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An early intervention to promote well-being and flourishing and reduce anxiety and depression: A randomized controlled trial

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ABSTRACT

Background: There is growing evidence that fostering mental well-being and flourishing might effectively prevent mental disorders. In this study, we examined whether a 9-week comprehensive positive self-help intervention with email support (TL-E) was effective in enhancing well-being and flourishing and decreasing anxiety and depressive symptoms in a non-clinical sample.
Methods: A total of 275 participants with low or moderate well-being (mean age = 48 years, 86% female) were randomly assigned to a TL-E ($n = 137$) or wait-list control group (WL; $n = 138$). Participants completed online self-reporting questionnaires at baseline and at 3, 6 and 12 months.
Results: Repeated measure analyses revealed significant more improvement on mental well-being ($F = 42.00$, $p \leq 0.001$, $d = 0.66$, 95% CI = 0.42–0.90), anxiety ($F = 21.65$, $p \leq 0.001$, $d = 0.63$, 95% CI = 0.39–0.87) and depression ($F = 13.62$, $p \leq 0.001$, $d = 0.43$, 95% CI = 0.19–0.67) in the TL-E group versus the WL group. The proportion of flourishing in the TL-E group increased from 7 to 30% after 3 months (NNT = 5.46) and to 34% after 6 months (NNT = 5.25). All within group effects were maintained up to 12 months. We found no meaningful dose-response relationship for adherence, nor a clear moderator pattern.
Limitations: It is unknown whether results were influenced by the email support that accompanied the self-help intervention since TL-E was only compared to a wait-list condition. The generalizability of the findings is limited by the self-selected sample of mainly higher-educated women.
Conclusion: A guided positive self-help intervention might be considered as a new mental health promotion strategy because it has the potential to improve well-being up to the status of flourishing mental health, and to decrease anxiety and depressive symptomatology.

1. Introduction

The World Health Organization views mental well-being as a state in which the individual realizes his or her own abilities, copes with the normal stresses in life, works productively and makes a contribution to his or her community (WHO, 2004; p. 4). This definition embodies aspects of feeling good and functioning well in life, and indicates that mental well-being is more than just the absence of mental illness (Keyes, 2002, 2007). Empirical evidence shows that mental well-being and mental illness are moderately interrelated, representing two different dimensions (Huppert and Whittington, 2003; Keyes, 2005; Lamers et al., 2011; Weich et al., 2011). The dimension of mental illness

runs from no mental disorder to a diagnosed mental disorder, and the dimension of mental well-being runs from languishing mental health to flourishing mental health, terms derived from Keyes' (2007) classification framework of mental well-being. When individuals possess high levels of at least one emotional well-being aspect (life-satisfaction, happiness, positive affect) and possess high levels of at least six of the 14 aspects of social and psychological well-being (e.g. social contribution, purpose in life, autonomy, positive relations), these individuals are classified as having flourishing mental health. Individuals with languishing mental health score low on emotional, social and psychological well-being and people who are not flourishing neither languishing are classified as having moderate mental health (Keyes, 2002, 2007).

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People who have low levels of mental well-being do not automatically have (more symptoms of) a mental disorder (Keyes, 2002, 2005; Lamers et al., 2015). Nevertheless, alongside traditional treatments that focus on alleviating the burden of disease, there is growing support for enhancing long-term mental well-being in clinical practice (Duckworth et al., 2005; Forsman et al., 2015; Jeste et al., 2015; Kobau et al., 2011; Ryff, 2014). Recent evidence has shown that higher well-being and flourishing mental health protects against the incidence of mental disorders such as anxiety and depression (Grant et al., 2013; Keyes et al., 2010; Lamers et al., 2015; Schotanus-Dijkstra et al., 2016a; Wood and Joseph, 2010) and reduces suicide risk (Keyes et al., 2012; Koivumaa-Honkanen et al., 2004). There is also compelling evidence that higher well-being increases longevity by several years in healthy populations and in some somatic illness populations (Chida and Steptoe, 2008; Diener and Chan, 2011; Keyes and Simoes, 2012; Lamers et al., 2012; Veenhoven, 2007). In addition, studies have found that low or moderate well-being has substantial economic consequences due to productivity losses and healthcare costs (Hamar et al., 2015; Keyes, 2007; Keyes and Grzywacz, 2005). Importantly, the most beneficial effects on health, society and the economy have been found for those with flourishing as opposed to languishing mental health or moderate mental health (Keyes, 2005; Keyes and Simoes, 2012; Keyes et al., 2010; Keyes and Grzywacz, 2005).

Interestingly, people with languishing mental health but without a major depression function only nominally better or even worse than people with a major depression without languishing mental health (Keyes, 2002, 2005, 2007). This finding indicates that enhancing well-being in people with low or moderate well-being is important and could also be an effective strategy for the prevention of anxiety and depression (Keyes et al., 2010; Schotanus-Dijkstra et al., 2016a). In light of the abovementioned evidence, the promotion of mental well-being has been prioritized as the number one goal for the public mental health agenda in Europe (Forsman et al., 2015).

In order to promote long-term mental well-being and flourishing, a comprehensive intervention based on a positive framework is deemed necessary, simultaneously targeting multiple well-being components such as positive emotions, optimism and positive relations (Huta and Ryan, 2009; Kobau et al., 2011; Seligman, 2011). Examples of such interventions are Positive Psychotherapy (Rashid, 2014), Well-being therapy (Fava, 1999; Ruini et al., 2014) and the Working for Wellness program (Page and Vella-Brodrick, 2012). However, studies examining the efficacy of these comprehensive interventions did not target people with low or moderate well-being, and the interventions were also not systematically evaluated for effects on flourishing. Furthermore, most of these studies suffered from methodological limitations such as a relatively small sample size in group therapies (Page and Vella-Brodrick, 2012; Rashid, 2014; Ruini et al., 2014) or a low adherence rate in (web-based) self-help interventions (Bolier et al., 2013b; Mitchell et al., 2010; Schueller and Parks, 2012). To tackle these deficiencies, a successful approach might be to integrate the main advantage of group therapy—personal support—within a self-help program because self-help programs can reach a wider target group.

One such intervention that has shown promising results is a self-help intervention based on Acceptance and Commitment Therapy (ACT) and mindfulness. This program (*Living to the Full*; Bohlmeijer and Hulsbergen, 2009) was evaluated in the form of a self-help book and as an online intervention. Both interventions have demonstrated satisfactory adherence rates and beneficial results on mental well-being, anxiety and depression for participants who also received personal email support (Fledderus et al., 2012; Pots et al., 2016). Post-hoc analyses revealed that the self-help book was also effective in enhancing flourishing (Bohlmeijer et al., 2015). Yet, this positively based self-help program was designed and evaluated for people with depressive symptoms, without aiming to promote mental well-being and flourishing in the general population.

The current study continued to research into the potentialities of a

positive self-help book with email support. This study examined the efficacy of the self-help program *Dit is jouw leven* (*This is Your Life*; (Bohlmeijer and Hulsbergen, 2013), a program based on the principles of positive psychology. *This is Your Life* was specifically designed for people with low or moderate well-being and minimal symptoms of a mental disorder. We evaluated this 9-week multicomponent intervention with email support in individuals with low or moderate well-being who were recruited in the general Dutch population. We conducted a randomized controlled trial (RCT) using Keyes (2007) classification framework as a systematic approach for evaluating the superiority of the intervention on well-being and flourishing over a wait-list control group. We also examined the efficacy of this early intervention on anxiety and depressive symptoms and tested whether specific subgroups benefited most from the intervention.

2. Methods

This study was approved by the Ethics Committee of the University of Twente (no. 13212) and registered in The Netherlands Trial Register (NTR4297). All participants gave their online informed consent before participating in the study.

2.1. Design

This study is a parallel RCT conducted in The Netherlands. Eligible participants with low or moderate well-being were randomly assigned (allocation ratio 1:1) to the Dutch self-help book *This is Your Life* with email support (TL-E) or to a wait-list control group (WL). Online questionnaires were obtained at baseline and at 3, 6 and 12 months.

2.2. Participants and procedure

In January 2014, advertisements were placed in national newspapers and in an online psychology newsletter calling for people who were motivated to work on their 'well-being and resilience'. Eligible participants were self-selected adults in The Netherlands, aged 18 years or older, who were willing to invest an average time of 4 h per week in the self-help program, owned a valid email address and a sufficient Internet connection. Participants who gave online informed consent received a screening questionnaire. Participants were excluded from the study when they possessed: (1) flourishing mental health as assessed with the Mental Health Continuum Short Form (MHC-SF, see Section 2.4 for more details; Keyes, 2006; Keyes et al., 2008) or (2) moderate or severe anxiety or depressive symptoms assessed with the Hospital Anxiety and Depression Scale (score > 10 on either the anxiety or depression subscale, HADS-A or HADS-D, respectively; Spinhoven et al., 1997; Zigmond and Snaith, 1983).

Of the 518 eligible participants, 275 participants completed the baseline questionnaire, and 243 individuals were excluded mainly due to their HADS score. After baseline, randomization was stratified by gender and educational level (low, intermediate, high) using a computerized random number generator created with Excel. The first author was responsible for randomization, enrollment and the assignment of participants to either the TL-E or WL group. After randomization, participants received a personal email with information about their assigned group. Fig. 1 shows the flow chart of participants.

Assessments took place between January 2014 and February 2015. To reduce attrition, up to three email reminders were sent within one month when questionnaires were incomplete. As an incentive, participants who completed all four assessments could win one of the 125 gift vouchers of €50, €20 or €10.

2.3. Interventions

2.3.1. TL-E group (comprehensive positive self-help intervention)

The self-help book *Dit is jouw leven* (*This is Your Life*; Bohlmeijer and

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                                    ┌─────────────────────────────┐
                                    │   Assessed for eligibility  │
                                    │        (n = 518)            │
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                                                  │      ┌──────────────────────────────────────────────────┐
                                                  │      │ Excluded at screening (n = 235)                    │
                                                  │      │                                                    │
                                                  │      │ Reasons:                                           │
                                                  ├──────│   HADS > 10 (n = 143)                              │
                                                  │      │   No complete screening assessment (n = 58)        │
                                                  │      │   Flourishers (n = 25)                             │
                                                  │      │   No valid email address (n = 5)                   │
                                                  │      │   Flourishing and HADS                             │
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                                    ┌─────────────────────────────┐
                                    │         Included            │
                                    │        (n = 283)            │
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                                                  │      │ Excluded (n = 8)                           │
                                                  ├──────│                                            │
                                                  │      │ Reason:                                    │
                                                  │      │   No complete baseline assessment          │
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                                    ┌─────────────────────────────┐
                                    │        Randomized           │
                                    │        (n = 275)            │
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Allocated to self-help book *This is Your Life* with email support (n = 137)	**Allocated to wait-list** (n = 138)
Completed email support (n = 88)	
Discontinued email support (n = 48)	
Excluded from intervention (n=1)	
Reasons discontinued email support:	
Too time-consuming (n = 9)	
Personal circumstances (n = 8)	
Too demanding (n = 7)	
Started with coach/(psycho)therapy (n = 4)	
Due to medical illness/accident/pregnancy (n = 4)	
Vacation (n = 3)	
Follows course in own time pace (n = 2)	
Did not like the book (n = 1)	
Already able to experience well-being (n = 1)	
Unknown reason (n = 9)	
Reason excluded:	
Participated with professional reason	

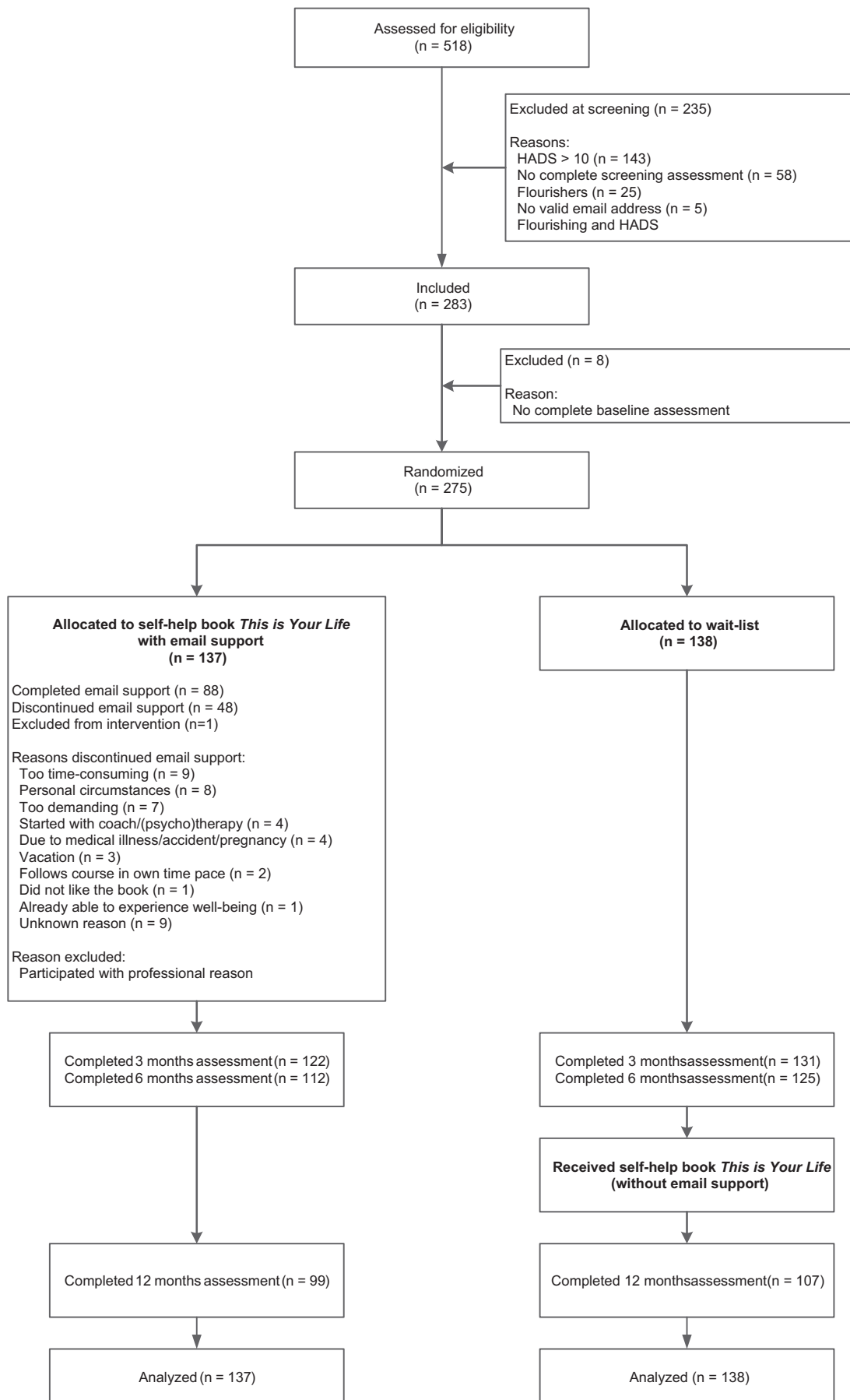| Completed 3 months assessment (n = 122) Completed 6 months assessment (n = 112)	Completed 3 months assessment (n = 131) Completed 6 months assessment (n = 125)
	Received self-help book *This is Your Life* (without email support)
Completed 12 months assessment (n = 99)	Completed 12 months assessment (n = 107)
Analyzed (n = 137)	Analyzed (n = 138)

Fig. 1. Flow-chart of participants in the *This is Your Life study*.

Hulsbergen, 2013) is a theory-based intervention that covers 8 modules (Schotanus-Dijkstra et al., 2015). Each module consists of psycho-education, and evidence-based positive psychology exercises concerning six key components of mental well-being: positive emotions, discovering and using strengths (two modules), optimism and hope, self-compassion, resilience, and positive relations (two modules; Schotanus-Dijkstra et al., 2015). Participants were instructed to use a 9-week time schedule of reading one module per week (except for Module 2, which was spread out over two weeks) and practicing a minimum of two recommended exercises for each module. Examples of such exercises are: 1) "the three good things exercise": savor the things that went well that day; 2) "wish yourself something good": use your inner voice to repeat compassionately your greatest need at that moment; and 3) "active-constructive responding": positively and actively respond to good news shared by others. Please refer to the study protocol for an overview of all the recommended exercises (Schotanus-Dijkstra et al., 2015).

Participants had 8 to 12 weeks to complete the program and received weekly email support from a personal counselor to increase adherence. Five masters students in the Department of Positive Psychology and Technology at the University of Twente guided 25 participants each, and the remaining participants were guided by the first author. The personal counselors were trained in TL-E during a study-course and in a one-day workshop. All counselors also attended weekly supervision meetings to ensure treatment integrity. The email guidance was meant to support the book rather than to provide counseling. The email support was asynchronous and comprised tailored feedback on processes and progression according to the time schedule. The counselors were also instructed to use generic techniques such as positive reinforcement, paraphrasing, and some motivational interviewing techniques such as providing feedback and support, encouraging self-efficacy, and offering instructions about exercises. Adherence to the intervention was encouraged by email reminders from the personal counselor or first author.

2.3.2. WL control group

After completing the 6-months assessment, participants in the WL group received the book *This is Your Life* and the 9-week time schedule. Participants did not receive email support. During the study, participants in both conditions had unrestricted access to other therapies or health care services.

We had planned a third 'active control' arm in which participants would have received the self-help book and, instead of email support, weekly emails containing frequently asked questions (Schotanus-Dijkstra et al., 2015). Due to an unexpectedly high exclusion rate (143 individuals scored > 10 on the HADS-A or HADS-D) and limited study funding, we were forced to adjust the trial to two arms.

2.4. Measures

2.4.1. Primary outcome

Well-being was measured on all time-points with the 14-item MHC-SF, of which its total continuous scale was used as well as its subscales (Keyes et al., 2008). The emotional well-being subscale (EWB) contains three 3 items about happiness, positive affect and life-satisfaction. The subscale social well-being (SWB) has five items about social contribution, social integration, social actualization, social acceptance and social coherence. The third subscale psychological well-being (PWB) includes six items about self-acceptance, environmental mastery, positive relations, personal growth, autonomy and purpose in life. Each item was rated on a scale from 0 (never) to 5 (almost always).

Social-psychological well-being was also assessed with a fairly novel instrument, the 8-item Flourishing Scale (FS; Diener et al., 2009). Items were rated on a 7-point scale from 1 (strongly disagree) to 7 (strongly agree). The FS measures purpose and meaning, supportive relationships, engagement, contribution to the well-being of others, compe-

tence, self-acceptance, optimism and being respected. When compared to the MHC-SF, the FS does not measure emotional well-being and only one item measures social well-being.

Both instruments demonstrated good psychometric properties in general population samples (Hone et al., 2013; Lamers et al., 2011), although a recent study found a lack of measurement precision at the flourishing continuum of the FS (Schotanus-Dijkstra et al., 2016b). Total scores ranged from 0 to 5 on the MHC-SF ($\alpha = 0.88$) and from 8 to 56 on the FS ($\alpha = 0.86$), with higher scores indicating higher levels of well-being. Strong positive cross-sectional correlations between the MHC-SF and FS were found at baseline ($r = 0.58$), 3 months ($r = 0.69$), 6 months ($r = 0.72$) and 12 months ($r = 0.74$).

2.4.2. Secondary outcomes

Higher scores on the continuous measure of the MHC-SF indicate the probability that people are flourishing. However, to more specifically measure flourishing mental health, we used the proposed criteria of the MHC-SF as a secondary outcome to be able to classify participants as having flourishing mental health, moderate mental health or languishing mental health (Keyes, 2006; Keyes et al., 2008). Participants are considered flourishers when they score 4 or 5 on at least one EWB item together with a score of 4 or 5 on at least 6 of the 11 remaining items. Languishers score 0 or 1 on these items. Moderately mentally healthy individuals are those who do not fulfill either of these two criteria. In the current sample, few participants were classified as languishers (4.4%). Therefore, the languishing and moderate mental health categories were merged and coded as "not flourishing" (as opposed to flourishing).

Other secondary outcomes were anxiety and depressive symptoms as measured with the HADS-A and HADS-D (Spinhoven et al., 1997; Zigmond and Snaith, 1983). These measures were assessed at screening and at 6 months in both the TL-E and WL conditions, and in the TL-E group also at 12 months. Each subscale consists of 7 items with scores ranging from 0 to 3. Higher total scores (0 to 21) on each subscale indicate more anxiety or depressive symptoms. The HADS is a widely validated instrument (Bjelland et al., 2002; Spinhoven et al., 1997) and showed good internal consistency in the current sample ($\alpha = 0.76$ for both subscales). There were other secondary measurements included in the trial, which we will not report in the current paper. A complete list of these other measures can be found in the study protocol (Schotanus-Dijkstra et al., 2015).

2.4.3. Moderators of the intervention effect

Prior research has indicated that personality traits, socio-economic status, social support and positive life-events (but not negative life-events) were associated with flourishing (Keyes, 2007; Peter et al., 2011; Schotanus-Dijkstra et al., 2016c). In the current study, we included personality traits and life-events as possible moderators. Personality traits were measured at baseline using the Eysenck Personality Questionnaire-Revised Short Scale (Sanderman et al., 1995) for extraversion and neuroticism and the NEO Five Factor Inventory for conscientiousness (Costa and McCrae, 1995). Positive and negative life-events were assessed at all time-points with a modified version of the Brugha Life-events section (Brugha et al., 1985). Gender, age and education were assessed at the time of the participants' screening.

2.4.4. Participants' evaluation of the intervention

At 3 months, the TL-E group received the Client Satisfaction Questionnaire-short form (CSQ-8; Attkisson and Zwick, 1982) and a process evaluation questionnaire developed by the first author to assess the following: (1) the average time the participant spent per week on the intervention, (2) how each element of the intervention was evaluated on a scale from 1 to 10 (4 items: self-help book, positive psychology exercises, email support and the personal counselor), and (3) how much time was spent on each of the 8 modules, ranging from 1 (no time spent) to 5 (spent a lot of time). Responses from the latter

Table 1
Baseline characteristics of participants in the intervention group, control group and the total sample.

	TL-E (n = 137)	WL (n = 138)	Total (n = 275)
Age, M (SD)	48.9 (10.9)	46.7 (10.8)	47.8 (10.9)
Gender, n (%)			
Female	118 (86.1)	118 (85.5)	236 (85.8)
Male	19 (13.9)	20 (14.5)	39 (14.2)
Education, n (%)			
Low	5 (3.6)	5 (3.6)	10 (3.6)
Intermediate	30 (21.9)	30 (21.7)	60 (21.8)
High	102 (74.5)	103 (74.6)	205 (74.5)
Marital status, n (%)			
Married	57 (41.6)	61 (44.2)	118 (42.9)
Single	44 (32.1)	49 (35.5)	93 (33.8)
Separated or divorced	36 (26.3)	28 (20.3)	64 (23.3)
Nationality, n (%)			
Dutch	122 (89.1)	128 (92.8)	250 (90.9)
Other	15 (10.9)	10 (7.2)	25 (9.1)
Living situation, n (%)			
Alone	34 (24.8)	42 (30.4)	76 (27.6)
With others	103 (75.2)	96 (69.6)	199 (72.4)
Employment status, n (%)			
Paid employment	89 (65.0)	99 (71.7)	188 (68.4)
Unemployed or unable to work	33 (24.1)	26 (18.8)	59 (21.5)
Retired, student or homemaker	15 (10.9)	13 (9.4)	28 (10.2)
Health care use in 3 months prior to baseline, n (%)			
General practitioner	72 (52.5)	79 (57.2)	151 (54.9)
Psychologist, psychiatrist, mental health service	22 (16.0)	30 (21.7)	52 (18.9)

TL-E = intervention group, 'This is your life' with email support; WL = wait-list control group.

Note. There were no significant group differences.

question were used to calculate the number of completed modules, with scores of 1 (no time spent) and 2 (little time spent) coded as indicating that the module had not been completed.

2.5. Power calculation

A sample size of 99 participants per condition was required to provide a statistical power of 80% and a two-sided 5% significance to detect a standardized effect size of 0.40 (Cohen's *d*) on mental well-being (MHC-SF). This assumed effect size was based on meta-analyses of positive psychology interventions (Bolier et al., 2013a; Sin and Lyubomirsky, 2009). A drop-out rate of 25% was anticipated based on a similar study (Fledderus et al., 2012), resulting in a required sample size of 132 participants per condition. The power calculation was not adjusted after the third arm was removed from the trial design.

2.6. Statistical analyses

For our statistical analyses, we followed the Consolidated Standards of Reporting Trials (CONSORT) statement (Moher et al., 2010) and used SPSS version 22.0 (IBM, Chicago, Ill., USA) and 2-tailed tests with a significance level < 0.05. Missing data on the primary and secondary outcomes were imputed (7.7%; Little's MCAR test: χ^2 (72) = 55.91, $p = 0.919$) using the estimation maximization algorithm (EM). This method uses the observed data in an iterative process (Dempster et al., 1977) and has been proven to be a highly valid and reliable method as compared to other imputation techniques (Blankers et al., 2010). We only report the intention-to-treat results because a comparison to analyses with the observed data (i.e. completed questionnaires without imputation) revealed similar results.

Descriptive statistics of participant characteristics and Pearson correlation coefficients of baseline measures were analyzed. Differences between conditions at baseline and between drop-outs

and completers were analyzed using χ^2-tests and independent *t*-tests. Drop-out was defined as incomplete data on the assessments at 3 and/or 6 months. Condition × drop-out interactions were analyzed using an analysis of variance (ANOVA). To evaluate the superiority of the intervention on primary and secondary outcomes, we used 2 (group) by 3 (time) ANOVA and a *post-hoc* Bonferroni test. Cohen's *d* effect sizes for between group differences were calculated by subtracting the mean differences from baseline to each follow-up point of the TL-E group from the WL group, and dividing the difference by the pooled standard deviation. The 95% confidence intervals (CI's) of Cohen's *d* were computed using R version 3.3.0. We used χ^2 to examine the difference in the proportion of flourishers between conditions. The number needed to treat (NNT) for flourishing was also calculated at 3 and 6 months (Cook and Sackett, 1995). Paired *t*-tests within each group were used to explore within group changes from baseline to 12 months, and from 6 to 12 months.

To examine a dose-response relationship of adherence to TL-E, regression analyses were used with well-being (MHC-SF and FS) or clinical symptomatology (HADS-A and HADS-D) as a dependent variable (controlled for their baseline outcome) at 3 and 6 months along with the number of sent emails and the number of completed modules as predictor variables. For these analyses, participants in the WL group were excluded because they received no intervention. The number of completed modules was self-reported and available for 122 of the 137 participants in the TL-E group.

Finally, moderation analyses were performed according to the procedure as outlined by Preacher and Hayes (2008) using the PROCESS tool (Hayes, 2012). Well-being at 3 months (controlled for well-being at baseline) or 6 months (controlled for well-being at baseline and well-being at 3 months) were entered in the regression analyses as dependent variables. The grand centered means of the potential moderators and the group × moderator interaction term were entered as independent variables. If this interaction term contributed significantly to the intervention effect, then the moderator was further explored with plots.

3. Results

Table 1 summarizes the baseline characteristics of the sample. The mean age was 47.8 years (*SD* = 10.9), and participants were predominantly female (85.8%) and higher educated (74.5%). More than half of the participants had seen a general practitioner in the three months prior to the study (54.9%), and almost 20% had seen a mental health professional. Table 2 shows the bivariate correlations between baseline measures. All Pearson correlation coefficients were significant, with strong correlations between the MHC-SF and its subscales ($r > 0.80$). Moderate to strong correlations were found between (subscales of) the MHC-SF and the FS (r between 0.40 and 0.58), and weak to moderate correlations were found between the well-being measures and anxiety and depressive symptoms (r between −0.17 and −0.52).

3.1. Drop-out

A total of 253 (92.0%) participants completed the 3-month assessment and 237 (86.2%) the 6-month assessment. Overall, there were significantly more drop-outs in the TL-E group as compared to the WL group [19.7% vs. 10.9%, χ^2(1) = 4.15, $p = 0.042$]. Drop-outs and completers did not significantly differ on any of the demographics and baseline measures. Interaction tests of all baseline levels of the outcome measures revealed only a different drop-out pattern for anxiety symptoms [F(1, 271) = 7.24, $p = 0.008$], indicating that people with higher baseline anxiety symptoms in the WL group were more inclined to drop-out than people with higher baseline anxiety symptoms in the TL-E group.

Table 2
Bivariate correlations between different measures of mental well-being with anxiety and depressive symptoms at baseline.

		MHC-SF	MHC-SF EMO	MHC-SF SOC	MHC-SF PSY	FS	HADS-A	HADS-D
MHC-SF	Mental well-being	(0.88)						
MHC-SF EMO	Emotional well-being subscale	0.80***	(0.80)					
MHC-SF SOC	Social well-being subscale	0.88***	0.56***	(0.70)				
MHC-SF PSY	Psychological well-being subscale	0.92***	0.66***	0.68***	(0.79)			
FS	Flourishing Scale	0.58***	0.40***	0.50***	0.58***	(0.86)		
HADS-A	Anxiety symptoms	− 0.27***	− 0.22***	− 0.28***	− 0.22***	− 0.17**	(0.76)	
HADS-D	Depressive symptoms	− 0.49***	− 0.52***	− 36***	− 0.44***	− 0.34***	0.34***	(0.76)

Cronbach's alphas are in parentheses.
  ** $p < 0.01$.
  *** $p < 0.001$.

3.2. Interaction effects

There were no significant differences between groups on demographics and baseline measures. Table 3 shows that there was a significant time × group interaction effect on the MHC-SF, $F(1.9, 522.9) = 42.00$, $p < 0.001$, indicating that participants in the TL-E group reported a stronger increase in well-being immediately following the intervention ($d = 0.68$, 95%CI = 0.44–0.92) and at 6 months ($d = 0.66$, 95%CI = 0.42–0.90) than participants in the WL group. However, the interaction effect of the FS was not significant [$F(2, 546) = 2.45$, $p = 0.087$]. A post hoc Bonferroni test of the MHC-SF results revealed that the increase in well-being was significant from baseline to 3 months and from baseline to 6 months, but not from 3 to 6 months, indicating that the initial increase was maintained.

Anxiety and depressive symptoms significantly decreased more in the TL-E group between baseline and 6 months than these symptoms did in the WL group, $F(1, 273) = 21.65$, $p < 0.001$ and $F(1, 273) = 13.62$, $p < 0.001$ respectively. The largest effect sizes were found for the MHC-SF, its psychological well-being subscale and anxiety, which were above $d = 0.63$ indicating medium effect sizes between groups.

3.3. Impact on flourishing

The proportion of flourishers (Table 4) did not significantly differ between conditions at baseline [χ^2 (1) = 0.04, $p = 0.834$]. However, at 3 months, there were significantly more flourishers in the TL-E group as compared to the WL group [χ^2 (1) = 14.06, $p < 0.001$]. The NNT was 5.46 indicating that 1 in 5 participants achieved flourishing after the 9-week program and, therefore, benefited from the intervention. Comparable results were found at 6 months with a NNT of 5.25.

3.4. Long-term effects

The 12-month assessment was completed by 100 participants in the TL-E group (73%) and the MHC-SF and FS were also completed by 107 participants in the WL group (78%). In the TL-E group, paired *t*-test results demonstrated significant within-group improvement from baseline to 12 months on the MHC-SF [$t(136) = 10.18$, $p < 0.001$], FS [$t(136) = 4.17$, $p < 0.001$], HADS-A [$t(136) = − 5.73$, $p < 0.001$] and HADS-D [$t(136) = − 5.82$, $p < 0.001$]. The proportion of flourishing in this group was highest at 12 months (33.6%).

The WL group had received the book *This is Your Life* (without email support) after completing the 6-month assessment. Paired *t*-tests showed that participants in the WL group improved significantly from baseline to 12 months on mental well-being [MHC-SF: $t(137) = 4.17$, $p ≤ 0.001$; FS: $t(137) = 4.10$, $p ≤ 0.001$], as well as from 6 months to 12 months [MHC-SF: $t(137) = 3.38$, $p = 0.001$; FS: $t(137) = 3.87$, $p ≤ 0.001$]. The proportion of participants classified as flourishing in this group was also highest at 12 months (21%). These results suggest that participants in the control group also benefited from receiving the

Table 3
Means and standard deviations for well-being and psychological distress and results of the repeated measures analysis of variance and Cohen's *d* for between group effect sizes, intention-to-treat analysis.

	TL-E (n = 137) M (SD)	WL (n = 138) M (SD)	F[a]	p	Effect size d [95% CI]
MHC-SF					
Baseline	2.56 (0.62)	2.59 (0.64)			
3 months	3.09 (0.67)	2.64 (0.66)			0.68 [0.44–0.92]
6 months	3.13 (0.74)	2.65 (0.71)	42.00	< 0.001	0.66 [0.42–0.90]
12 months	3.12 (0.76)	2.78 (0.74)			
EWB					
Baseline	2.80 (0.77)	2.75 (0.72)			
3 months	3.29 (0.76)	2.81 (0.80)			0.62 [0.38–0.86]
6 months	3.42 (0.86)	2.93 (0.88)	18.10	< 0.001	0.56 [0.32–0.80]
12 months	3.34 (0.90)	2.93 (0.82)			
SWB					
Baseline	2.35 (0.74)	2.38 (0.72)			
3 months	2.80 (0.67)	2.42 (0.70)			0.56 [0.32–0.80]
6 months	2.76 (0.80)	2.38 (0.72)	21.70	< 0.001	0.50 [0.26–0.74]
12 months	2.81 (0.81)	2.52 (0.79)			
PWB					
Baseline	2.62 (0.68)	2.68 (0.72)			
3 months	3.22 (0.76)	2.75 (0.73)			0.63 [0.39–0.87]
6 months	3.28 (0.81)	2.73 (0.79)	39.55	< 0.001	0.69 [0.44–0.93]
12 months	3.26 (0.80)	2.93 (0.81)			
FS					
Baseline	41.95 (6.19)	40.94 (6.74)			
3 months	44.19 (6.52)	41.82 (6.25)			0.37 [0.13–0.61]
6 months	43.75 (7.57)	41.22 (7.16)	2.45	0.087	0.34 [0.10–0.58]
12 months	44.28 (6.98)	42.89 (6.22)			
HADS-A[b]					
Baseline	7.10 (2.43)	7.47 (2.37)			
6 months	5.29 (3.08)	7.31 (3.38)	21.65	< 0.001	0.63 [0.39–0.87]
12 months	5.44 (3.25)				
HADS-D[b]					
Baseline	5.78 (2.53)	5.83 (2.42)			
6 months	3.88 (4.00)	5.45 (3.37)	13.62	< 0.001	0.43 [0.19–0.67]
12 months	4.02 (3.64)				

CI = confidence interval; EWB = Emotional Well-being, measured with the MHC-SF; FS = Flourishing Scale; HADS-A = Hospital Anxiety and Depression Scale-Anxiety; HADS-D = Hospital Anxiety and Depression Scale-Depression; MHC-SF = Mental Health Continuum-Short Form; PWB = Psychological Well-being, measured with the MHC-SF; SWB = Social Well-being, measured with the MHC-SF; TL-E = intervention group, 'This is your life' with email support; WL = wait-list control group.
  [a] Interaction effect (time × group). When the assumption of sphericity is violated, Greenhouse-Geisser results are reported.
  [b] The HADS-A and HADS-D were measured at screening, approximately 2 weeks before baseline.

self-help book after six months of "waiting", despite only 23% ($n = 24$) self-reporting to have read (parts of) the book and practicing some exercises. Another 43% ($n = 45$) of the participants reported having read (parts of) the book.

Table 4

Chi-square tests of the number of participants (%) with flourishing (F) and non-flourishing (NF) mental health.

	TL-E (n = 137)		WL (n = 138)		p
	F	NF	F	NF	
Screening	0	137	0	138	
Baseline	10 (7.3)	127 (92.7)	11 (8.0)	127 (92.0)	0.834
3 months	41 (29.9)	96 (70.1)	16 (11.6)	122 (88.4)	< 0.001
6 months	42 (30.7)	95 (69.3)	16 (11.6)	122 (88.4)	< 0.001
12 months	46 (33.6)	91 (66.4)	29 (21.0)	109 (79.0)	

TL-E = intervention group, 'This is your life' with email support; WL = wait-list control group.
Note. Flourishing was measured with the Mental Health Continuum-Short Form (MHC-SF).

3.5. Adherence

Half of the participants (52%) had invested 2 to 4 h per week in the program, 31% had invested < 2 h and 17% > 4 h. Most participants evaluated the program positively: the mean on the CSQ-8 was 3.07 ($SD = 0.59$) and the mean grades for the book, exercises, email support and the personal counselors were 7.8 ($SD = 1.25$), 7.5 ($SD = 1.23$), 6.8 ($SD = 1.95$) and 6.8 ($SD = 1.88$) respectively. On average, participants sent 6.4 extensive emails (range = 0–12, $SD = 3.62$) and completed 6.4 modules (range = 0–8, $SD = 2.4$). We did not find a clear dose-response relationship for the number of extensive emails sent by the participant or the number of completed modules. However, we did find a marginally significant dose-response relationship for the number of completed modules and anxiety symptoms at 6 months ($b = -0.204$, $p = 0.054$), indicating that adherence increases as anxiety symptoms decrease.

3.6. Moderation

Table 5 shows the group × moderator interaction effects on the MHC-SF for each pre-specified moderator (age, gender, education, positive and negative life-events, extraversion, neuroticism and conscientiousness). Tests revealed no significant interaction effects for any of the moderators at 3 months. However, at 6 months, a significant interaction was found for neuroticism ($p = 0.031$). Further inspection of the data revealed that participants with low or intermediate levels of neuroticism benefited more from the intervention at 6 months than participants with high levels of neuroticism.

4. Discussion

The promotion of flourishing as an optimal level of mental health has shown to have a significant impact on reducing the incidence and prevalence of mental disorders (Grant et al., 2013; Keyes et al., 2010; Schotanus-Dijkstra et al., 2016a). Studies, however, have yet to determine how it might be possible to enhance flourishing in people with low or moderate well-being. We worked towards this aim in the current study by evaluating the short-term and long-term effectiveness of a multicomponent and guided self-help intervention in persons with languishing or moderate mental health. Results of this 9-week multi-component self-help program demonstrated that the early intervention was superior to a WL condition in increasing mental well-being (MHC-SF) and the proportion of flourishers. In addition, participants in the self-help program showed a decrease in anxiety and depressive symptoms (HADS) up to 6 months after the start of the program. In particular, the proportion of flourishers in the TL-E group increased from 7% at baseline to 34% at 12 months, indicating that the intervention was able to enhance the proportion of flourishers in the study to the average population level of flourishers in The Netherlands (37%; Schotanus-Dijkstra et al., 2016c).

The medium between-group effects on the MHC-SF and its PWB subscale were somewhat lower compared to some previous multi-component positive interventions (Page and Vella-Brodrick, 2012; Rashid, 2014). However, the effect sizes from prior studies could have been overestimated by their small sample sizes. Compared to a study that also used a self-help book with email support (Fledderus et al., 2012), our study demonstrated larger effect sizes on psychological well-being and smaller effect sizes on anxiety and depression. This finding suggests that both positive interventions were adequately designed for different target groups, because Fledderus et al.' (2012) study was designed and evaluated among people with mild to moderate depressive symptomatology. Furthermore, we found considerable larger effect sizes than has been found in a recent meta-analysis of RCT's about mostly single component positive psychology interventions (Bolier et al., 2013b), indicating that it seems more effective to invest in *multicomponent* well-being interventions.

The larger effect sizes found in the current study compared to the prior meta-analysis could be partly explained by the use of a wait-list control group rather than treatment as usual (Sin and Lyubomirsky, 2009). In addition, the medium-sized effects might have been partly due to the use of weekly and tailored email support from personal counselors, which corresponds to findings of an earlier study by Andersson and Cuijpers (2009). They found that effect sizes of web-

Table 5

Moderator analyses of well-being (moderator × group interaction effects).

	MHC-SF at 3 months[a]			MHC-SF at 6 months[b]		
	b	95% CI	p	b	95% CI	p
Demographics						
Age	0.01	− 0.00–0.02	0.097	0.00	− 0.01–0.01	0.776
Gender	0.10	− 0.27–0.47	0.607	− 0.16	− 0.50–0.17	0.338
Education	− 0.17	− 0.42–0.09	0.207	− 0.13	− 0.34–0.08	0.218
Life events						
Positive events before baseline	0.14	− 0.13–0.41	0.312			
Negative events before baseline	0.01	− 0.26–0.27	0.960			
Positive events between baseline and 6 months				0.18	− 0.06–0.42	0.142
Negative events between baseline and 6 months				0.16	− 0.08–0.40	0.178
Personality traits						
Extraversion	− 0.01	− 0.04–0.03	0.784	− 0.02	− 0.05–0.01	0.159
Neuroticism	0.00	− 0.04–0.04	0.965	− 0.04	− 0.07 to − 0.00	0.031
Conscientiousness	-0.00	− 0.02–0.02	0.964	0.00	− 0.02–0.02	0.964

MHC-SF = Mental Health Continuum-Short Form. *b* refers to the unique contribution of the interaction term (moderator × group) in the prediction of the MHC-SF after controlling for the separate effects of group and moderator, and MHC-SF at baseline (or baseline and 3 months).
[a] Controlled for well-being at baseline.
[b] Controlled for well-being at baseline and 3 month.

based treatments for depression increased from small to medium when personal support was added to the treatment.

Adding email support to the intervention might also have been one of the reasons why we did not find a meaningful dose-response relationship. In other words, the fact that people received at least minimal attention from another human being might have caused beneficial results for all the participants in the intervention group. Another possibility for the lack of a dose-response relationship in the current study is that we did not measure whether participants continued to use the exercises in their daily lives, and this factor may be highly relevant to mental health outcomes (Cohn and Fredrickson, 2010; Seligman et al., 2005). Because there is a large variety in how adherence is measured in psychological interventions, the relationship between adherence and beneficial mental health outcomes is not straightforward (Donkin et al., 2011).

A surprising finding of the current study was that psychological well-being as measured with the FS did not reach statistical significance, even though the RCT-data also revealed significant improvements in the intervention group compared to the control group on positive emotion, use of strengths, optimism, self-compassion, resilience and positive relations (Schotanus-Dijkstra et al., in revision). The MHC-SF and FS are both acclaimed to be measures of social and psychological well-being, but might contain different facets of well-being. This can also be concluded from the intercorrelations in the current study, which were significant but of moderate magnitude. The non-significant finding for the FS might be a result of the positive skewness at baseline leaving not much room for growth, and a less accurate measurement precision at the higher end of the social-psychological well-being continuum (Schotanus-Dijkstra et al., 2016b). The FS might also be less sensitive to change, especially with regard to the transition from moderate mental health to flourishing. Researchers should be aware of these possible limitations of the FS, especially in intervention studies aimed at increasing mental well-being.

Another striking finding was that participants with a high level of neuroticism (i.e. emotional instability, nervousness, worrying) benefited equally from the intervention at 3 months compared to participants with a low or moderate level of neuroticism, but they benefited less from the intervention at 6 months. This finding seems somewhat in agreement with a prior study wherein the moderating effect of neuroticism was found for a one-week intervention wherein participants expressed gratitude or kindness each day (Ng, 2016). These findings might indicate that people with high levels of neuroticism need more guidance or tools to keep on practicing and to benefit from their new learned skills.

4.1. Strengths and limitations

The present study makes several contributions to the mental health literature. Firstly, to the best of our knowledge, our study is the first to adopt Keyes' (2007) classification model of well-being for participant selection as well as for the intervention's development and evaluation. We demonstrated that it is possible for people to increase their well-being up to a flourishing mental health status using an early intervention based on a positive framework. This is important because low and moderate well-being is highly prevalent in the USA and Europe, regardless of mental illness (Huppert and So, 2013; Keyes, 2005, 2007; Schotanus-Dijkstra et al., 2016c). For example, Keyes (2005) found that nearly 75% of American adults had no common mental disorder, but about 80% of them showed less than optimal well-being. Hence, our findings are promising from a public mental health perspective as languishing and moderate mental health are risk factors for developing mental disorders later in life (Grant et al., 2013; Keyes et al., 2010; Lamers et al., 2015; Schotanus-Dijkstra et al., 2016a; Wood and Joseph, 2010). A future study will test whether our program is also cost-effective, which seems plausible since we used a relatively low-cost intervention.

Second, although between-group comparisons were confined to 6 months, our study did follow participants for 12 months, which is a rarity in positive psychology intervention studies. These promisingly results suggest that the intervention has enduring positive effects on well-being, flourishing, anxiety and depression.

Third, we were the first to include life-events and personality traits as possible moderators of change in a multicomponent positive intervention. Besides neuroticism at 6 months, we did not find significant moderator effects, suggesting that the self-help book in combination with email support seems suitable for a rather heterogeneous target group within the boundaries of the self-selected sample of mainly higher-educated women.

Our study's conclusions are primarily limited by the use of a wait-list control group and the self-selected study sample. It is unfortunate that we were unable to follow through with our plans to conduct a three-arm trial with an active control group (Schotanus-Dijkstra et al., 2015). Consequently, by only using a wait-list control group, our conclusions on the added effect of email support to the self-help program were impeded. However, based on the within-group effects from 6 to 12 months in the WL condition, it seems that the WL group also benefited from receiving the book without email support even though they appear to have worked less intensively on the program.

Our results should also be interpreted with care because our self-selected sample—with an overrepresentation of higher-educated, middle aged, female participants—limits the generalizability of the findings. As this is common in similar studies, this does not affect the comparability of our results to previous studies. This also indicates that researchers are challenged to reach lower-educated people of all ages, as well as more men which is especially vital for large-scale implementation of the intervention.

In addition, our sample probably consisted of motivated participants because they were willing to invest approximately 4 h per week on the intervention. In fact, 69% invested at least 2 h per week. The intervention may not have similar effects for people with less time or motivation to invest in the self-help program. Final limitations include that the first author was responsible for randomization, enrollment and the assignment of participants to each group rather than an uninvolved independent researcher, and that our study was not statistically powered for the moderation analyses.

4.2. Practical implications and future research

Our findings are relevant for clinical psychiatry, primary care, public mental health and policy. Clinical psychiatry needs innovative preventive approaches for seeking effective solutions for mental suffering (Insel and Scolnick, 2006). A new promising strategy might be to focus on non-flourishers with mild anxiety or depressive symptoms who are motivated to work on their well-being and resilience. The intervention *This is Your Life* could be offered as an early intervention in mental health services, maybe even for people who are waiting for psychological treatment.

Notably, our study also attracted a large group of people with at least moderate anxiety and depressive symptoms. Although we made the decision to exclude this group from the current study, other self-help interventions aligned with positive psychology for people with moderate or severe depressive symptoms have been successful in enhancing mental well-being and decreasing anxiety and depression as well (e.g. Chaves et al., 2016; Fledderus et al., 2012; Pots et al., 2016). In future studies we intend to implement the intervention in people with higher levels of distress. Researchers could also test the applicability and efficacy of the intervention in relapse prevention or as a complementary intervention integrated with regular treatments. Hence, a large and diverse population for mental health promotion might possibly be reached for the prevention of first or recurrent symptoms of mental illness. In this regard, the MHC-SF, which is

already available in a wide variety of languages, could help professionals with screening, selection or monitoring of mental well-being in addition to mental illness.

To conclude, this study's findings may especially be relevant for primary care. For example, the intervention could be considered as a first step in collaborative care or stepped-care models. A promising finding from our study was that more than half of the participants had seen a general practitioner in the three months prior to the study, indicating that this group—at risk for developing anxiety or depression—might be effectively reached in primary care. More research is needed to identify a more specific risk profile, which can then be used as a screening tool in primary care and in mental health services. Furthermore, an online version of the intervention has potential to reach individuals on an even wider scale. Adding automated support to this type of intervention could ensure similar effects and adherence rates (Kelders et al., 2015) as well as lower costs. Overall, it seems fruitful for people with less than optimal well-being to actively invest in a multicomponent self-help intervention based on positive psychology. Programs like *This is Your Life* that enhance flourishing could then be considered as a new approach to enhancing public mental health.

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Contributors

ETB and MS conceived the study. MS contributed to the design and coordination of the study, performed statistical analyses and wrote the manuscript. CHCD and MEP were involved in drafting the manuscript and provided critical review. BB, JAW and ETB revised the paper critically. All authors read and approved the final manuscript.

Conflict of interest

None.

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