

# Personality Plasticity in Later Adulthood: Contextual and Personal Resources Are Needed to Increase Openness to New Experiences

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The central objective of the present study was to investigate whether it would be possible to facilitate increases in openness to new experiences in later adulthood. Specifically, we investigated whether individuals with higher internal control beliefs (personal resource) provided with training to successfully prepare them for a challenging volunteering context (contextual resources) would increase in openness. Participants of the training program ( $n = 148$ , 44–72 years,  $M_{\text{age}} = 62.80$ ) and a control group of volunteers ( $n = 92$ , 46–80 years,  $M_{\text{age}} = 63.01$ ) were assessed 3 times: before the training program (T0), after the training program (T1), and 1 year later (T2). As expected, there was a significant training by internal control beliefs interaction such that participants of the training program with higher internal control beliefs increased significantly in openness relative to control participants between T1 and T2. The current study provides evidence for the plasticity of personality in later adulthood and confirms the importance of both personal and contextual resources.

*Keywords:* openness to new experiences, personality change, plasticity, intervention, internal control beliefs

One of the central tenets of lifespan psychology is that human development is characterized by a considerable degree of *plasticity* (Baltes, 1987; Kessler & Staudinger, 2007; Lerner, 1996; Staudinger, Marsiske, & Baltes, 1995). Plasticity denotes the potential for the modifiability of developmental trajectories within an individual (Baltes, Lindenberger, & Staudinger, 2006). Numerous studies have provided robust and strong evidence of the plasticity of cognitive development across the life span (e.g., Lövdén, Bäckman, Lindenberger, Schaefer, & Schmiedek, 2010). For instance, cognitive training interventions stimulate more positive patterns of cognitive development across a range of indicators (Lindenberger & Kray, 2005). Recently, evidence has been presented that physical fitness interventions can stimulate positive cognitive development in later adulthood and old age (Colcombe & Kramer, 2003; Voelcker-Rehage, Godde, & Staudinger, 2011). In contrast to the cognitive domain, very little is known to date about the plasticity of personality development (Böhmig-Krumhaar,

Staudinger, & Baltes, 2002). This seems to be the result of heavy debate within the field regarding whether personality develops at all after age 30, let alone whether there is plasticity in this development (Baltes et al., 2006; Costa & McCrae, 1994; Helson, Kwan, John, & Jones, 2002). Furthermore, the lack of interest in the plasticity of personality development may be related to a lack of consensus about which patterns of personality development are most desirable. In the case of cognitive development, it seems more obvious that to remember more is better than to remember less, and to process information more quickly and accurately is more desirable than to process more slowly and less accurately (for the relativity of this argument, however, see, e.g., Baltes et al., 2006).

In the present study, we tested the plasticity of one personality characteristic, namely, openness to new experiences (hereafter, openness). Openness involves attentiveness to inner feelings, active imagination, aesthetic sensitivity, preference for variety, and intellectual curiosity (Costa & McCrae, 1992). Individuals high on this trait welcome change and seek new experiences, whereas people low in openness tend to be more conventional in their beliefs and behavior and prefer familiar routines to new experiences. We selected openness as the focus of this study for two reasons: (a) Openness has repeatedly been identified as an important correlate of personality maturity as indexed by constructs such as ego level, wisdom, personal growth, and purpose in life (Compton, Smith, Cornish, & Qualls, 1996; Mickler & Staudinger, 2008; Schmutte & Ryff, 1997; Staudinger, Lopez, & Baltes, 1997), and (b) openness typically declines after midlife (Donnellan & Lucas, 2008; McCrae et al., 1999; Roberts, Walton, & Viechtbauer, 2006). Thus, it may be useful to investigate whether it is possible to avoid decreases or to stimulate increases in openness among

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older adults, and if so, to identify the personal and contextual conditions that facilitate the positive plasticity of openness.

### Is There Plasticity of Personality Characteristics During Adulthood?

A variety of longitudinal studies have demonstrated event-related plasticity in the Big Five personality traits, that is, neuroticism, extraversion, agreeableness, conscientiousness and openness (Bagby, Joffe, Parker, Kalemka, & Harkness, 1995; Costa, Herbst, McCrae, & Siegler, 2000; Lambert & Supplee, 1997; Piedmont, 2001; Roberts & Chapman, 2000; Robins, Caspi, & Moffitt, 2002; Trull, Useda, Costa, & McCrae, 1995). For example, analysis of data from the Duke Longitudinal Study demonstrated that the experience of divorce increased neuroticism and decreased extraversion among men, whereas the opposite pattern was evident for women (Costa et al., 2000). Experiencing tense, dissatisfying, and abusive relationships has been associated with increases in neuroticism (Roberts & Chapman, 2000; Robins et al., 2002). In contrast, work satisfaction has been associated with decreases in measures of neuroticism in women (Roberts & Chapman, 2000). There are also several studies showing that psychotherapeutic interventions can stimulate changes in personality traits (Bagby et al., 1995; Lambert & Supplee, 1997; Piedmont, 2001; Trull et al., 1995). Three months of treatment have been found to stimulate decreases in neuroticism (Bagby et al., 1995; Trull et al., 1995), as well as increases in agreeableness (Trull et al., 1995) and increases in extraversion (Bagby et al., 1995). These findings suggest that particular contextual resources such as positive work experiences or clinical interventions can foster personality plasticity.

To the best of our knowledge, so far only one study has investigated the potential for increases in openness after a multimodal intervention (Piedmont, 2001). During this program, participants (chronic polysubstance abusers) met 6 hr/day, 5 days/week for 6 weeks. The aim of the treatment program was to empower participants to overcome their addiction and to find employment. The pre-post intervention comparison revealed a significant increase in participants' openness. Unfortunately, however, no control group was included in this study, and the selective sample may limit the generalizability of the results. Still, the findings of this study suggest that fostering an individual's subjective sense of personal efficacy and procurement of skills that help people to practically master new situations (e.g., vocational skills), together with entry into new situations in which they can apply their skills (e.g., vocational contexts), seem to be supportive of increases in openness.

### Both Contextual and Personal Resources Are Needed to Support Plasticity in Openness: Competence Training and Internal Control Beliefs

Individuals are more likely to want to approach novel situations (i.e., be high in openness) if they feel that they can cope with new contexts and if past experiences in novel situations have been positive. In contrast, novel situations may be appraised as threatening (and thus avoided) if the individual feels that he or she lacks the appropriate resources for dealing with the situation or feels uncertain about the outcome, especially if aspects of the novel

situation have been associated with negative outcomes in the past (Lazarus & Folkman, 1984).

### Contextual Resources

Training that helps people develop the competences to master a certain novel situation increases the likelihood that the novel situation will be appraised as a challenge, instead of a threat, as well as the likelihood that the challenge will be mastered. In turn, successful experiences in a challenging situation may increase the likelihood that the individual will seek novel situations in the future. In other words, training together with mastering a new and challenging situation may stimulate an increase in openness (cf. Lazarus & Folkman, 1984; Piedmont, 2001).

### Contextual Effects Differ Depending on Personal Resources

It has been demonstrated that contexts (such as training) do not exert the same effects on different individuals (e.g., Elder, 1998). The degree and direction of (personality) plasticity depend not only on the contextual resources available to the individual, such as training and/or experience in new contexts, but also his or her personal resources (Greve & Staudinger, 2006; Staudinger et al., 1995). Certain personal resources may serve as "general purpose resources" that predispose individuals toward the maintenance of resources or toward gaining resources across situations (Baltes et al., 2006; Hobfoll, 1989). One such general purpose resource is an individual's *internal control beliefs* (e.g., Aldwin, Sutton, & Lachman, 1996). Internal control beliefs reflect a person's conviction that his or her ability to perform certain tasks or achieve certain outcomes depends on his or her own behavior, skill, effort, or personal characteristics (Levenson, 1981; Rotter, 1966). In comparison, *external control beliefs* refer to the conviction that an outcome is a function of chance, luck, or fate, or is under the control of powerful others (Levenson, 1981).

Evidence suggests that individuals with higher internal control beliefs are more likely to profit from competence training and experiential interventions than those with lower internal control beliefs. People with higher internal control beliefs tend to have more positive attitudes toward training opportunities because they expect that training will result in tangible benefits and are more motivated to learn (Renn & Vandenberg, 1991). Furthermore, perceiving a contingency between one's own actions and outcomes makes it more likely that an individual will proactively engage in behaviors (e.g., use strategies, skills) to influence a situation (Aldwin et al., 1996; Lazarus & Folkman, 1984). For instance, people with higher levels of internal control have a higher tendency to purposefully try to control their health through diet and exercise (Lachman & Prenda Firth, 2004). People with higher internal control beliefs are also attracted by situations in which they believe that their personal abilities can exert control over the environment (Julian & Katz, 1968; Kabanoff & O'Brien, 1980). Given a higher motivation to learn, greater tendency to apply strategies to a situation, and motivation to exert control over an environment, there may be more transfer from training to the situation among people with higher internal control beliefs. Finally, there is evidence that having high internal control beliefs helps to buffer against contextual stressors (Callan, Terry, & Schweitzer, 1994;

Cohen & Edwards, 1989; Seeman & Robbins, 1994; Terry, 1991), which may likewise help people with higher internal control beliefs to better master a novel and possibly stressful situation.

Internal control beliefs, however, may also have negative effects with regard to openness if the person lacks the necessary competencies for successfully coping with a challenging situation and in turn attributes stress or failure to his or her own abilities and behavior, resulting in a reluctance to approach other novel situations. Furthermore, the tendency of internally controlled people to use problem-focused coping strategies will result in success only to the extent that the person has the appropriate “tools” and strategies. In short, it is the particular combination of internal control beliefs with the knowledge and skills of how to best master a situation (provided, for instance, by training) that should result in more positive attitudes toward novel and potentially challenging situations.

In sum, we argue that the particular constellation of higher internal control beliefs in combination with a training program and the actual experience of a challenging new situation has the potential to stimulate increases in openness. Empowering people to master a new, challenging situation through training should result in increased openness, especially for people with high internal control beliefs because such individuals are more likely to (a) experience the situation as a challenge, as opposed to a threat; (b) exert more control over the situation by proactively engaging in appropriate behaviors; and (c) attribute the positive experience to their own actions and capabilities.

### A Quasi-Experimental Longitudinal Intervention Study of the Plasticity of Openness

In the present study, we hypothesized that a special constellation of contextual and personal resources would stimulate increases in openness. We had the opportunity to pursue this question by evaluating the effects of a volunteer training program and subsequent volunteering experience on openness. The training program was designed to (a) foster volunteers' sense of efficacy as well as (b) provide volunteers with practical skills for mastering a volunteer project. After the training program, participants continued to engage in volunteer activities. We assumed that participation in the volunteer training program and subsequent volunteering activities would stimulate increases in openness, especially for participants with higher internal control beliefs.

To test our hypothesis about the effects of the training/volunteering intervention, we needed to compare any changes in openness in this experimental group with changes in openness in a comparable control group. A control group of nonvolunteers does not provide an appropriate comparison for testing our hypothesis because any observed differences between the training/volunteer participants and the nonvolunteers might be due to (a) differences between volunteers and nonvolunteers across a range of possible confounding characteristics (e.g., Herzog & Morgan, 1993; Penner & Finkelstein, 1998; Shmotkin, Blumstein, & Modan, 2003; Wilson & Musick, 1997) and/or (b) the activating effects of volunteering in general, which have been previously demonstrated (Morrow-Howell, Hinterlong, Rozario, & Tang, 2003; Thoits & Hewitt, 2001; Van Willigen, 2000), as opposed to the effects of the training/volunteering intervention. Furthermore, we can assume that volunteers who self-select themselves into a training program

are even more positively selected than volunteers in general. We therefore compared participants of the training/volunteering program (volunteer training group: VT) with a control group of volunteers who participated in similar volunteer projects and were on the waiting list for the training program (volunteer control group: VC). We evaluated changes in openness between baseline (T0) and after the completion of the training (T1) as well as after 1 year of volunteering experience (T2).

We expected that only those VT participants with higher internal control beliefs would profit from the competence training in terms of increases in openness (between T0 and T1). We tentatively hypothesized that the increases in openness would at least remain stable, if not further increase, between T1 and T2. This latter hypothesis was based on the assumption that VT participants with higher internal control beliefs would be more likely to gain more from the training program in terms of initial learning and transfer and attribute outcomes and success to their own effort. This constellation, in turn, may be conducive to stimulating the interest in learning about and participating in other new experiences. Thus, it might also be possible that, in the sense of an upward spiral, increases in openness continued between T1 and T2 for VT participants with higher internal control beliefs.<sup>1</sup>

## Method

### Participants

The VT and VC groups were recruited from a special training program in Germany (Erfahrungswissen für Initiativen; in English: experience for volunteering initiatives). Thirty-five volunteer agencies participated in the study. The VT group consisted of those participants of the second wave (2003/2004) of the training program who were also willing to take part in our study ( $n = 148$ , participation rate: 72%). Study participants did not differ from study nonparticipants in terms of age, gender, or education. Individuals of the VC group were on the waiting list for participation in the training program ( $n = 92$ ). Members of the VC and VT groups had already been active as volunteers with a volunteer agency before participating in or applying for the volunteer training program. Hence, the present study compared two active and engaged groups of volunteers.<sup>2</sup> No significant differences between the VC and VT groups were found across a range of demographic variables, subjective health, and cognition, as displayed in Table 1.

<sup>1</sup>We had no specific hypotheses regarding changes in openness among the VC participants. Because volunteering older adults are a positively selected group, we assumed that the VC group would show no decline—as is usually the case in unselected samples of older adults (see Footnote 2)—but rather stability in openness.

<sup>2</sup>To verify the positive selection bias of volunteers, we compared the characteristics of the VT and VC groups with a group of rather inactive adults. The nonvolunteering control group (NVC) consisted of nonvolunteering (or otherwise active and engaged) older adults ( $n = 105$ ) recruited through newspaper advertisements. NVC participants were matched with regard to age, gender, and education as closely as possible with the VC and VT participants. As expected, NVC participants were less open, reported lower internal control beliefs, and had lower scores on measures of crystallized and fluid intelligence. NVC participants were assessed at T0 and T1 and showed no significant changes in openness. The full statistics regarding the NVC participants can be obtained on request.

Table 1  
*Sample Characteristics by Quasi-Experimental Group*

| Variable                  | VT<br>(N = 148) |         |           | VC<br>(N = 92) |         |       |
|---------------------------|-----------------|---------|-----------|----------------|---------|-------|
|                           | M (SD)          | Range   | %         | M (SD)         | Range   | %     |
| Age, [years]              |                 | [44–72] |           | 63.01 (6.30)   | [46–80] |       |
| Gender (women/men)        |                 |         | 59.5/40.5 |                |         | 62/38 |
| Education, [years]        | 13.45 (3.58)    | [9–18]  |           | 12.80 (3.61)   | [9–18]  |       |
| Marital status            |                 |         |           |                |         |       |
| Married                   |                 |         | 59.5      |                |         | 57.6  |
| Single                    |                 |         | 6.1       |                |         | 13    |
| Divorced/separated        |                 |         | 20.9      |                |         | 14.1  |
| Widowed                   |                 |         | 10.1      |                |         | 12.0  |
| Long-term relationship    |                 |         | 3.4       |                |         | 3.3   |
| Living alone              |                 |         | 35.8      |                |         | 37    |
| Occupational status       |                 |         |           |                |         |       |
| Full-time employed        |                 |         | 2         |                |         | 7.6   |
| Retired                   |                 |         | 78.4      |                |         | 72.8  |
| Part-time employed        |                 |         | 7.4       |                |         | 5.4   |
| Unemployed                |                 |         | 10.8      |                |         | 12    |
| Other                     |                 |         | 1.4       |                |         | 2.2   |
| Subjective health         | 3.11 (0.73)     | 1–5     |           | 3.06 (0.80)    | 1–5     |       |
| Cognition                 |                 |         |           |                |         |       |
| Fluid intelligence        | 50.60 (11.46)   | 27–93   |           | 48.74 (12.45)  | 17–93   |       |
| Crystallized intelligence | 32.13 (2.85)    | 18–36   |           | 48.74 (12.45)  | 17–37   |       |
| Internal control          | 36.37 (3.55)    | 23–45   |           |                |         |       |
| Baseline Openness         | 3.59 (0.52)     | 2–4.58  |           | 3.57 (0.51)    | 2–4.75  |       |

Note. VT = Volunteer Training Group; VC = Volunteer Control Group. Statistics refer to the variables with imputed missing values. EM imputed values have been rounded to the nearest integer for the categorical variables.

## Measures

**Openness.** Openness was assessed at all three measurement points (T0, T1, T2) with the German version of the NEO-Five Factor Inventory (NEO-FFI; Borkenau & Ostendorf, 1993). Participants responded to each of the 12 items on a 5-point Likert scale ranging from 1 (*applies very well*) to 5 (*does not apply at all*). An example item is “I often try out new and exotic foods.” Reliabilities were satisfactory, with Cronbach’s alphas ranging from .80 to .88 across measurement points.

**Internal control beliefs.** Internal control beliefs were assessed at T0 with the IPC scale (Krampen, 1981), a German version of Levenson’s (1981) Locus of Control Scale. Participants answered eight items on internal control beliefs with a 7-point Likert scale ranging from 1 (*applies very well*) to 7 (*does not apply at all*). An example item is “When I make plans, I am almost certain to make them work.” Reliability was satisfactory, with Cronbach’s alphas ranging from .60 to .70 across measurement points.

### Control variables.

**Demographics and subjective health.** We assessed demographic characteristics and subjective health to help ensure that the two groups did not differ from each other and also to assess selectivity due to attrition. At the first measurement point (T0), participants indicated their age, gender, education, marital status, living arrangements (living alone, living with others), occupational status, and subjective health on a short questionnaire. Subjective health was assessed with a single item and a 5-point Likert scale ranging from 1 (*bad*) to 5 (*excellent*).

**Characteristics of the volunteer projects.** To check whether the volunteering experiences varied across the VT and VC groups, we

asked participants at T2 to indicate the (a) number of projects conducted during the past year as well as provide a short (b) project description, which we then coded as administrative work, sports-related, providing training to others, or work within the social domain. Using single items and 5-point Likert scales, we asked participants to evaluate their volunteer work according to several dimensions: their satisfaction with their volunteer work over the past year, the degree to which their project fulfilled their expectations, unpleasant experiences encountered during the project, and the degree to which they self-determined their projects. Participants also indicated whether the projects were self-initiated and self-conducted (yes/no).

**Cognition.** There is evidence that openness and cognition are related (e.g., Sharp, Reynolds, Pedersen, & Gatz, 2010). We therefore investigated potential baseline differences between groups as well as possible participation/attrition effects with regard to baseline fluid and crystallized intelligence. Both fluid and crystallized intelligence were assessed at T0 and T1. We used scores on the Digit Symbol Substitution Test of the HAWIE-III (Tewes, 1991; a German version of the Wechsler Adult Intelligence Scale—Revised; Wechsler, 1981) as an indicator for fluid intelligence (perceptual speed). Scores indicate the number of digits correctly assigned within 90 s (maximum 100). We used scores on the Mehrfachwahl-Wortschatz-Intelligenztest-B (Lehrl, 1995), also called the Spot-a-Word test, as an indicator for crystallized intelligence. Scores indicate the number of correctly identified words (maximum 37).

## Design and Procedure

The baseline measurement (T0) took place before the training program. A trained project member administered all measures in a



group setting at each volunteer agency (see sample description above). The VT and VC groups were assessed on the same day, although at different times. Participants first completed two cognitive tests and then other performance measures that were not part of the present study. Afterward, participants were given a pre-stamped return envelope including the demographic questionnaire and the self-report measures. Participants were asked to complete the questionnaires at home and send them back as soon as possible. The first postintervention measurement point (T1) took place after completion of the training seminars, about 4 months after T0, and followed the same procedure. One year after the short-term follow-up, participants completed a mail-in assessment of the self-report measures (T2). Participants were then debriefed about the study in writing.

### Training Program

Members of the VT group participated in a training program developed and conducted by the German Federal Ministry of Family, Seniors, Women, and Youth. The training program took place nationwide between 2002 and 2006 at 35 volunteer agencies. The aim of the training program was to provide volunteers with competencies relevant for volunteering activities and to support them in initiating their own personal volunteering project(s) in their neighborhood or community. Participants attended three seminars that each lasted for 3 days. Group sizes of the seminars ranged from nine to 16 people. The first seminar dealt with the development of a new role identity in the context of civic engagement. An important prerequisite for a new role identity is to come to terms with oneself. Hence, participants were encouraged to think about themselves, to critically reflect about their weaknesses and strengths, and finally to focus on their expectations and conceptions with regard to being a volunteer. After this guided process of critical self-reflection, participants devised a personal volunteering project. The second and third seminar of the curriculum focused on some of the practical as well as personal competencies and skills that are needed to successfully engage in volunteering projects. Participants were taught various practical skills (e.g., organizational skills, group leading skills) relevant to volunteering. Furthermore, the training program was designed to foster the relevant personal competencies to help prepare participants to face and master potential challenges of initiating and implementing their own volunteering projects.

### Statistical Analyses

**Attrition.** To examine predictors of complete versus incomplete participation, we conducted a binary logistic regression analysis with “complete/incomplete” as the dependent variable separately within the VT and VC groups. Age, gender, health, social class, and intelligence are typically associated with incomplete participation in longitudinal studies (Lindenberger et al., 2001) and, hence, were entered as predictors in the model with education as a proxy for social class, along with internal control beliefs and baseline openness, because these were our main variables of interest.

**Volunteer projects.** We compared post hoc volunteering project descriptions and evaluations to check for potential differences in the number, type, and nature of the volunteer projects between the VT and VC groups.

**Missing values.** With the exception of the project description variables, which were measured only at T2, missing values were low (<10%).<sup>3</sup> Missing values were imputed using the expectation-maximization algorithm available in the MVA (missing value analysis) module of SPSS 19 (see Allison, 2009, for a thorough description). The imputation model included all person-related and project-related variables previously mentioned and was run separately for the VT and VC groups.

**Main analysis.** The data were analyzed with HLM 6.06 software to account for the nonindependence of time points (Level 1) within individuals (Level 2) and of individuals within volunteer agencies (Level 3; Raudenbush, Bryk, & Congdon, 2004). We separately modeled the change trajectories between T0 and T1 and between T1 and T2. Membership in the VT (dummy) and internal control were entered on Level 2 as predictors of the intercept and the piecewise slope terms. The interaction term Internal Control  $\times$  Training (internal control grand-mean centered prior to calculation; Aiken & West, 1991) was then likewise added to the Level 2 equation as a predictor of the intercept and piecewise slope terms. On the basis of the attrition analyses (see Results section), we included gender as a statistical control. We also included a dummy variable indicating whether participation was complete (0) or incomplete (1) as a second statistical control (e.g., Hedeker & Gibbons, 1997). Continuous variables on Level 2 were group-mean centered and agency aggregates were included on Level 3 (grand-mean centered; Chan, 1998; Enders & Tofighi, 2007). To tease apart the interaction between time, internal control, and training, we conducted simple slope analyses for three-way interactions as described by Preacher, Curran, and Bauer (2006) using the online interactive simple slope calculator available at <http://www.quantpsy.org/interact/hlm3.htm>.

**Follow-up analyses.** Members of the VT and VC groups differed with respect to the number of volunteer projects completed (see Results section). However, because the variable “number of projects” was only assessed retrospectively at T2, there was a rather high level of missing data on this variable (see Footnote 3). Consequently, we ran follow-up analyses with number of projects as an additional control variable using (a) the raw data ( $n = 127$ ) and (b) the imputed data on this variable to avoid compromising the power and data quality of the main model.

To rule out the possibility that possible training effects in participants with higher internal control beliefs could be reduced to differences and changes in cognitive functioning, we included measures of crystallized and fluid intelligence at T0 and T1 on Level 1 as predictors of change in openness between T0 and T1 in a separate follow-up analysis. In line with the main model, gender and incomplete participation were included as statistical controls.

<sup>3</sup> The distribution of missing data across variables was as follows: age (9.2%), gender (6.3%), education (3.3%), family status (1.7%), living arrangement (2.5%), occupational status (7.9%), subjective health (2.5%), fluid intelligence (14.6%), crystallized intelligence (9.2%), internal control (1.3%), baseline openness (0.4%), number of projects (47.1%), met expectations (36.7%), unpleasant experiences (37.1%), self-determination (37.1%), conducted independently (40.8%), and self-initiation (37.1%).

## Results

### Sample Attrition

Among VC and VT participants, there were four patterns of participation: complete participation, 47%; no participation at T1, 21%, no participation at T2, 16%; and no participation at T1 and T2, 15%. The distribution of participation patterns did not differ between the VT and VC groups,  $\chi^2(3) = 5.35, p = .15$ . These participation (attrition) rates are comparable to those found in other longitudinal studies (e.g., Pushkar, Reis, & Morros, 2002; Rook & Sorkin, 2003; Manners, Durkin, & Nesdale, 2004). Age, gender, education, subjective health, fluid intelligence, crystallized intelligence, internal control, and baseline openness did not predict complete or incomplete participation within the VC group ( $ps > .08$ ). Within the VT group, gender (female) was associated with incomplete participation,  $B = -0.88, SE = 0.38, p < .05$ , odds ratio = 0.42. Namely, male VT participants were more likely to drop out of the study than female VT participants. None of the other variables (age, education, subjective health, fluid intelligence, crystallized intelligence, internal control, and baseline openness) were significant predictors of complete or incomplete participation within the VT group ( $ps > .07$ ).

### Volunteer Projects

Table 2 provides an overview of the characteristics of the volunteer projects by group. Significantly fewer projects were conducted by members of the VT group ( $M = 2.12$  projects,  $SD = 1.49$ ) compared with members of the VC group ( $M = 3.36$  projects,  $SD = 2.04$ ),  $F(1, 125) = 15.48, p < .001$ . There were no significant differences between the VT and VC groups with regard to the distribution of type of project,  $\chi^2(4,169) = 4.21, p = .38$ . One-way analyses of variance did not suggest that there were any differences as to how members of the VT and VC groups evaluated

Table 2  
Characteristics of the Volunteer Projects by Quasi-Experimental Group at T2

| Variable                      | VT            |      | VC            |      |
|-------------------------------|---------------|------|---------------|------|
|                               | <i>M (SD)</i> | %    | <i>M (SD)</i> | %    |
| Number of projects*           | 2.12 (1.49)   |      | 3.36 (2.04)   |      |
| Type of project               |               |      |               |      |
| Administrative work           |               | 20.5 |               | 20.1 |
| Training of others            |               | 26.8 |               | 22.5 |
| Social work                   |               | 48.2 |               | 52.1 |
| Sport                         |               | 3.6  |               | 4.1  |
| Project evaluation            |               |      |               |      |
| Satisfaction                  | 3.59 (0.84)   |      | 3.56 (0.95)   |      |
| Met expectations              | 3.49 (0.78)   |      | 3.56 (0.92)   |      |
| Unpleasant experiences        | 2.27 (0.73)   |      | 2.25 (1.03)   |      |
| Self-determination            | 3.62 (0.94)   |      | 3.34 (1.09)   |      |
| Self-initiated (yes)          |               | 59.3 |               | 46.7 |
| Conducted independently (yes) |               | 39.1 |               | 36.4 |

Note. VT = volunteer training group; VC = volunteer control group. Statistics refer to the raw data ( $n = 127$ ). Ranges of the project evaluation scores were all from 1 to 5.

\* Differences between VT and VC group significant at  $p \leq .05$ .

their volunteer project experience in terms of their satisfaction with the project, the degree to which their project fulfilled their expectations, unpleasant experiences encountered during the project, or the degree to which they self-determined their project ( $ps > .10$ ). There were also no differences as to whether the projects were self-initiated,  $\chi^2(1,151) = 2.34, p = .13$ , or self-conducted  $\chi^2(1,142) = 0.11, p = .75$ .

### Main Results

The major question of the study was whether the openness trajectories of participants of the VT group with higher internal control beliefs differed from the openness trajectories of other participants. Table 3 displays the results of the HLM analysis. The final model included a random intercept, a random slope term from T0 to T1, and a fixed slope from T1 to T2. Results from the empty model indicated that 40% of the variance in openness was related to time and measurement, 57.8% was related to individual characteristics, and 2% was related to volunteer agencies.

**Baseline openness.** Consistent with the comparison of the sample characteristics, participation in the training intervention did not predict baseline differences in openness. Neither internal control nor the internal control by training interaction was significantly related to baseline differences in openness.

**Change in openness, T0 to T1.** Overall, participants' openness did not change between T0 and T1. There was no main effect of training participation on changes in openness between T0 and T1. Internal control did not predict changes in openness between T0 and T1. However, as predicted, the internal control by training interaction did indeed predict change in openness from T0 to T1.

**Change in openness, T1 to T2.** Overall, participants' openness did not change between T1 and T2. There was no main effect of training on change in openness between T1 and T2. Internal control did not predict changes in openness between T1 and T2. However, in line with predictions, again the internal control by training interaction predicted change in openness from T0 to T1.

**Simple slope analyses.** Even though the overall effect of the internal control by training interaction was significant in the main model (see Table 3), the simple slope analyses indicated that participants in neither the VT nor the VC group increased in openness between T0 and T1, independent of their level of internal control beliefs at baseline ( $ps > .13$ ). However, training participants with higher internal control increased in openness between T1 and T2,  $B = 0.34 (0.10), t(232) = 3.31, p < .001$ , at 1  $SD$  above mean internal control. More specifically, training participants with internal control at least 0.24  $SD$  above the mean (34.5% of the VT sample) significantly increased in openness between T1 and T2. In comparison, although there was a trend that VC participants with high internal control changed in openness between T1 and T2,  $B = 0.18 (0.10), t(232) = 1.74, p = .08$ , at 1  $SD$  above the mean, there was no indication of a significant increase in openness among VC participants, even for participants with very high internal control beliefs,  $B = 0.23 (0.13), t(232) = 1.78, p = .08$ , at 2  $SD$  above mean internal control beliefs. Neither VT nor VC participants with low internal control changed in openness between T1 and T2,  $B = -0.12 (0.10), t(232) = -1.23, p = .22$ , and  $B = 0.08, (0.12), t(232) = 0.69, p = .49$ , respectively, at 1  $SD$  below mean internal control. Figure 1 depicts the patterns of change in openness across all time points for the VT and VC

Table 3  
HLM Statistics for Main Model (T0, T1, and T2)

| Variable  | B     | SE                 | t        |                |
|---|-------|--------------------|----------|----------------|
| Baseline openness                                       |       |                    |          |                |
| Average baseline openness <sup>a</sup>                  | 3.36  | 0.07               | 48.37*** |                |
| Agency mean internal control <sup>a</sup>               | -0.01 | 0.02               | -0.48    |                |
| Agency proportion incomplete participation <sup>a</sup> | -0.07 | 0.16               | -0.45    |                |
| Agency proportion women <sup>a</sup>                    | -0.25 | 0.22               | -1.12    |                |
| Training <sup>b</sup>                                   | 0.02  | 0.06               | 0.42     |                |
| Internal control <sup>b</sup>                           | 0.01  | 0.01               | 0.49     |                |
| Internal Control × Training <sup>b</sup>                | -0.01 | 0.01               | -1.01    |                |
| Incomplete participation <sup>b</sup>                   | 0.10  | 0.07               | 1.46     |                |
| Gender <sup>b</sup>                                     | 0.23  | 0.06               | 3.73***  |                |
| Change in openness, T0 to T1 <sup>b</sup>               |       |                    |          |                |
| Average slope T0 to T1                                  | -0.02 | 0.09               | -0.25    |                |
| Training  | 0.08  | 0.08               | 1.03     |                |
| Internal control  | -0.03 | 0.02               | -1.64    |                |
| Internal Control × Training                             | 0.07  | 0.03               | 2.65**   |                |
| Incomplete participation                                | 0.03  | 0.15               | 0.19     |                |
| Gender  | 0.06  | 0.11               | 0.52     |                |
| Change in openness, T1 to T2 <sup>c</sup>               |       |                    |          |                |
| Average slope T1 to T2                                  | 0.13  | 0.10               | 1.33     |                |
| Training  | -0.02 | 0.09               | -0.23    |                |
| Internal control  | 0.01  | 0.01               | 1.02     |                |
| Internal Control × Training                             | 0.04  | 0.02               | 2.97**   |                |
| Incomplete participation                                | -0.30 | 0.13               | -2.29*   |                |
| Gender  | -0.03 | 0.11               | -0.25    |                |
| Random effect   | SD    | Variance component | df       | χ <sup>2</sup> |
| Level 2 intercept                                       | 0.29  | 0.08               | 162      | 257.30***      |
| Level 2 slope, T0 to T1                                 | 0.41  | 0.17               | 196      | 327.56***      |
| Level 1   | 0.40  | 0.16               |          |                |
| Level 3 intercept                                       | 0.07  | 0.00               | 31       | 51.68*         |

Note. T0 = before training program; T1 = after training program; T2 = 1 year after training program. Results with unstandardized coefficients and robust standard errors.

<sup>a</sup> *df* = 31. <sup>b</sup> *df* = 232. <sup>c</sup> *df* = 532.

\*  $p \leq .05$ . \*\*  $p \leq .01$ . \*\*\*  $p < .001$ .

groups with low and high levels of internal control ( $\pm 1$  *SD*) controlling for gender and incomplete participation.

### Follow-Up Analyses

**Number of projects.** Including number of projects as a control variable did not alter the results of the main analyses as described above with regards to the effects of internal control, training, and the internal control by training interaction on either baseline or changes in openness according to both (a) the analysis including the raw data for number of projects with the reduced sample size and (b) the analysis with imputed data for number of projects.<sup>4</sup>

**Changes in cognition.** Baseline openness was significantly related to baseline crystallized intelligence,  $B = 0.03$  (0.01),  $t(230) = 2.65$ ,  $p = .01$ , but not baseline fluid intelligence ( $p = .32$ ). Neither crystallized nor fluid intelligence at baseline was related to change in openness between T0 and T1 ( $p = .71$  and  $p = .95$ , respectively). Change in openness from T0 to T1 was related to changes in crystallized intelligence,  $B = 0.06$  (0.03),  $t(338) = 2.24$ ,  $p = .03$ , but not changes in fluid intelligence ( $p = .61$ ). It is important to note that the internal control by training interaction remained a significant predictor of change

in openness between T0 and T1 when fluid and crystallized intelligence were included as time-varying covariates,  $B = 0.06$  (0.03),  $t(338) = 2.07$ ,  $p = .04$ .

<sup>4</sup> (a) Model controlled for gender, incomplete participation, and number of projects (imputed data). Baseline openness: training,  $B = -0.01$  (0.02),  $t(231) = -0.12$ ,  $p = .90$ ; internal control,  $B = 0.00$  (0.01),  $t(231) = 0.07$ ,  $p = .94$ ; Internal Control × Training,  $B = -0.01$  (0.01),  $t(231) = -1.32$ ,  $p = .19$ . Change in openness, T0 to T1: training,  $B = 0.10$  (0.09),  $t(231) = 1.08$ ,  $p = .28$ ; internal control,  $B = -0.03$  (0.02),  $t(231) = -1.46$ ,  $p = .15$ ; Internal Control × Training,  $B = 0.07$  (0.03),  $t(231) = 2.69$ ,  $p < .01$ . Change in openness, T1 to T2: training,  $B = -0.04$  (0.09),  $t(528) = -0.47$ ,  $p = .64$ ; internal control,  $B = 0.01$  (0.01),  $t = 0.8$ ,  $p = .43$ ; Internal Control × Training,  $B = 0.04$  (0.01),  $t(528) = 2.86$ ,  $p < .01$ . (b) Model controlled for gender, incomplete participation, and number of projects (raw data). Baseline openness: training,  $B = -0.09$  (0.11),  $t(120) = -0.86$ ,  $p = .39$ ; internal control,  $B = -0.01$  (0.02),  $t(120) = -0.58$ ,  $p = .56$ ; Internal Control × Training,  $B = -0.01$  (0.02),  $t(120) = -0.31$ ,  $p = .75$ . Change in openness, T0 to T1: training,  $B = 0.18$  (0.14),  $t(121) = 1.24$ ,  $p = .22$ ; internal control,  $B = -0.02$  (0.03),  $t(121) = -0.71$ ,  $p = .48$ ; Internal Control × Training,  $B = 0.05$  (0.03),  $t(121) = 1.88$ ,  $p = .06$ . Change in openness, T1 to T2: training,  $B = -0.02$  (0.13),  $t(331) = -0.16$ ,  $p = .87$ ; internal control,  $B = 0.00$  (0.02),  $t(331) = -0.23$ ,  $p = .82$ ; Internal Control × Training,  $B = 0.06$  (0.02),  $t(331) = 3.16$ ,  $p < .001$ .

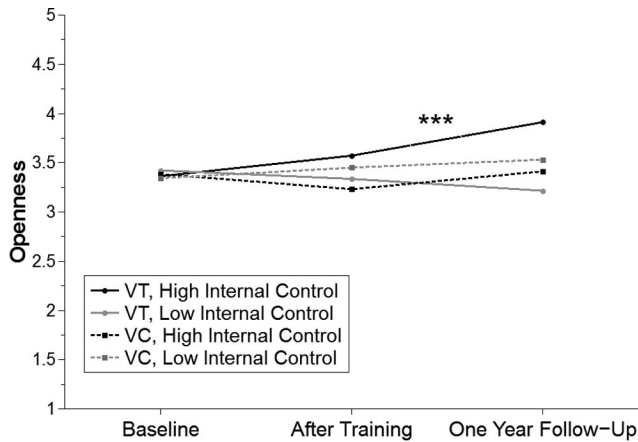


Figure 1. Changes in openness among volunteer training (VT) and volunteer control (VC) group participants as a function of internal control beliefs (controlled for gender and incomplete participation). Note. High and low internal control refers to 1 *SD* above and below the mean, respectively. \*\*\*  $p < .001$ ; all other slopes are nonsignificant.

## Discussion

In this study, we set out to provide further evidence for one of the central tenets of lifespan psychology, namely, that there is plasticity of development throughout the life span well into old age (Baltes et al., 2006). We investigated the plasticity of human development not in the well-researched area of cognitive functioning, but rather in the domain of personality. We tested whether a training course designed to foster psychological as well as practical competence in volunteering and the application of the training in volunteering practice (contextual resources) combined with high internal control beliefs (personal resource) would stimulate increases in openness for active volunteers.

It is noteworthy that our study avoided some of the pitfalls that are usually connected with research in the area of volunteering such as the issue of sample selection bias. To avoid this problem, we recruited a control group of active volunteers as opposed to a sedentary control group. The analyses indicated that the VT and VC participants were equivalent with regard to demographic characteristics, subjective health, fluid and crystallized intelligence, internal control, and baseline openness. In line with previous research about the positive selectivity of volunteers (Herzog & Morgan, 1993; Penner & Finkelstein, 1998; Shmotkin et al., 2003; Wilson & Musick, 1997), comparison of the VT and VC groups with a comparison group of inactive, nonvolunteers demonstrated that both the VT and VC participants indeed had higher fluid intelligence, internal control, and baseline openness than relatively inactive, nonvolunteering older adults (see Footnote 2).

### Contextual and Personal Resources Are Needed to Activate Personality Plasticity

All in all, the study confirmed the hypothesis that personality plasticity in openness can be observed in older adulthood if individuals have access to a facilitative combination of contextual and personal resources. This finding was not compromised when controlling for potentially confounding variables such as number of

volunteering projects, gender and incomplete participation, and fluid and crystallized cognition as time-varying covariates.

Our results indicate that volunteering on its own (i.e., VC; irrespective of internal control beliefs) is related to stability in openness in later adulthood (rather than decline) but not to an increase in openness. Furthermore, our results show that it is not enough to provide training to volunteers in order to trigger positive plasticity in openness. Rather, it seems that the same training has differential effects on individuals. Analogously, there is evidence accruing in the realm of cognitive plasticity that the same training intervention has differential effects on individuals depending on their genetic characteristics (polymorphism *val/val* vs. *met/met*; Voelcker-Rehage, Jeltsch, Godde, & Staudinger, 2012). In that sense, it may be useful, if not necessary, to investigate *personalized plasticity*, that is, the conditions that facilitate plasticity for specific (types of) individuals as opposed to plasticity as such (Staudinger, 2010). Of course, personalization may not only be investigated with regard to genotypes but also personality characteristics and other person variables (e.g., internal control beliefs).

Our results demonstrate that the positive effect of the training for volunteers with higher internal control beliefs only emerged over time. Although there were significant differences between the change in openness between T0 and T1 between the VT and VC groups based on internal control beliefs (significant interaction effect), increases in openness for the members of the VT group with higher internal control became significant only between T1 and T2 (simple slope analyses). This pattern of results suggests that the actual application of learned skills plays an important role with regard to observing increases in openness. Applying skills and practicing a new role may increase the likelihood for success and positive experiences in the volunteering setting, which in turn further increases the openness of those participants who attribute such positive outcomes to themselves. This latter aspect of our findings is in line with earlier results (cf. Piedmont, 2001) indicating that it was the combination of training and its application that resulted in personality change.

Our findings add to the literature that has demonstrated that people with higher internal control beliefs can better profit from certain contexts because they are more active (Menec & Chipperfield, 1997; Parsons & Betz, 2001; Wolk & Kurtz, 1975; Ziegler & Reid, 1979), are better able to buffer contextual stressors (Callan et al., 1994; Cohen & Edwards, 1989), and have more positive attitudes toward training opportunities as well as demonstrate more motivation to learn (Noe & Schmitt, 1986; Renn & Vandenberg, 1991). Our results are suggestive of a “positive spiral” such that people with initially high levels of internal control beliefs and know-how (provided by training) tend to profit from challenging situations (i.e., pursuing volunteering projects; see also Aldwin et al., 1996).

### Implications

As found by a number of empirical studies, openness is associated with many positive outcomes. It has been discussed as the most central concomitant of personality maturity (Compton, 2001; Schmutte & Ryff, 1997; Staudinger et al., 1997). Openness is also positively correlated with ego development (Hogansen & Lanning, 2001; Kurtz & Tiegreen, 2005; McCrae & Costa, 1980), emotional complexity (Kang & Shaver, 2004), maturity of coping strategies



(Costa, Zonderman, & McCrae, 1991), and general and personal wisdom (Mickler & Staudinger, 2008; Staudinger, Dörner, & Mickler, 2005). In addition, openness seems to constitute a personal resource that helps people to continue to try out new roles, which may be especially necessary during retirement when individuals must actively seek new contexts for activity and engagement. Hence, openness may be supportive of life satisfaction at older ages (Stephan, 2009). Finally, higher levels of openness also have been recently linked to decreased risk for Alzheimer's disease (Duberstein et al., 2011). It is possible that over a lifetime, people who are more open expose themselves to a greater variety of life situations, which in turn acts as a sort of "natural" cognitive intervention that mediates the link between openness and Alzheimer's disease risk.

Despite the positive associations between openness and a range of positive outcomes particularly relevant for older adults, openness tends to decline after young adulthood under current circumstances of aging (Donnellan & Lucas, 2008; McCrae et al., 1999; Roberts et al., 2006). We interpret the results of this study as evidence that age-related declines in openness do not necessarily constitute a "natural law" of personality development. Rather, we speculate that providing individuals with more of an incentive to continue to venture in new and challenging contexts, in combination with the procurement of the objective and subjective "tools" for succeeding in new environments, has the potential to yield increases rather than declines in openness in later adulthood. This argument is in line with results from a longitudinal study of twins, which suggests that changes in openness across adulthood are almost entirely related to environmental opposed to genetic sources (Bleidorn, Kandler, Riemann, Angleitner, & Spinath, 2009).

### Possible Mediating Mechanisms

This first study concentrated on establishing the fact that personality plasticity in old age can be promoted at all. Our results indicate that changes in openness between T0 and T1 cannot be reduced to changes in cognition between T0 and T1. Future work should address other potential mediating mechanisms that might be associated with training and internal control beliefs, such as whether participants actually learned new skills and competencies, applied more of the learned skills and competencies in the volunteering context, and/or whether they really felt more in control. We have suggested that people with internal control beliefs may have been able to profit more from the training intervention in terms of learning and transfer gains. Given that having high internal control beliefs is an important factor for buffering contextual stressors (Callan et al., 1994; Cohen & Edwards, 1989; Terry, 1991), it also may be the case that members of the VT group with higher internal control beliefs felt in control of the situation as opposed to stressed, which may have increased their attraction to further novel contexts. It may be justified to speculate that the training and volunteer experience represented what Rappaport (1984) called an empowering context. Empowerment has been described as the result of programs designed to foster the active participation of the individual (Rappaport, 1984). Such empowering programs provide training and opportunities to increase skills, competencies, and social support, and to encourage participants to become active, to use their own talents, and thus to develop. Becoming part of an

empowering context has been shown to enhance the sense of independence and self-determination in older participants (Perkinson, 1993). Certainly, more detailed knowledge about the mediating processes underlying the current results will be essential when striving toward the systematic implementation of interventions to promote increases in openness.

### Limitations and Suggestions for Future Research

The results of this study are restricted to a highly selective group, that is, volunteers, who were more open to new experiences to begin with, and had higher baseline measures of fluid and crystallized intelligence and internal control compared with a comparison group of nonvolunteers. It may be more difficult to stimulate changes in openness among people with initially lower levels of these personal resources. However, other intervention work has shown that it is actually easier to increase levels of functioning from lower baseline levels (e.g., Lövdén et al., 2010). Furthermore, the volunteer participants were motivated to enter the volunteering and training context. It may be that our results are limited to individuals who feel able to master a context (i.e., in terms of higher internal control beliefs) in addition to wanting to enter a context. The same pattern of results may not hold for individuals unwillingly confronted with a new situation. We can speculate that stimulating individuals with lower baseline levels of openness and less motivation to enter new contexts may necessitate more powerful incentives and more intensive preparation.

Another limitation is that a fairly significant proportion of the participants did not complete the three measurement points. We statistically controlled for the potential effects of incomplete participation. However, our results should be interpreted in light of this limitation. Furthermore, it may be interesting for future studies to test the even longer term development of openness following training and subsequent volunteering experience.

Finally, the current study relied on a self-report measure of openness. Obviously, self-report measures have certain limitations (Clark, Collins, & Henry, 1993). Future research would profit from including behavioral indicators such as entering new social contexts, eating new food or engaging in new activities, including ratings from others, such as spouses and/or trainers, and/or using diary methods.

### Conclusion

To our knowledge, this is the first study that has systematically investigated the impact of an intervention on older individuals and found increases in openness. The findings underline that certain personal characteristics and empowering contextual factors need to act together for the promotion of openness to occur. Hence, the results provide evidence for personalized plasticity (Staudinger, 2010). An implication of the present study is that it is not sufficient to provide opportunities for older individuals to participate in society. Rather, it is also necessary to provide opportunities to learn and develop the competencies to be successful in such new activities, to provide incentives that encourage older adults to learn new skills, and to identify individuals able to profit from a specific training. Applying and further compiling such knowledge would not only benefit the individual enormously, but will also become increasingly indispensable in societies of longer lives.

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### **Correction to Mühlig-Versen, Bowen, and Staudinger (2012)**

In the article “Personality plasticity in later adulthood: Contextual and personal resources are needed to increase openness to new experiences” by Andrea Mühlig-Versen, Catherine E. Bowen, and Ursula M. Staudinger (*Psychology and Aging*, Vol. 27, No. 4), there was an error in Table 1. In the line “Internal control” the values under the “VC” heading should have been:  $M (SD)$  36.42 (4.67) and under Range should have been [25–45].

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