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Moderators of the effect of guided online self-help for people with HIV and depressive symptoms

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ABSTRACT

The goal of the study was to investigate moderators of intervention effect of a guided Internet-based self-help cognitive behavioral intervention for people with HIV and depressive symptoms. This study was part of a randomized controlled trial where the intervention was found to be effective in reducing depressive symptoms, compared to an attention-only control group. Demographic characteristics (e.g., age), HIV characteristics (e.g., duration of HIV), and psychological characteristics (e.g., coping self-efficacy) were investigated as potential moderators of intervention effect. In 2015, 188 people with HIV and depressive symptoms were included in the study: 97 were randomized to the intervention group and 91 to the control group. Two moderators of intervention effect were found: coping self-efficacy and baseline depression severity. Participants with low coping self-efficacy and baseline depression severity improved more in the intervention group than in the control group, and participants with high coping self-efficacy and baseline depression severity improved in both groups. The results indicate that the intervention may be provided to all people with HIV and depressive symptoms. It may be especially important for people with HIV and low coping self-efficacy to start with the intervention since they show less improvement in the control group with only attention.

Trial registration: Nederlands Trialregister NTR5407, September 11, 2015.

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KEYWORDS
HIV; depression; Internet; cognitive behavioral therapy; moderator; randomized controlled trial

Introduction

A guided Internet-based intervention for people living with HIV (PLWH) with depressive symptoms has been developed: Living positive with HIV (van Luenen, Kraaij, Spinhoven, & Garnefski, 2016), based on cognitive behavioral therapy (CBT). It was found to be effective in decreasing depressive symptoms, compared to a control condition that received attention only (van Luenen, Garnefski, Spinhoven, & Kraaij, 2018). However, we did not investigate moderating factors yet, which could provide information about who benefitted more or less from treatment. This is important for future referrals of subgroups of PLWH with depressive symptoms: Is the online intervention a good option?

So far, studies have been conducted regarding moderators of effects of (online) CBT for depressive symptoms, but not for PLWH. Marriage, unemployment, and experience of recent life events predicted superior response to face-to-face CBT, compared to antidepressants (Fournier et al., 2009). With regard to online CBT, moderator studies showed larger improvements for participants having more severe depressive symptoms (Button, Wiles, Lewis, Peters, & Kessler, 2012), being widowed/divorced (Button et al., 2012), and being older (Donker et al., 2013), compared to a control group.

The current study investigated the moderators of outcome of an intervention for PLWH. The first research question was: which factors moderate the effectiveness of the intervention? A large number of possible moderators was explored, based on previous research on other patient groups and assumed importance. We included demographics, HIV-related, and psychological variables. The second question was: which subgroups of participants benefit most from the intervention? To answer this question, higher order interactions between moderators and treatment conditions were examined.

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Methods

Participants and procedure

This study is based on a randomized controlled trial (RCT) on the effectiveness of the online intervention "Living positive with HIV". The methods are explained in more detail elsewhere (van Luenen et al., 2016). PLWH with mild to moderate depressive symptoms were recruited in HIV treatment centers in the Netherlands. When patients were eligible for the study (for inclusion criteria see: [van Luenen et al., 2016]), agreed to participate, signed informed consent, and completed the pretest, they were randomly allocated to the intervention or control condition. There were multiple measurement moments; pretest, first post-test (approximately eight weeks after pretest), and second post-test (approximately five months after pretest) were used in the current analyses. The study was approved by the medical ethics committee of Leiden University Medical Center (LUMC; nr. P14.091).

Study conditions

Guided online self-help intervention

The online self-help CBT intervention included four main components: activation, relaxation, changing negative cognitions, and goal attainment. Participants worked approximately eight weeks on the intervention, one-to-two hours a week. Additionally, they were supported by a personal coach, who called them each week for about 15 min. The coach motivated participants and checked their well-being.

Control condition

Participants in the control condition were on a waiting list and received attention only. They were called by a personal coach for about five minutes per week during the first eight weeks of the waiting period. The coach enhanced motivation to stay in the study and monitored depressive symptoms. Participants gained access to the intervention after post-test 2.

Assessments

All assessments were online. Potential moderating variables were measured at pretest and the outcome variable was measured at pretest, post-tests 1 and 2. For more information, see (van Luenen et al., 2016).

Outcome variable

Depressive symptoms in the last two weeks were measured by the Patient Health Questionnaire-9 (PHQ-9 [Kroenke, Spitzer, & Williams, 2001]).

Potential moderators

Demographics (sex, age, education, marital status, employment status), HIV characteristics (physical symptoms in last two weeks, diagnosis of AIDS, use of antiretroviral therapy (ART) known to have depression as side effect, duration of HIV), and psychological characteristics (satisfaction with received social support, treatment of psychological symptoms, depressive symptoms at pretest, anxiety symptoms, coping self-efficacy, use of alcohol, soft drugs, hard drugs, and sedatives, depressive thoughts, physical tension, behavioral activation, life events) were investigated. In Appendix 1 the measurement of these variables is described.

Statistical analysis

To answer the first question regarding moderators of intervention effect, longitudinal multilevel moderated regression analyses (LMRA) (Stoel, van Den Wittenboer, & Hox, 2003), were conducted in SPSS version 23. To answer the second question regarding particular subgroups benefiting of the intervention, the Qualitative Interaction Trees (QUINT) method was conducted in R version 3.2.2 (Dusseldorp & Van Mechelen, 2014; Dusseldorp, Doove, & Van Mechelen, 2015). Details regarding the analyses can be found in Appendix 2.

Results

Participants

Participants were 188 PLWH: 97 in the intervention group and 91 in the control group. A flow chart of participants through the study is available elsewhere (van Luenen et al., 2018). The majority of participants were male, around 46 years, and had HIV for about ten years, see Table 1.

Moderators of intervention effect

The results of the LMRA showed that coping self-efficacy and baseline depression severity were significant moderators. Participants in the intervention group improved, regardless of level of coping self-efficacy and baseline depression severity. However, in the control group, participants improved less when they had low coping self-efficacy and baseline depression severity, compared to high coping self-efficacy and baseline depression severity. No other significant moderators were found, see Table 2.

Table 1. Baseline characteristics of the intervention and control group.

Characteristic	Intervention group ($n = 97$)	Control group ($n = 91$)	Total sample ($n = 188$)
Sex			
Male	85 (88%)	81 (89%)	166 (88%)
Female	12 (12%)	10 (11%)	22 (12%)
Education			
Low	20 (21%)	22 (24%)	42 (22%)
Medium	44 (45%)	33 (36%)	77 (41%)
High	33 (34%)	36 (40%)	69 (37%)
Marital status			
Married or cohabiting	41 (42%)	44 (48%)	85 (45%)
Single or living without partner	56 (58%)	47 (52%)	103 (55%)
Employment status			
Employed	52 (54%)	43 (47%)	95 (51%)
Not employed	45 (46%)	48 (53%)	93 (49%)
Diagnosis of AIDS			
No	88 (91%)	77 (85%)	165 (88%)
Yes	9 (9%)	14 (15%)	23 (12%)
Use of ART with side effect depression[a]			
Often	45 (48%)	40 (45%)	85 (46%)
Rarely	27 (29%)	29 (32%)	56 (30%)
Never	22 (23%)	21 (23%)	43 (24%)
Use of psychotropic medication			
No	85 (88%)	81 (89%)	166 (88%)
Yes	12 (12%)	10 (11%)	22 (12%)
Treatment of psychological symptoms last 5 years			
No	47 (48%)	41 (45%)	88 (47%)
Yes	50 (52%)	50 (55%)	100 (53%)
Age (years)	45.53 (10.32)	47.12 (10.94)	46.30 (10.63)
Number of physical symptoms last 2 weeks	9.09 (3.57)	9.44 (3.66)	9.26 (3.61)
Time since HIV diagnosis (years)[b]	9.35 (6.46)	10.41 (6.70)	9.87 (6.58)
Satisfaction with received support			
Not at all	8 (8%)	8 (9%)	16 (9%)
Hardly	10 (10%)	14 (15%)	24 (13%)
At little	20 (21%)	19 (21%)	39 (21%)
Quite a bit	34 (35%)	34 (37%)	68 (36%)
Certainly	25 (26%)	16 (18%)	41 (22%)
Depressive symptoms (PHQ-9)	11.74 (4.74)	11.11 (4.22)	11.44 (4.50)
Anxiety symptoms (GAD-7)	9.44 (4.72)	8.24 (4.41)	8.86 (4.60)
Coping self-efficacy	28.63 (6.38)	28.75 (6.02)	28.69 (6.20)
Alcohol use (ASSIST)[c]	10.29 (8.83)	7.11 (6.74)	8.75 (8.02)
Soft drugs use (ASSIST)[d]	7.73 (9.19)	6.27 (6.80)	7.00 (8.09)
Hard drugs use (ASSIST)[e]	8.06 (8.70)	7.96 (9.16)	8.01 (8.87)
Sedatives use (ASSIST)[f]	6.20 (6.75)	8.64 (9.21)	7.38 (8.09)
Depressive thoughts (CCI)	15.27 (6.44)	15.09 (6.46)	15.18 (6.43)
Physical tension	21.14 (3.64)	21.58 (3.77)	21.36 (3.70)
Behavioral activation (BADS)	18.88 (8.93)	17.90 (8.15)	18.40 (8.55)
Number of life events	5.66 (3.32)	5.18 (3.42)	5.43 (3.37)

Notes: Data are provided as M (SD) or *n* (%). ART = antiretroviral therapy; ASSIST = Alcohol, Smoking and Substance Involvement Screening Test; BADS = Behavioral Activation for Depression Scale; CCI = Crandell Cognitions Inventory; GAD-7 = Generalized Anxiety Disorder-7; PHQ-9 = Patient Health Questionnaire-9.
[a]based on 184 participants that use ART.
[b]available for 187 participants.
[c]based on 169 participants that ever used alcohol.
[d]based on 120 participants that ever used soft drugs.
[e]based on 98 participants that ever used hard drugs.
[f]based on 97 participants that ever used sedatives.

Interactions between moderators

The results of QUINT analyses showed that no higher order interactions between moderators and the treatment condition were present. The final pruned tree had two leaves and showed a split on the variable coping self-efficacy. The results indicated that participants with low to average coping self-efficacy (≤33.5) showed larger reductions in PHQ-9 score from pretest to post-test 1 in the intervention group than in the control group ($d =$ 0.68, 95% CI [0.31, 1.05]). Furthermore, for participants with high coping self-efficacy (>33.5), there were no differences between groups ($d = -0.40$, 95% CI [−1.28, 0.48]). The analysis with the change score from pretest to post-test 2 as outcome variable yielded the same results.

Discussion

This study found two moderators of the effect of the intervention "Living positive with HIV": coping self-efficacy and baseline depression severity. Participants with high coping self-efficacy and baseline depression

Table 2. Results of LMRA investigating Time × Group × Moderator effects of an Internet-based intervention for PLWH to improve depressive symptoms ($n = 188$).

	Short-term effect				Long-term effect			
Moderator	*b*	*t*	*p*	95% CI	*b*	*t*	*p*	95% CI
Sex	−2.43	−1.07	.29	−6.90, 2.04	1.38	0.56	.57	−3.44, 6.20
Education								
Low vs. high	−2.67	−1.31	.19	−6.68, 1.34	0.08	0.04	.97	−4.29, 4.45
Medium vs. high	−1.25	−0.73	.46	−4.61, 2.11	−0.57	−0.31	.76	−4.20, 3.05
Marital status	−2.33	−1.52	.13	−5.35, 0.68	−1.60	−0.98	.33	−4.84, 1.63
Employment status	−0.17	−0.11	.91	−3.18, 2.85	2.11	1.30	.20	−1.09, 5.31
Diagnosis of AIDS	−0.95	−0.40	.69	−5.64, 3.74	−1.63	−0.65	.52	−6.61, 3.36
Use of ART with side effect depression								
Often vs. never	−1.21	−0.62	.54	−5.07, 2.66	−3.10	−1.50	.14	−7.18, 0.98
Rarely vs. never	−0.15	−0.07	.94	−4.32, 4.02	−1.50	−0.67	.50	−5.91, 2.91
Use of psychotropic medication	−1.35	−0.57	.57	−6.03, 3.33	−2.08	−0.81	.42	−7.13, 2.98
Satisfaction with received support								
Not at all vs. certainly	−2.26	−0.72	.48	−8.47, 3.96	0.67	0.17	.87	−7.14, 8.48
Hardly vs. certainly	−2.48	−0.95	.34	−7.62, 2.66	2.95	1.12	.27	−2.26, 8.16
A little vs. certainly	−3.19	−1.36	.18	−7.83, 1.44	−2.46	−0.98	.33	−7.38, 2.47
Quite a bit vs. certainly	−1.99	−0.94	.35	−6.15, 2.17	1.08	0.49	.63	−3.28, 5.45
Treatment psychological symptoms last 5 years	−2.41	−1.58	.12	−5.41, 0.59	−2.35	−1.43	.16	−5.59, 0.90
Baseline depression severity (PHQ-9)	−0.51	−3.18	.002*	−0.82, −0.19	−0.49	−2.62	.01*	−0.85, −0.12
Age	−0.04	−0.54	.59	−0.19, 0.11	−0.003	−0.04	.97	−0.16, 0.16
Number of physical symptoms last 2 weeks	0.29	1.38	.17	−0.13, 0.71	0.21	0.90	.37	−0.25, 0.68
Time since HIV diagnosis	0.01	0.09	.93	−0.23, 0.25	−0.23	−1.83	.07	−0.47, 0.02
Anxiety symptoms (GAD-7)	−0.19	−1.14	.26	−0.52, 0.14	−0.27	−1.48	.14	−0.63, 0.09
Coping self-efficacy	0.28	2.26	.03*	0.04, 0.53	0.26	1.95	.05	−0.004, 0.53
Alcohol use (ASSIST)	−2.33	−1.30	.20	−5.86, 1.20	−0.54	−0.28	.78	−4.35, 3.27
Soft drugs use (ASSIST)	0.08	0.05	.96	−3.16, 3.32	0.68	0.38	.70	−2.86, 4.23
Hard drugs use (ASSIST)	−0.16	−0.09	.93	−3.66, 3.34	0.08	0.04	.97	−3.75, 3.92
Sedatives use (ASSSIT)	−1.84	−1.11	.27	−5.12, 1.44	−0.75	−0.41	.68	−4.33, 2.83
Depressive thoughts (CCI)	−0.11	−0.93	.35	−0.34, 0.12	−0.08	−0.64	.52	−0.34, 0.17
Physical tension	0.11	0.55	.59	−0.29, 0.51	−0.07	−0.34	.73	−0.49, 0.34
Behavioral activation (BADS)	0.09	0.97	.33	−0.09, 0.28	−0.10	−1.02	.31	−0.30, 0.09
Number of life events	0.002	0.01	.99	−0.45, 0.45	−0.10	−0.43	.67	−0.58, 0.37

Notes: ART: antiretroviral therapy; ASSIST: Alcohol, Smoking and Substance Involvement Screening Test; BADS: Behavioral Activation for Depression Scale; CCI: Crandell Cognitions Inventory; GAD-7: Generalized Anxiety Disorder-7; LMRA: longitudinal multilevel regression analyses; PHQ-9: Patient Health Questionnaire-9; PLWH: people living with HIV.

* $p < .05$.

severity improved on average in both groups, and participants with low coping self-efficacy and baseline depression severity improved more in the intervention group than in the control group. Additional analyses to investigate which subgroups of participants benefitted most from the intervention by examining higher order interactions between moderators and treatment condition found only self-efficacy as a moderator.

The result that no other moderators of intervention effect were found than coping self-efficacy and baseline depression severity, suggests that the intervention could be beneficial for all participants, irrespective of demographic, HIV-related or psychological characteristics. This knowledge is relevant for implementation; the intervention can be offered to all PLWH with mild to moderate depressive symptoms. Additionally, previous research showed that high self-efficacy was associated with more active coping (Turner, Ersek, & Kemp, 2005). Because PLWH with low self-efficacy might be more passive and avoiding, a more intensive intervention than attention only might be needed to improve on depressive symptoms.

Thus far (coping) self-efficacy had only been investigated as a general predictor of outcome of CBT for depression in three uncontrolled studies (Backenstrass et al., 2006; Kavanagh & Wilson, 1989; Stiles-Shields, Corden, Kwasny, Schueller, & Mohr, 2015), of which only the latter found a significant result. They found that participants with moderate to high coping self-efficacy were more likely to improve than participants with low coping self-efficacy in face-to-face and telephone CBT for depression.

A previous study showed a larger effect of online CBT for participants with more severe depressive symptoms (Button et al., 2012), contrary to our findings. Additionally, baseline depression severity was not found to be a moderator in the QUINT analysis. QUINT examines higher order interactions between moderators and treatment condition while SPSS examines single moderators. Therefore, the results of both analyses may be somewhat different.

Some limitations of the study have to be mentioned. This was an exploratory post-hoc analysis, so findings need to be interpreted with caution and replicated in future studies. As we wanted to explore a wide variety

of possible moderators, we conducted many univariate analyses increasing the chance of type 1 errors. However, the analysis conducted in QUINT including all moderators in one model yielded almost similar results. Furthermore, the analysis in SPSS was ITT, but the analysis in QUINT was with participants that completed questionnaires at the post-tests and there was some drop-out. Yet no differences in baseline characteristics were found between dropouts and completers (see [van Luenen et al., 2018]).

To conclude, this study found two factors that influenced the effectiveness of the intervention: coping self-efficacy and baseline depression severity. The intervention may be provided to all PLWH, but it may be particularly important to provide the intervention to PLWH with low coping self-efficacy, as they show less improvement with minimal attention only. When these findings are confirmed in future studies, it may be recommended to screen PLWH with depressive symptoms on coping self-efficacy before referral to an intervention.

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References

Backenstrass, M., Schwarz, T., Fiedler, P., Joest, K., Reck, C., Mundt, C., & Kronmueller, K.-T. (2006). Negative mood regulation expectancies, self-efficacy beliefs, and locus of control orientation: Moderators or mediators of change in the treatment of depression? *Psychotherapy Research*, *16* (2), 250–258.

Button, K. S., Wiles, N. J., Lewis, G., Peters, T. J., & Kessler, D. (2012). Factors associated with differential response to online cognitive behavioural therapy. *Social Psychiatry and Psychiatric Epidemiology*, *47*(5), 827–833.

Crandell, C. J., & Chambless, D. L. (1986). The validation of an inventory for measuring depressive thoughts – the Crandell Cognitions Inventory. *Behaviour Research and Therapy*, *24* (4), 403–411.

Donker, T., Batterham, P. J., Warmerdam, L., Bennett, K., Bennett, A., Cuijpers, P., … Christensen, H. (2013). Predictors and moderators of response to internet-delivered Interpersonal Psychotherapy and Cognitive Behavior Therapy for depression. *Journal of Affective Disorders*, *151* (1), 343–351.

Dusseldorp, E., Doove, L., & Van Mechelen, I. (2015). Quint: An R package for identification of subgroups of clients who differ in which treatment alternative is best for them. *Behavior Research Methods*, *48*(2), 650–663.

Dusseldorp, E., & Van Mechelen, I. (2014). Qualitative interaction trees: A tool to identify qualitative treatment–subgroup interactions. *Statistics in Medicine*, *33*(2), 219–237.

Fournier, J. C., DeRubeis, R. J., Shelton, R. C., Hollon, S. D., Amsterdam, J. D., & Gallop, R. (2009). Prediction of response to medication and cognitive therapy in the treatment of moderate to severe depression. *Journal of Consulting and Clinical Psychology*, *77*(4), 775–787.

Garnefski, N., & Kraaij, V. (2001). *Life Events Scale*. Retrieved from www.cerq.leidenuniv.nl

Kanter, J. W., Mulick, P. S., Busch, A. M., Berlin, K. S., & Martell, C. R. (2007). The behavioral activation for depression scale (BADS): Psychometric properties and factor structure. *Journal of Psychopathology and Behavioral Assessment*, *29*(3), 191–202.

Kavanagh, D. J., & Wilson, P. H. (1989). Prediction of outcome with group cognitive therapy for depression. *Behaviour Research and Therapy*, *27*(4), 333–343.

Kroenke, K., Spitzer, R. L., & Williams, J. B. W. (2001). The PHQ-9 – validity of a brief depression severity measure. *Journal of General Internal Medicine*, *16*(9), 606–613.

Schwarzer, R., & Jerusalem, M. (1995). Generalized Self-efficacy Scale. In J. Weinman, S. Wright, & M. Johnston (Eds.), *Measures in health psychology: A user's portfolio. Causal and control beliefs* (pp. 35–37). Windsor: NFER-NELSON.

Spitzer, R. L., Kroenke, K., Williams, J. B. W., & Lowe, B. (2006). A brief measure for assessing generalized anxiety disorder – the GAD-7. *Archives of Internal Medicine*, *166* (10), 1092–1097.

Stiles-Shields, C., Corden, M. E., Kwasny, M. J., Schueller, S. M., & Mohr, D. C. (2015). Predictors of outcome for telephone and face-to-face administered cognitive behavioral therapy for depression. *Psychological Medicine*, *45*(15), 3205–3215.

Stoel, R. D., van Den Wittenboer, G., & Hox, J. (2003). Analyzing longitudinal data using multilevel regression and latent growth curve analysis. *Metodologia de las Ciencias del Comportamiento*, *5*(1), 21–42.

Turner, J. A., Ersek, M., & Kemp, C. (2005). Self-efficacy for managing pain is associated with disability, depression, and pain coping among retirement community residents with chronic pain. *The Journal of Pain*, *6*(7), 471–479.

van Luenen, S., Garnefski, N., Spinhoven, P., & Kraaij, V. (2018). Guided internet-based intervention for people with HIV and depressive symptoms: A randomised controlled trial in the Netherlands. *The Lancet HIV*, *5*(9), e488–e497.

van Luenen, S., Kraaij, V., Spinhoven, P., & Garnefski, N. (2016). An Internet-based self-help intervention for people with HIV and depressive symptoms: Study protocol for a randomized controlled trial. *Trials*, *17*(1), 1–12.

WHO Group. (2002). The alcohol, smoking and substance involvement screening test (ASSIST): Development, reliability and feasibility. *Addiction*, *97*(9), 1183–1194.

Appendices

Appendix 1. Measurement of potential moderators

Demographic characteristics

The following questions were asked regarding demographic characteristics: sex, age, education, marital status, and employment status.

HIV characteristics

Regarding HIV characteristics the following questions were asked: physical symptoms in the last two weeks, diagnosis of AIDS, use of antiretroviral therapy (ART) known to have depression as side effect based on the *Farmacotherapeutisch Kompas* (Farmacotherapeutic Compass; www.farmacotherapeutischkompas.nl). Data on the duration of HIV of participants was obtained from the Athena/SHM Cohort Study (Stichting HIV monitoring; www.hiv-monitoring.nl) after consent from the participant. The ATHENA Cohort Study is maintained by the Stichting HIV Monitoring, which is supported by the Dutch Ministry of Health via the National Institute for Public Health and Environment (RIVM).

Psychological characteristics

Satisfaction with received social support. One question was asked regarding the satisfaction with the received social support (from family, friends, colleagues, etc.) in relation to having HIV. Participants indicated their satisfaction on scale from 1 (not at all) to 5 (certainly).

Treatment for psychological symptoms. Two questions were asked about treatment for psychological symptoms: use of psychotropic medication and treatment for psychological symptoms in the last five years.

Baseline depression severity. The PHQ-9 score at pretest was included as a potential moderating variable. Higher scores indicate more depressive symptoms and total scores range from 0 to 27. Cronbach's α of the PHQ-9 score at pretest was .70, which is acceptable.

Anxiety symptoms. The Generalized Anxiety Disorder-7 (GAD-7) (Spitzer, Kroenke, Williams, & Lowe, 2006) was used to measure symptoms of anxiety in the last two weeks. Total scores range from 0 to 21 and higher scores represent more anxiety symptoms. Cronbach's α of the GAD-7 score at pretest was .85.

Coping self-efficacy. Self-efficacy to cope with having HIV was measured with an adapted version of the Generalized Self-Efficacy scale, which has good reliability and validity (Schwarzer & Jerusalem, 1995). The scale was adjusted for PLWH, Cronbach's α at pretest for the adjusted scale was .92. Total scores range from 8 to 40 and higher scores indicate more self-efficacy to cope with having HIV.

Use of alcohol, soft drugs, hard drugs, and sedatives. The Alcohol, Smoking and Substance Involvement Screening Test (ASSIST) (WHO Group, 2002) was used to measure psychoactive substance use (alcohol, soft drugs, hard drugs, and sedatives/sleeping pills) and related problems. Total scores for each substance range from 0 to 39. For alcohol, a total score of zero to ten indicates that no intervention is needed (i.e., no problematic alcohol use), and a score > ten indicates that an intervention is needed (i.e., problematic alcohol use). For soft drugs, hard drugs, and sedatives, a total score of zero to three indicates that no intervention is needed (i.e., no problematic drug use), and a score higher than three indicates that an intervention is needed (i.e., problematic drug use). The categorical variables with two categories (no intervention needed; intervention needed) were used in the moderator analyses. Cronbach's α at pretest for the alcohol subscale was .72, for the soft drugs subscale .70, for the hard drugs subscale .75, and for the sedatives subscale .66.

Depressive thoughts. The hopelessness subscale of the Crandell Cognitions Inventory (CCI) (Crandell & Chambless, 1986) was used to measure depressive thoughts. Total scores range from 7 to 35 and higher scores reflect more black and white depressive thinking. The reliability was excellent, Cronbach's α at pretest was .91.

Physical tension. Physical tension was measured with a self-designed 10 item questionnaire. Questions were asked regarding difficulty to relax, ways to relax, and symptoms of physical tension. Total scores range from 10 to 30 and higher scores indicate less physical tension. Cronbach's α at pretest was .67.

Behavioral activation. The subscale activation of the Behavioral Activation for Depression Scale (BADS) (Kanter, Mulick, Busch, Berlin, & Martell, 2007) was used to measure behavioral activation during the past week. Total scores range from 0 to 42 and higher scores reflect higher levels of activation. Cronbach's α at pretest was .84.

Life events. The number of life events that a participant had ever experienced was measured with the Life Events Scale (Garnefski & Kraaij, 2001). The scale consists of 17 negative life events and it was counted how many life events (e.g., divorce, dead of a loved one) a participant experienced during life.

Appendix 2. Statistical analysis

SPSS analysis

In SPSS, longitudinal multilevel moderated regression analyses (LMRA) (Stoel et al., 2003) were conducted. Time, Group, moderators, and interactions were included as fixed effects and slopes for Time and the intercept were included as random effects. Two time contrasts were created: short term (pretest to post-test 1) and long term (pretest to post-test 2). Continuous

moderator variables were grand mean centered and moderators were individually included in the model. All two-way and three-way interactions were included in the model. When the interaction Time × Group × Moderator was significant, this indicated a moderator effect. Maximum likelihood estimation was used to estimate the effects in the model. The variance components covariance structure provided the best fit and was chosen for the analyses. The analysis was intention-to-treat (ITT) and $\alpha = .05$ was used for significance testing.

QUINT analysis

The aim of QUINT is to identify three subgroups of participants, based on different combinations of certain participant characteristics at baseline (i.e., moderators). For the first subgroup, the intervention is more effective than the control condition, for the second subgroup the control condition is more effective than the intervention, and for the optional third subgroup both conditions are equally effective. The subgroups are to be found by splitting on values of moderators. QUINT has some advantages; multiple moderators can be included in the analysis at the same time, without a priori specifying which moderators interact and which type of interaction (as opposed to linear regression, where interactions are prespecified and usually only first order interactions, also called two-way interactions, are included). In this way, higher order interactions can be detected, and QUINT may identify subgroups for which the direction of the intervention effect is different. The created subgroups are graphically represented in a binary tree with nodes and leaves that is easy to interpret. The QUINT algorithm starts with all participants in the root node. Then a moderator is searched that has the largest intervention-subgroup interaction. All moderators, possible split points on moderators, and possible assignments of leaves to the subgroups are considered. Then, the node splits into two child nodes (leaves) based on the best combination of moderator, split point, and assignment. Thereafter, the child nodes split again, etc. QUINT uses some criteria to stop the tree building process, e.g., the number of participants in a leaf should be large enough (for more information see [Dusseldorp et al., 2015]). The whole procedure may result in a large and complex tree which also models noise in the data, and may not fit future data. QUINT reduces this overfitting by pruning the tree back to an optimal subtree, using bias-corrected bootstrapping.

In QUINT analyses, type of partitioning criterion was set at effect size criterion, and the minimum absolute value of d (effect size) in each of two leaves after the first split (d_{min}) was set at 0.40 (as suggested by [Dusseldorp et al., 2015]). The minimal sample size of a group in a leaf was 10, and number of bootstrap samples was 1000. Two analyses were conducted. First, PHQ-9 pretest minus PHQ-9 post-test 1 was used as outcome variable, and Group and all moderators were included in the formula. Second, PHQ-9 pretest minus PHQ-9 post-test 2 was used as outcome variable, and Group and all moderators were included. The analysis in QUINT was based on participants that completed questionnaires at post-test 1 or post-test 2.