coping strategies are motivational self-instructions, emotional control and use of resources (aids, skills or persons). Higher coping plans scores indicate that respondents identified more plans to overcome barriers, regardless of the number of barriers identified. The coping plans of women who did not return the planning sheet were coded as zero.

*SOC strategy use (optimisation, compensation, elective and loss-based selection)* was measured retrospectively after completion of the physical activity intervention (T2). The generic SOC strategies questionnaire by Freund and Baltes (2002), as adapted by Ziegelmann and Lippke (2007a), was adjusted to apply specifically to the physical activity intervention. Reponses were given on a four-point scale ranging from *strongly disagree* (1), *disagree* (2), *agree* (3) to *strongly agree* (4). The items cited below are translations from the original German.

*Optimisation* strategies (Cronbach's $\alpha = 0.62$) were assessed by three items preceded by the following introduction: 'Please think back to your *Berlin Stays Fit* course. We are interested in your behaviour relating to your attendance of the course over the last six months'. The introduction was followed by three items such as 'I did everything possible to put my plans to participate in the course into practice'.

*Compensation* strategies (Cronbach's $\alpha = 0.77$) were assessed by three items preceded by the following introduction: 'In the past 6 months there must have been times when it was difficult to participate in your course. What did you do in such

situations? Please think back to the questionnaire you completed on ways of overcoming ''internal resistance''. You were asked what you could do to ensure your participation in the course despite difficulties'. The item stem: 'If it was difficult for me to participate in the course' was followed by three items such as: 'I tried even harder to make up for what I had missed'.

The *goal-pursuit strategies* score was the sum score of the optimisation and compensation strategy scores (Cronbach's $\alpha = 0.73$).

*Elective selection* strategies (Cronbach's $\alpha = 0.89$) were assessed using the same introduction as optimisation strategies, followed by three items (sample item: 'In attending the course, I committed myself to one or two important goals').

*Loss-based selection* strategies (Cronbach's $\alpha = 0.80$) were assessed using the same introduction and stem as compensation strategies, followed by three items (sample item: 'I carefully considered on which days I could still participate under these circumstances').

The *SOC strategies* score was a composite score of all 12 items (Cronbach's $\alpha = 0.85$).



### *Statistical analyses*

One-way ANOVA was used to test the effect of treatment on coping plans. The Sobel *Z*-test was used to test for mediated effects, using an SPSS macro provided by Preacher and Hayes (2004) to examine whether the indirect influence of the treatment on long-term adherence through coping plans was significant (20 weeks; *H*1). As the Sobel *Z*-test assumes a normal distribution of the indirect effect, which is the case only in large samples (Preacher & Hayes, 2008), we additionally used a product-of-coefficients strategy with bootstrapping (Hayes, 2009; Preacher, Rucker, & Hayes, 2007; Shrout & Bolger, 2002).

We conducted a hierarchical regression analysis regressing long-term adherence on coping plans in the first step, goal-pursuit strategies and loss-based and elective selection strategies in the second step and the interaction of goal-pursuit strategies and coping plans in the third step (*H*2).

To determine whether the strength of the hypothesised indirect effect was conditional on the degree of use of goal-pursuit strategies, we tested a moderated mediation model (Figure 1) using an SPSS macro (MODMED Macro Model 3) provided by Preacher et al. (2007). Given that a significant interaction effect was found between coping plans and goal-pursuit strategies, we conducted regression analyses with bias-corrected (BC) bootstrapping for accurate confidence intervals (CIs, MacKinnon, Lockwood, & Williams, 2004) for participants with low, mean and high levels of goal-pursuit strategies (mean $\pm$ 1 SD). As interactions were included in the analyses, variables were standardised and *B* coefficients were interpreted. All analyses were performed using PASW 18.0.

## Results

### *Randomisation check and attrition analysis*

Results of ANOVAs comparing the two treatment groups in terms of motivational variables (e.g. intention to participate, exercise self-efficacy), self-reported average exercise per week measured before randomisation to groups, years of education and

age, suggest that randomisation was successful (all $F$ ratios n.s.). Marital status did not differ significantly across the two treatment conditions, $\chi^2$ (4) = 3.42, $p = 0.49$.

In terms of treatment effects, data from four women (two in each condition) could not be analysed. All women in the telephone-assisted condition were reached by phone; however, two women already had returned their planning sheets before the telephone call and were thus excluded from this analysis. One woman did not return the planning sheet after being reached by phone and so her coping plans were coded as zero. Average duration of telephone calls in the analysed sample ($n = 41$) was 11 min (range: 4–19). Two women in the control group withdrew from the course after one unit and were therefore excluded from the analysis.

The return rate of planning sheets was not significantly higher in the telephone-assisted group: 97.6% ($n = 40$) in the telephone-assisted condition vs. 90.2% ($n = 37$) in the control group, $\chi^2$ (1) = 1.92, $p = 0.17$.

Of the remaining 82 women included in the planning analysis, four did not return for follow-up assessment (telephone-assisted condition: $n = 3$) due to health complaints. Data on strategy use are therefore available from $n = 78$ women (91% of study sample; Figure 2). Of the four women lost at follow-up, one woman (telephone-assisted condition) dropped out after course unit 40 due to illness, having reported one coping plan. The other three women were completely non-adherent (attendance = 0%) without giving reasons during the physical activity intervention and having reported no coping plans; two women did not return the planning sheet, one woman returned it but reported no coping plan.



### *Adherence data*

Overall, course participation after the planning session was on average 65.27% (SD = 31.38). Specifically, average adherence was 63.5% (SD = 34.0) in the telephone-assisted condition and 67.1% (SD = 28.8) in the control group. The slight difference between the treatment groups was not significant, $F(1,80) = 0.27$, $p = 0.607$.

### *Treatment effects on adherence via coping plans*

Women in the telephone-assisted condition formulated significantly more coping plans ($M = 1.73$, SD = 1.16) than did women in the control group ($M = 0.98$, SD = 1.06), $F(1,80) = 9.47$, $p = 0.003$, with treatment having a mean effect of $d = 0.67$ on the number of reported coping plans. Intercorrelations with long-term adherence were significant for both groups, but higher for the telephone-assisted condition ($r = 0.56$, $p < 0.001$) than the control group ($r = 0.37$, $p = 0.02$).

Treatment had no significant simple effect on adherence. The data revealed a significant indirect effect of treatment through formulating coping plans on long-term adherence (Sobel $Z = 2.56$, $p = 0.01$). According to Hayes (2009) and Preacher and Hayes (2004) this effect can be labelled *indirect* effect instead of *mediated* effect, which is thought to be a special case of indirect effects. Bootstrapped 99% CIs ranging from 0.04 to 0.70 corroborated the findings of a mean indirect effect of $B = 0.33$, SE = 0.13. These findings support our first hypothesis.

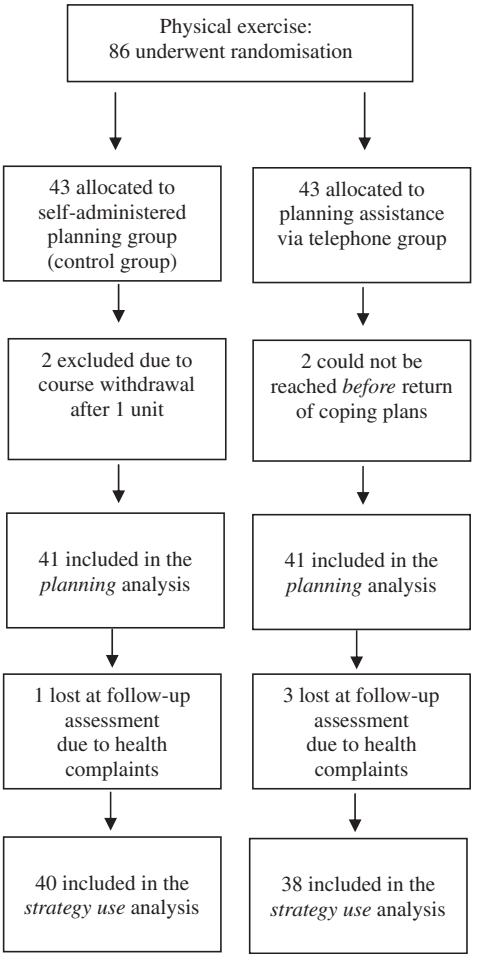


Figure 2. Flow of participants in the telephone-assisted group vs. the self-administered planning group (control group).



### *Coping plans and SOC strategy use as predictors of adherence*

The results of the hierarchical regression analysis are presented in Table 2. Coping plans emerged as a significant predictor of adherence (first step). As expected, goal-pursuit strategies positively predicted adherence over and above coping plans, whereas loss-based selection negatively predicted adherence. Elective selection had no significant influence (second step). The interaction of goal-pursuit strategies and coping plans increased the amount of variance explained by 4% (third step). Overall, the variables examined explained 34% of variance in adherence.

We next used an SPSS macro provided by Hayes and Matthes (2009) to examine the interaction of three levels (mean $\pm$ 1 SD) of goal-pursuit strategies, with loss-based selection as a covariate. The data showed that the number of coping plans formulated had a significant effect on adherence when goal-pursuit strategy scores were mean ($t = 2.93$, $p = 0.005$) or low ($-1$ SD; $t = 3.49$, $p < 0.001$). The macro also produces an additional output to assist in the visualising of the conditional effect of coping plans (Figure 3).

Table 2. Hierarchical regression predicting long-term adherence to the physical activity intervention.

| Steps | Predictor | $\beta_{\text{Step 1}}$ | $\beta_{\text{Step 2}}$ | $\beta_{\text{Step 3}}$ |
|---|---|---|---|---|
| 1. | Coping plans | 0.40*** | 0.27** | 0.28** |
| 2. | Goal-pursuit strategies | | 0.45** | 0.39** |
| | Loss-based selection | | −0.24* | −0.26* |
| | Elective selection | | 0.10 | 0.08 |
| 3. | Goal-pursuit strategies × coping plans | | | −0.21* |
| $\Delta R^2$ | | 0.16*** | 0.19*** | 0.04* |
| Adjusted $R^2_{\text{cum}}$ | | 0.15 | 0.31 | 0.34 |

Notes: $n = 78$. $Z$-standardised regression coefficients are reported.
*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

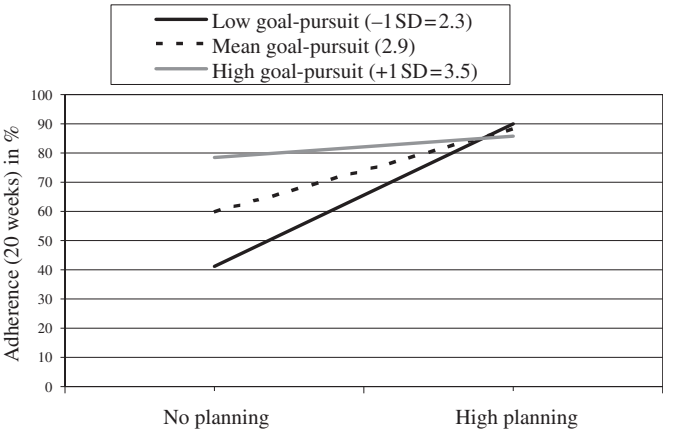


Figure 3. The lower the use of goal-pursuit strategies, the stronger the effect of coping plans.



### *Testing the moderated mediation model*

To test whether the indirect effect of treatment through coping plans was moderated by goal-pursuit strategies, we conducted a BC bootstrapped moderated mediation analysis, with loss-based and elective selection as covariates (Table 3). The mediator variable model confirmed that treatment predicted the number of coping plans formulated, with women in the telephone-assisted condition identifying significantly more coping strategies than women in the control group ($B = 0.68$, $p = 0.003$). Use of loss-based and elective selection strategies had no significant influence on coping plans.

The moderator variable model revealed that coping plans and goal-pursuit strategies significantly predicted adherence. Loss-based selection had a significant negative influence, whereas elective selection and treatment condition had no significant influence on adherence. The significant interaction shows that goal-pursuit strategies moderate the link from coping plans to adherence. In other words, the indirect effect of the treatment on adherence through coping plans was moderated by goal-pursuit strategies, and this effect was significant when goal-pursuit strategy

Table 3. Conditional indirect effect of treatment: results from regression analyses.

| Predictor | *B* | SE | *t* | *p* |
|---|---|---|---|---|
| | Mediator variable model (DV: coping plans) | | | |
| Constant | −0.33 | 0.15 | −2.20 | 0.030 |
| Treatment[a] | 0.68 | 0.22 | 3.13 | 0.003 |
| Loss-based selection | 0.01 | 0.11 | 0.05 | 0.963 |
| Elective selection | 0.11 | 0.11 | 0.95 | 0.344 |
| | Dependent variable model (DV: adherence) | | | |
| Constant | 0.21 | 0.14 | 1.54 | 0.128 |
| Treatment | −0.33 | 0.20 | −1.63 | 0.108 |
| Coping plans | 0.34 | 0.10 | 3.34 | 0.001 |
| Goal-pursuit strategies | 0.35 | 0.13 | 2.72 | 0.008 |
| Coping plans × goal-pursuit strategies | −0.22 | 0.10 | −2.20 | 0.031 |
| Loss-based selection | −0.27 | 0.11 | −2.53 | 0.014 |
| Elective selection | 0.11 | 0.11 | 0.96 | 0.338 |

Conditional indirect effect of goal-pursuit strategies, mean ± 1 SD (DV: adherence)

| Goal-pursuit strategies | Boot indirect effect | Boot SE | Boot *z* | Boot *p* | 95% BC CIs |
|---|---|---|---|---|---|
| −1 SD (−1.0) | 0.38 | 0.15 | 2.50 | 0.013 | LL = 0.1338 UL = 0.7433 |
| Mean (0.00) | 0.23 | 0.11 | 2.15 | 0.032 | LL = 0.0777 UL = 0.5107 |
| +1 SD (1.0) | 0.09 | 0.10 | 0.87 | 0.384 | LL = −0.0497 UL = 0.3746 |

Notes: BC CI = bias-corrected confidence interval.
$n = 78$. Standardised regression coefficients are reported.
[a]0 = control group, 1 = telephone-assisted condition; bootstrap sample size = 5000.



scores were mean or low (−1 SD). BC bootstrapped CIs corroborated the results: none of the CIs of mean or low levels of goal-pursuit strategies contained zero.

An additional analysis with the composite SOC strategies score as a moderator revealed an equally strong interaction with coping plans ($B = -0.28$, $p = 0.018$), but no significant influence on adherence ($B = 0.15$, $p = 0.17$).

## Discussion

This study demonstrated the effectiveness of elicitation of coping plans in increasing older women's adherence to a physical activity intervention over 20 weeks. Results showed that self-reported goal-pursuit strategies significantly predicted adherence over and above the number of coping plans formulated. The positive effect of coping plans was stronger for participants with mean or low goal-pursuit strategy scores. Furthermore, provision of additional planning assistance by telephone was an effective tool in increasing the number of coping plans reported.

Women reporting high use of goal-pursuit strategies were most effective in exercising within the framework of the intervention. High attenders were characterised by having invested time and effort in the programme (optimisation), having modelled other successful persons and increased their effort in the face of barriers (compensation), but not by having to restructure their goal hierarchy due to losses (loss-based selection). We conclude that the beneficial impact of optimisation

and compensation is especially high when participants remain sufficiently healthy to exercise and loss-based selection is not yet necessary.

Furthermore, the number of coping plans formulated predicted exercise adherence. The significant interaction of coping plans and strategy indicated that coping plans were a particularly effective means of accomplishing goals for participants who reported using only few goal-pursuit strategies (or, similarly, only few SOC strategies).

We interpret these findings as indicating that deficits in goal-pursuit strategies can be buffered by coping plans: with increasing age, the available resources are reduced, the remaining resources are increasingly invested in processes of repair, and a focus on gains is shifted to a focus on avoiding or compensating for losses (Baltes & Smith, 2003; Jopp & Smith, 2006). Frequent use of SOC strategies becomes more difficult; in particular, diminishing resources impact the use of optimisation and compensation strategies (Freund & Baltes, 2002). In other words, our results showed that a lack of coping plans was especially disadvantageous when participants used few goal-pursuit strategies, as it resulted in lower adherence.

Our findings add to results of Reuter et al. (2010). In a sample of 19 to 64-year-old individuals, they report on the increasing strength of the association between coping planning and physical activity with increasing age. We showed that coping plans predicted physical exercise adherence regardless of age in a sample of women beyond 70 years (no interaction was found between age and coping plans). Bargh et al. (2010) discussed goal characteristics, such as goal difficulty and intrinsic goal formation that moderate the effect of *if-then plans* on goal attainment. Both are likely to have influenced the positive association of coping plans and behaviour in our sample; participants are likely to be intrinsically motivated, because study participation was on a voluntary and unpaid basis and physical exercise can be regarded as a difficult and complex behaviour, needing the assistance of *if-then plans* to a greater extent compared to easy goals.

We assume that coping plans enabled participants faced with loss of resources to establish a strong cue–response linkage and thus to put their remaining resources to optimal use (Bargh et al., 2010; Webb & Sheeran, 2008). Their focus seems to be shifted from losses to gains (here: getting fitter by participating in an exercise intervention).

We expect that the effect of coping plans in persons with low SOC strategy use would even be stronger in settings allowing for alternative behaviours, such as home-based exercise. In our study, loss-based selection (e.g. restructuring one's goal hierarchy and focusing on alternative goals) is necessarily associated with lower adherence.

Two strengths of this study should be noted: first, exercise levels were measured objectively, and second, the effect of coping plans on exercise was analysed for a relatively long period of 20 weeks (Reuter et al., 2010; Scholz, Sniehotta, Burkert, & Schwarzer, 2007). Furthermore, the study showed that a telephone contact does not enhance adherence rates above and beyond the effects of coping planning, which may be self-administered or administered through telephone assistance. The significant indirect effect of treatment indicates that telephone support worked only through enhanced coping planning, which in turn increased adherence.

## Limitations

Some limitations should be discussed. Use of SOC strategies was measured after completion of the exercise intervention, which does not allow the identification of clear-cut cause-and-effect relationships. It is also possible that exercise behaviour influenced self-reported strategies. Furthermore, the telephone-assisted planning group did not outperform the control group, although these participants reported more coping plans. It is possible that this group's responses were affected by social desirability bias, resulting in more coping plans due to the telephone call. Further research may test a simple reminder telephone call to complete the planning sheet in a control group to rule out this possible effect.

Nevertheless, it is likely that the non-adherence (attendance = 0%) of five persons (12.2%) in this group after the planning assessment occurred by chance; these five persons reported no coping plans at all, relative to three (7.3%) non-adherers in the control group, of whom at least one reported a coping plan.



## Conclusion

We showed that prompting people to create coping plans led to more coping plans, and more coping plans were associated with better physical exercise adherence. Other researchers have shown telephone-assisted support with 9–14 telephone calls over a 6-month period to be effective in encouraging participants to adopt or increase physical activity (Green et al., 2002; Marcus et al., 2007). We showed that a written assessment of coping plans, combined with a single telephone call, during which coping plans were generated, was valuable in increasing the number of coping plans which were, in turn, related to adherence to 20-week programme of intense physical activity. This treatment is less costly for staff as well as for participants, especially compared with face-to-face interventions.

We provided evidence for coping plans having a buffering effect on adherence levels when use of SOC strategies is low. Future research should further examine the effects of coping plans in older people by helping them to mentally anticipate obstacles and to identify appropriate SOC strategies as responses to those obstacles.

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