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ABSTRACT

Background: The current study aimed to investigate the possible interplay between self-compassion and affect during Mindfulness-Based Compassionate Living (MBCL) in recurrently depressed individuals.
Methods: Data was used from a subsample of a parallel-group randomized controlled trial investigating the efficacy of MBCL in recurrently depressed adults ($n = 104$). Self-reports of self-compassion and positive/negative affect were obtained at the start of each of the eight MBCL sessions.
Results: Bivariate Autoregressive Latent Trajectory (ALT) modeling showed that, when looking at the interplay between self-compassion and positive/negative affect on a session-to-session basis, no significant reciprocal cross-lagged effects between self-compassion and positive affect were found. Although there were no cross-lagged effects from negative affect to self-compassion, higher levels of self-compassion at each session did predict lower levels of negative affect at the subsequent session ($b_{SC(t-1),NA(t)} = -0.182$, *s.e.* $= 0.076$, $p = .017$).
Conclusions: The current study shows that increases in self-compassion are followed by decreases in negative affect in MBCL for depression.

Abbreviations: MBCL, mindfulness-based compassionate living; ALT, autoregressive latent trajectory; MDD, major depressive disorder; MBCT, mindfulness-based cognitive therapy; CBI, compassion-based intervention; MBSR, mindfulness-based stress reduction; RCT, randomized controlled trial; TAU, treatment-as-usual; AR, autoregressive; LTM, latent trajectory model; CL, cross-lagged; SC, self-compassion; PA, positive affect; NA, negative affect.

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1. Introduction

Major depressive disorder (MDD) is one of the most prevalent and impairing mental disorders (Wittchen et al., 2011; World Health Organization, 2017). MDD is recognized as having a chronic and recurrent course, whereby the risk of relapse increases with each successive episode (Richards, 2011; Solomon et al., 2000). Next to antidepressant medication, various psychological interventions are available for individuals with recurrent depression, such as mindfulness-based cognitive therapy (MBCT; Segal et al., 2012). MBCT has been shown effective in reducing relapse and/or recurrence in recurrently depressive individuals (Kuyken et al., 2016; Strauss et al., 2014). Unfortunately, many individuals still experience residual depressive symptoms after MBCT, which are a predictor for relapse to depression (Buckman et al., 2018; Piet & Hougaard, 2011).

Self-compassion has been shown to mediate the effect of MBCT for recurrent MDD (Kuyken et al., 2010). It may reduce low self-esteem or self-denigration which are possible underlying mechanisms for the chronic and recurrent nature of depressive symptoms (Gilbert & Procter, 2006). Individuals with MDD have been found to report less self-compassion when suffering from negative emotions than healthy controls (Krieger et al., 2013). In addition, higher levels of self-compassion have been shown to predict lower levels of depressive symptoms and reduced risk of relapse/recurrence depression (Krieger et al., 2016).

Although compassion is implicitly conveyed in MBCT, explicit cultivation of self-compassion might be a fruitful approach to further improve outcome of MBCT in this population. Van den Brink and Koster (2015) developed mindfulness-based compassionate living (MBCL) as a follow-up intervention to MBCT or mindfulness-based stress reduction (MBSR; Kabat-Zinn, 1990), with the intention to offer (self-)compassion building on already established mindfulness skills. In MBCL, (self-) compassion encompasses, the capacity to be sensitive to the suffering of self and others, and the commitment to alleviate and prevent this suffering (Gilbert & Choden, 2013). MBCL shares content with other compassion-based interventions (CBIs), such as compassion focused therapy (CFT; Gilbert, 2010) and the mindful self-compassion program (MSC; Neff & Germer, 2013). It has been structured in a similar way as MBCT/MBSR (van den Brink & Koster, 2015): it is a group-based intervention consisting of eight (bi)weekly sessions of 2.5 h, a silent (half)day, and daily home-practices of 45–60 min. The practices are explicitly focused on cultivating compassion and kindness towards self and others, including informal practices (e.g., breathing space with kindness or compassion) and formal practices (e.g., kindness meditation and compassionate breathing).

Research to date shows promising evidence for MBCL in individuals with recurrent depression. In a pilot study among recurrently depressed individuals who previously participated in MBCT ($N = 17$), MBCL was shown to be feasible and acceptable (Schuling et al., 2018). A recent randomized controlled trial (RCT) of recurrently depressed individuals who previously attended MBCT ($N = 122$), showed that MBCL resulted in a greater reduction of depressive symptoms and improvement of quality of life than treatment-as-usual (TAU). Further reduction of depressive symptoms and improvement of quality of life, relative to TAU, took place during the six-months follow-up (Schuling et al., 2020). In addition, self-compassion appeared to mediate the post-intervention effect of MBCL. However, the mediation analyses only used pre-post measurements, therefore inferences about possible causality cannot be made. More research is needed into the (dynamic) process of self-compassion in MBCL for recurrently depressed individuals.

Affect regulation of both positive and negative emotions is an additional working mechanism proposed for CBIs. Three basic types of emotion regulation systems are distinguished in MBCL (van den Brink & Koster, 2015; Gilbert, 2009): 1. the threat system, activated when there is threat/danger and aimed at self-protection; 2. the drive system, triggered by desire and aimed at satisfaction; 3. the soothing system, activated when the threat and drive system are inactive. It is aimed at social connectedness, care and safeness. A disbalance may arise in case of an easily activated threat system (e.g., history of trauma) or drive system (e.g., tendency to compete), or in the presence of an insufficiently developed soothing system (e.g., history of emotional neglect). During MBCL, one is invited to explore the soothing system as a source of resilience, especially in the face of unpleasant events. This may simultaneously increase the ability to tolerate and regulate negative affect (van den Brink & Koster, 2015; Sommers-Spijkerman et al., 2018).

Changes in self-compassion have also been associated with changes in affect during CBIs. An intervention study in individuals vulnerable to depression ($N = 63$) found that practicing self-compassion resulted in subsequent increases in happiness and decreases in depression (Shapira & Mongrain, 2010). In addition, several experimental studies seem to show that self-compassion increases positive affect (e.g., Engen & Singer, 2015) and decreases in negative affect (e.g., Arimitsu & Hofmann, 2017; Leary et al., 2007). Only one experimental study has been conducted among individuals with MDD ($N = 48$; Diedrich et al., 2014). Depressed mood was induced at four points in time. After each mood induction, participants were instructed to either wait, reappraise the situation, accept their negative emotions, or employ self-compassion to regulate their depressed mood. Self-ratings of depressed mood were assessed before and after each mood induction and regulation phase. Results showed that the reduction of depressed mood was significantly greater in the self-compassion condition than in the waiting condition. In addition, the self-compassion condition was most effective for individuals who reported higher baseline levels of depressed mood. Reverse effects of positive/negative affect on self-compassion have not yet been scientifically researched.

The current study expands previous literature by investigating the interplay between self-compassion and positive/negative affect in individuals with recurrent depression participating in MBCL as a follow-up to MBCT. Measurements of self-compassion and positive/negative affect took place prior to each of the eight MBCL sessions. Autoregressive-Latent Trajectory (ALT) modeling was used to model changes in the course of variables over the whole duration of the intervention, and in addition, changes in variables on a session-to-session basis. We hypothesized that higher levels of self-compassion result in subsequent higher levels of positive affect and lower levels of negative affect. No hypotheses were formulated for the reciprocal relations between levels of positive/negative affect and subsequent levels of self-compassion.

2. Methods

2.1. Design

Data was used from a parallel-group RCT (Schuling et al., 2016), comparing MBCL + TAU to TAU alone. The RCT was carried out between July 2013 and April 2015 at the Radboudumc center for mindfulness, the Netherlands. Prior to randomization, additional demographic and clinical characteristics were collected. Sixty-one participants were randomly allocated to MBCL + TAU and 61 to TAU alone. Participants in the TAU group were invited to take part in MBCL after the TAU period and 57 of them did participate. Data on self-compassion and positive/negative affect were collected prior to each session in all 118 participants who eventually participated in MBCL. The protocol of the RCT was approved by the ethical review board CMO Arnhem-Nijmegen (2013/220). For further study details and outcomes of the RCT and follow-up study, see the respective paper (Schuling et al., 2020).

2.2. Participants

Individuals with recurrent depression who had previously participated in MBCT at the Radboudumc center for mindfulness were invited to take part in the RCT. Those interested were invited for a research interview to assess eligibility. Inclusion criteria were: recurrent

Table 1
Baseline demographic and clinical characteristics of participants with recurrent depression receiving mindfulness-based compassionate living ($n = 104$).

Variable	*N* (%)
Female	78 (75.0%)
Marital status	
Single	22 (21.2%)
Married or Cohabiting	65 (62.5%)
Divorced or Widowed	13 (12.5%)
Missing	4 (3.8%)
Level of education [a]	
Low	7 (6.7%)
Middle	74 (71.2%)
High	19 (18.3%)
Missing	4 (3.8%)
Employed	
Yes	59 (56.7%)
No	41 (39.4%)
Missing	4 (3.8%)
ADM use	
Yes	48 (46.2%)
No	52 (50.0%)
Missing	4 (3.8%)
Prior MDEs ≥ 3 [b]	91 (87.5%)
Current MDD [c]	32 (30.8%)
Childhood trauma [d]	45 (43.3%)
Variable	**Mean (*SD*)**
Age (years)	55.74 (10.69)
Depressive symptoms [e]	16.87 (10.17)
Age at MDD onset (years)	24.47 (11.68)
Time since MBCT (years) [f]	3.90 (1.74)

Note. ADM = antidepressant medication; MDE = major depressive episode; MDD = major depressive disorder; MBCT = mindfulness-based cognitive therapy.

[a] Low = no education, primary school, LBO, VMBO, KMBO, and MAO; Middle = MBO, HAVO, VWO, and HBO; High = WO. Abbreviations refer to the Dutch education system.

[b] Based on self-report.

[c] Assessed with the Structured Clinical Interview for DSM-IV Axis I disorders part I (SCID-I; First et al., 1996).

[d] Assigned 'yes' when ≥1 item was being answered positively on the physical or sexual abuse subscales of the childhood trauma questionnaire (Bernstein & Fink, 1998).

[e] Assessed with the Beck-Depression Index-II (BDI-II; van der Does, 2002) and based on $n = 103$.

[f] Based on $n = 70$.

depression according to the Diagnostic and Statistical Manual of Mental Disorders IV (DSM-IV; American Psychiatric Association, 1994), with or without a current depressive episode assessed with the Structured Clinical Interview for DSM disorders I (SCID-I; First et al., 1996); previous participation (≥one year ago) in MBCT at the Radboudumc center for mindfulness (≥4 sessions); and ≥18 years. Exclusion criteria were: ≥ 1 previous (hypo)manic episodes according to the DSM-IV (APA, 1994); primary psychotic disorder; neurological/somatic conditions possibly related to the depression; current alcohol and/or drug dependence; electro convulsive therapy < 3 months; and inability to complete interviews and/or self-report questionnaires. If eligible, individuals were included only after written informed consent had been obtained. Of all 118 participants who eventually participated in MBCL, 104 attended at least four sessions of MBCL and were therefore included in the current study. No differences were found in demographic and clinical characteristics between participants who were randomized to the MBCL + TAU condition and those who were initially randomized to the TAU condition and received MBCL + TAU afterwards. Demographic and clinical characteristics of the included participants can be found in Table 1. Participants participated, on average, 7.12 MBCL sessions (range: 4–8, $SD = 1.01$).

2.3. Interventions

MBCL + TAU. The MBCL intervention was based on the original protocol of van den Brink and Koster (2015). Participants received 8 biweekly 2.5-h sessions in groups of 8–10 participants. Daily home practice took about 30 min and was guided by CDs. In addition, participants received a folder containing background information on each session and accompanying practices. One of the primary practices of the MBCL program is the practice of befriending self and others (van den Brink & Koster, 2015). During MBCL, this quality of befriending is gradually developed from self to a close, neutral, and difficult person. For a detailed description of the MBCL sessions, see Schuling et al. (2016). The MBCL intervention was taught by two teachers who met the good practice guidelines (UK Network of Mindfulness-Based Teachers, 2015) and were trained by the developers of the intervention. An independent MBSR/MBCT teacher assessed treatment integrity and therapist competence using the Mindfulness Based Interventions Teaching Assessment Criteria (MBI:TAC; Crane et al., 2013) based on two randomly selected videotapes of each teacher. Both teachers of the current study were rated as 'competent'. In addition to MBCL, participants were allowed to receive TAU (i.e., any medical, psychiatric and/or psychological treatment, with the exception of compassion focused interventions).

2.4. Measuring instruments

Self-compassion. Of each of the six subscales of the Dutch version of the Self-Compassion Scale – Short Form (SCS-SF; Raes et al., 2011), the item with the largest factor loading was used to assess self-compassion. These were as follows: *self-kindness* ("When I'm going through a very hard time, I give myself the caring and tenderness I need"), *self-judgment* ("I'm disapproving and judgmental about my own flaws and inadequacies", *common humanity* "I try to see my failings as part of the human condition"), *isolation* ("When I'm feeling down, I tend to feel like most other people are probably happier than I am"), *mindfulness* ("When something painful happens I try to take a balanced view of the situation"), and *over-identification* ("When I'm feeling down I tend to obsess and fixate on everything that's wrong"). Items were rated on a 10-point Likert scale ranging from 'Totally untrue' to 'Totally true' relating to the time period between sessions. The internal consistency in the current study was calculated for every session and ranged from acceptable to good (αrange: 0.73-0.83).

Affect. Positive and negative affect were assessed with the two items with the largest factor loadings on each subscale (i.e., positive and negative) of the Dutch version of the Positive and Negative Affect Schedule (PANAS; Watson et al., 1988). Items assessing negative affect were "Upset" and "Scared", and items assessing positive affect were "Active" and "Excited". All items were rated on a 10-point Likert scale ranging from 'Totally untrue' to 'Totally true' with regard to the time period between sessions. The internal consistency was calculated at every session and appeared to be acceptable to good for positive affect (αrange: 0.72-0.85) and poor to acceptable for negative affect (αrange: 0.52-0.76).

2.5. Statistical analysis

Self-compassion. To compute a total self-compassion score, first the negative subscale items (i.e., self-judgment, isolation, and over-identification) were reverse scored. Then a mean score of the 6 items was calculated and used in the current study. In case of a missing value on one item, person mean imputation was applied for that missing value. If data on more than 1 item was missing, the self-compassion score was not calculated and indicated as missing.

Affect. For positive affect and negative affect, both items needed to be available to calculate the mean score. If data on at least one item was missing, this was considered as missing data.

Table 2
Correlations between and univariate statistics of self-compassion and positive affect during 8 sessions of mindfulness-based compassionate living.

	Self-compassion [a]								Positive affect [b]							
	S1	S2	S3	S4	S5	S6	S7	S8	S1	S2	S3	S4	S5	S6	S7	S8
SC S1																
SC S2	.651**															
SC S3	.631**	.672**														
SC S4	.627**	.710**	.751**													
SC S5	.556**	.683**	.693**	.757**												
SC S6	.460**	.594**	.510**	.645**	.575**											
SC S7	.548**	.626**	.657**	.621**	.681**	.693**										
SC S8	.584**	.678**	.608**	.738**	.589**	.687**	.709**									
PA S1	.371**	.374**	.384**	.393**	.273**	.424**	.346**	.475**								
PA S2	.209*	.521**	.487**	.553**	.384**	.529**	.403**	.452**	.565**							
PA S3	.175	.277**	.530**	.351**	.293**	.176	.429**	.350**	.529**	.555**						
PA S4	.312**	.363**	.582**	.510**	.414**	.356**	.483**	.506**	.390**	.617**	.573**					
PA S5	.283**	.376**	.446**	.203	.499**	.281*	.384**	.253*	.308**	.487**	.418**	.558**				
PA S6	.078	.332**	.286*	.136	.308**	.448**	.329**	.184	.417**	.570**	.423**	.351**	.461**			
PA S7	.225*	.290*	.420**	.259*	.334**	.442**	.562**	.317**	.450**	.499**	.544**	.342**	.443**	.610**		
PA S8	.295**	.289**	.387**	.307**	.148	.304**	.368**	.428**	.473**	.550**	.565**	.414**	.297**	.496**	.580**	
M	5.01	5.19	5.51	5.69	5.71	5.73	5.76	6.17	5.49	5.70	5.85	5.51	5.66	5.45	5.68	6.18
SD	1.51	1.49	1.61	1.54	1.52	1.35	1.33	1.39	1.67	1.63	1.89	1.84	1.74	1.87	1.93	1.64
γ_1	.56	.31	.42	.42	.47	.04	.23	.16	-.35	-.42	-.11	-.45	.01	.03	-.38	-.12
γ_2	.76	.14	-.06	.27	.03	.19	.84	.15	-.60	-.36	-.89	-.45	-.44	-.71	-.61	-.36

Note. SC = self-compassion; PA = positive affect; S1-8 = session 1–8; *M* = mean; *SD* = standard deviation; γ_1 = skewness; γ_2 = kurtosis. Level of significance is indicated for the correlations only. [a] Available *n* varies from 82 to 101 across S1-8. [b] Available *n* varies from 82 to 100 across S1-8.
^{ns} $p \geq .050$, $^{*}p < .050$, $^{**}p < .010$.

ALT modeling technique. The current study used the ALT modeling technique based on the recommendations of Bollen and Curran (2004), which combines a bivariate autoregressive (AR) and a bivariate latent trajectory model (LTM) into a bivariate ALT model. A bivariate AR model captures reciprocal session-to-session associations between variables, so called cross-lagged (CL) effects, while controlling each measurement point for its prior value (AR effects). However, when not accounting for the overall trajectories (courses) of both variables over the duration of the MBCL intervention, spurious CL effects might appear (Voelkle, 2008). A bivariate LTM does allow a different overall course for each individual (i.e., a different intercept and slope factor), however, but it does not capture CL and AR effects. Hence, the combination of a bivariate AR with a bivariate LTM makes it possible to study reciprocal CL effects (i.e., interplay) while controlling for overall courses and AR effects. This makes statements about the processes of stability and change during MBCL for recurrent depression more reliable. A predetermined model specification was adopted to prevent parameter bias from being introduced by not accounting for prior, unassessed levels of the variables (Bollen & Curran, 2004). As a consequence, the intercept factor no longer represents the initial baseline value, but resembles the value of the second measurement point which is not yet explained by the first measurement point.

Firstly, several univariate ALT models were fitted for each variable separately (i.e., self-compassion, positive affect, and negative affect) and compared to identify which model best represented the course of each variable separately during MBCL. Secondly, several bivariate ALT

Table 3
Correlations between and univariate statistics of self-compassion and negative affect during 8 sessions of mindfulness-based compassionate living.

	Negative affect [a]							
	S1	S2	S3	S4	S5	S6	S7	S8
NA S1								
NA S2	.336**							
NA S3	.456**	.487**						
NA S4	.355**	.525**	.500**					
NA S5	.390**	.372**	.488**	.445**				
NA S6	.292**	.460**	.496**	.193	.484**			
NA S7	.484**	.415**	.499**	.401**	.589**	.519**		
NA S8	.492**	.510**	.595**	.530**	.448**	.527**	.616**	
SC S1	-.601**	-.249*	-.310**	-.267*	-.415**	-.055	-.418**	-.234*
SC S2	-.435**	-.368**	-.236*	-.316**	-.329**	-.202	-.386**	-.188
SC S3	-.469**	-.393**	-.452**	-.478**	-.442**	-.219	-.419**	-.344**
SC S4	-.465**	-.397**	-.296**	-.481**	-.409**	-.064	-.367**	-.285*
SC S5	-.424**	-.332**	-.272*	-.418**	-.538**	-.199	-.462**	-.189
SC S6	-.443**	-.330**	-.244*	-.353**	-.373**	-.439**	-.483**	-.279*
SC S7	-.466**	-.381**	-.458**	-.414**	-.371**	-.371**	-.555**	-.450**
SC S8	-.464**	-.418**	-.320**	-.494**	-.378**	-.203	-.506**	-.452**
M	4.39	4.46	4.26	4.50	4.37	4.42	4.35	3.86
SD	2.01	1.97	2.01	1.93	2.06	2.09	2.01	1.99
γ_1	.05	.17	.51	.25	.55	.32	.07	.44
γ_2	−1.00	-.72	-.38	-.71	-.30	-.73	−1.02	-.76

Note. SC = self-compassion; NA = negative affect; S1-8 = session 1–8; *M* = mean; *SD* = standard deviation; γ_1 = skewness; γ_2 = kurtosis. Level of significance is indicated for the correlations only. [a] Available *n* varies from 82 to 100 across S1-8.
^{ns} $p \geq .050$, $^{*}p < .050$, $^{**}p < .010$.

models were fitted for self-compassion and positive affect, and self-compassion and negative affect. These models were compared in order to find the most parsimonious bivariate ALT model that best represented the possible interplay between self-compassion and positive/negative affect from session to session during MBCL. This analysis controls for the course of self-compassion and positive/negative affect over the full MBCL period and AR effects of each variable separately. For a detailed description of the univariate and bivariate ALT models that were fitted, see Supplementary Material A.

Model fit. Several fit indices were used to evaluate model fit: (1) Chi-square ($\chi 2$) to degrees of freedom (*df*) ratio, values close to 1 were considered good, values between 2 and 3 as acceptable and less than 2 as preferable fit (Carmines & McIver, 1981; Marsh & Hocevar, 1985); (2) the Tucker-Lewis index (TLI; Tucker & Lewis, 1973) and comparative fit index (CFI; Bentler, 1990) of which values higher than 0.90 were considered an adequate and higher than 0.95 a very good fit (Bollen, 1989; Hu & Bentler, 1999); (3) the root mean square error of approximation (RMSEA; Steiger, 1998) of which values below 0.07 were indicative of good fit and (4) the standardized root mean square residual (SRMR; Hooper et al., 2008) of which values below 0.08 were adequate and below 0.05 were considered good.

Nested models were compared with the chi-square difference test. If two models were significantly different, the more complex model (i.e., the model with more estimated parameters) was retained, otherwise the simpler model was maintained. Non-nested models were compared based on differences in the Akaike information criterion (AIC; Akaike, 1973) and the Bayesian information criterion (BIC; Raftery, 1995) values, in which the model with the lowest AIC and BIC was favored. Differences between 2 and 6 points were considered as small, 6–10 points as medium strong, and >10 points as very strong evidence of differences in model fit. Differences of 2 or less suggested that both models fitted the data equally well and the simplest model was favored in that case (Raftery, 1995).

Computational note. Descriptive analyses and normality tests were performed with SPSS version 25 (IBM Corporation, 2017). The ALT modeling technique was carried out with Mplus version 6.11 (Muthén & Muthén, 1998-2011). Full-information maximum likelihood (FIML) was employed in order to account for missing data (i.e., ranging from 2.9% to 21.2% for each variable at each time point). The FIML estimator takes all available measurement values into account when estimating model parameters and is suitable for the comparison of multiple structural equation models (Enders & Bandalos, 2001). For all analyses, a two-sided alpha level of 0.05 was considered significant.

3. Results

The descriptive statistics of and correlations between all studied variables can be found in Tables 2 and 3.

3.1. Univariate models

For the model fit indices of all univariate ALT models that were fitted, see Supplementary Material B. The final univariate ALT models showed that, after accounting for AR effects, self-compassion increased ($\mu_{\beta SC} = 0.095$, *s.e.* $= 0.018$, $p < .001$), while positive affect showed a stable course (i.e., the final model did not contain a slope factor nor a slope variance), and negative affect decreased ($\mu_{\beta NA} = -0.068$, *s.e.* $= 0.029$, $p = .018$) over the full MBCL intervention. A detailed description of the results of the final univariate ALT models can be found in Supplementary Material B.

3.2. Bivariate models

The model fit indices of the bivariate ALT models that were fitted in order to find the final bivariate ALT models can be found in Supplementary Material B, Table B.3. For sake of clarity, only the results of the final bivariate ALT models are described below. The variances, covariances and correlations of the final bivariate ALT models can be found in Table 4.

Table 4
Variances, covariances and correlations between the first measurements (session 1) and the intercepts of self-compassion and positive affect (upper part), and of self-compassion and negative affect (lower part) based on the final bivariate autoregressive latent trajectory (ALT) models.

	SC S1	PA S1	SC Intercept	PA Intercept
SC S1	2.244 (.314)***	.366 (.086)	.695 (.059)	.373 (.109)
PA S1	.915 (.263)***	2.776 (.392)***	.476 (.086)	.638 (.071)
SC Intercept	.953 (.186)***	.726 (.186)***	.838 (.180)***	.696 (.087)
PA Intercept	.584 (.208)**	1.111 (.239)***	.666 (.180)***	1.093 (.253)***
	SC S1	NA S1	SC Intercept	NA Intercept
SC S1	2.247 (.314)***	-.597 (.064)	.699 (.059)	-.280 (.113)
NA S1	−1.785 (.345)***	3.976 (.559)***	-.537 (.080)	.538 (.085)
SC Intercept	.930 (.183)***	-.950 (.224)***	.788 (.173)***	-.433 (.126)
NA Intercept	-.523 (.238)*	1.336 (.328)***	-.479 (.190)*	1.553 (.341)***

Note. SC = self-compassion; PA = positive affect; NA = negative affect; S1 = Observed variable of the first session. Variances are depicted on the diagonal, covariances below and correlations above the diagonal. Standard errors are shown between parenthesis. The slope is omitted from this table, given that no slope variances were fitted in the final bivariate ALT models. Level of significance is indicated for the covariances and variances only.
*$p < .050$, **$p < .010$, ***$p < .001$.

Self-compassion and positive affect. The final bivariate ALT model of self-compassion and positive affect that demonstrated the best fit to the data had no slope for positive affect, and no slope variance for self-compassion, equal time-specific correlations, equal AR effects over time for both SC and PA, and equal CL effects over time for PA to SC. This final bivariate ALT model had an adequate model fit ($\chi^2 = 179.037$, $df = 112$, $p < .001$; CFI = 0.928; TLI = 0.924; RMSEA = 0.076; SRMR = 0.104). The significant standardized parameter estimates are depicted in Fig. 1.

When looking at the overall course of self-compassion and positive affect, it was found that the mean of self-compassion at session 1 ($\mu_{SCt1} = 4.991$, *s.e.* $= 0.148$, $p < .001$) differed between participants ($\sigma_{SC(t1)} = 2.244$, *s.e.* $= 0.314$, $p < .001$). In addition, after accounting for AR effects, an increase in self-compassion was found over the duration of the MBCL intervention ($\mu\beta_{SC} = 0.094$, *s.e.* $= 0.018$, $p < .001$). This increase was not significantly different between participants (i.e., the slope variance of self-compassion could be removed from the model without significantly decreasing the model fit). Moreover, participants showed differences in their level of positive affect at session 1 ($\mu_{PA(t1)} = 5.465$, *s.e.* $= 0.166$, $p < .001$), and, after accounting for AR effects, positive affect showed a stable course over the duration of the MBCL intervention (i.e., the final model did not contain a slope factor for positive affect).

When looking at session-to-session effects, CL effects from self-compassion to positive affect were not found ($0.082 < p < .597$), nor vice versa ($p = .741$). This indicates that the level of self-compassion at a certain session did not predict the level of positive affect at the next session nor vice versa (no interplay).

Self-compassion and negative affect. The final bivariate ALT model of self-compassion and negative affect included no slope for negative affect, and no slope variance for self-compassion, equal time-specific, AR, and CL effects over time for both self-compassion and negative affect. This final bivariate ALT model provided an adequate to good model fit ($\chi^2 = 152.078$, $df = 118$, $p = .019$; CFI = 0.959; TLI = 0.958;

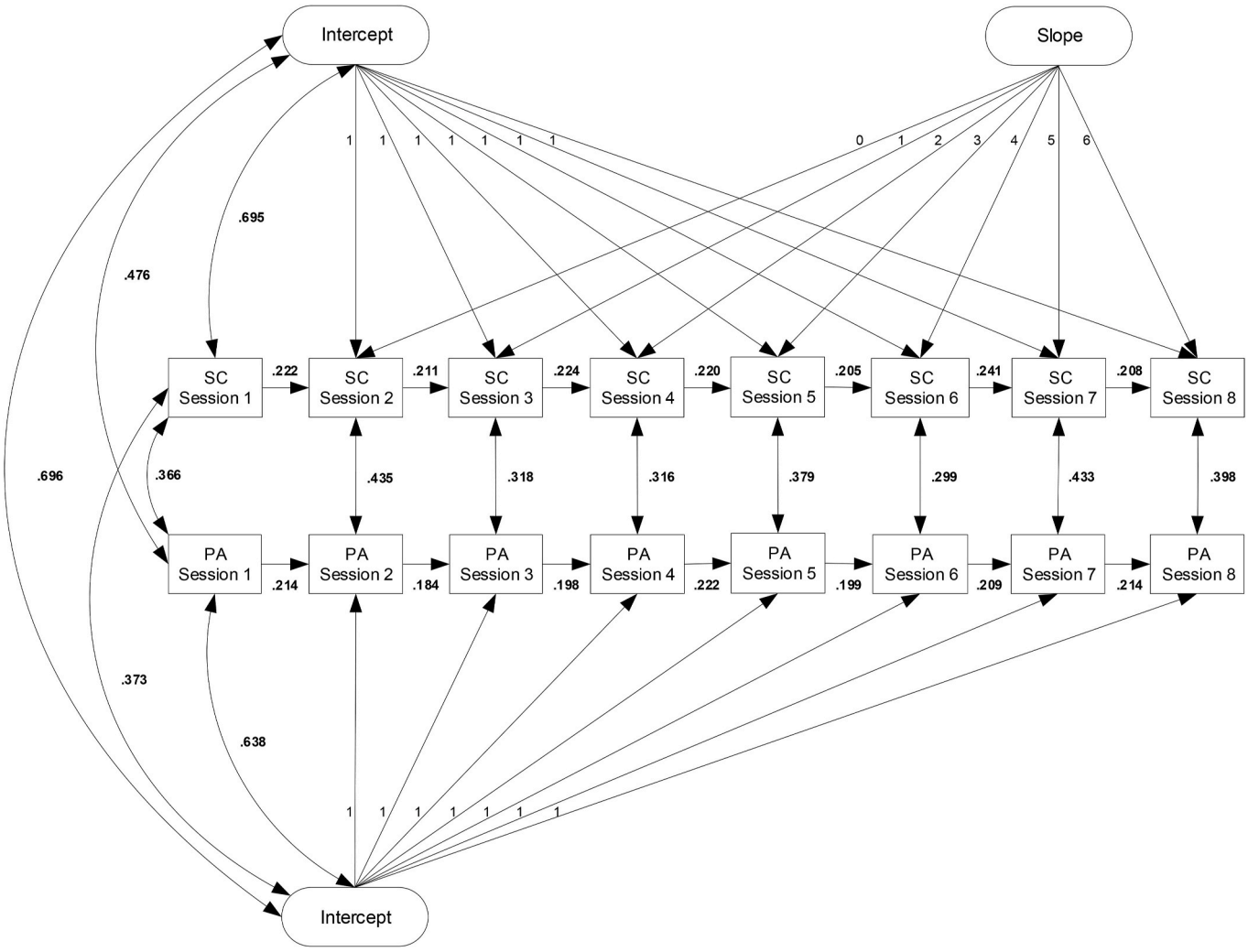

Fig. 1. Standardized parameter estimates of the final bivariate ALT model of self-compassion (SC) and positive affect (PA). Note that when having set (unstandardized) parameters to be equal over time, the standardized effects may still slightly differ over time. Only significant estimates of (error) correlations, autoregressive and cross-lagged parameters are shown. Double-headed arrows represent correlations.

RMSEA = 0.053; SRMR = 0.091). Fig. 2 shows the significant standardized parameter estimates of the final bivariate ALT model between self-compassion and negative affect.

When looking at the overall course of self-compassion and negative affect, it was found that participants differed ($\sigma_{SCt1} = 2.247$, *s.e.* = 0.314, $p < .001$) in their level of self-compassion at session 1 ($\mu_{SCt1} = 4.994$, *s.e.* = 0.148, $p < .001$). In addition, after accounting for AR effects, self-compassion increased over the full duration of the MBCL intervention ($\mu\beta_{SC} = 0.087$, *s.e.* = 0.018, $p < .001$). The strength of this increase did not significantly differ between participants (i.e., the final model did contain a slope factor but no slope variance). Moreover, participants differed ($\sigma_{NA(t1)} = 3.976$, *s.e.* = 0.559, $p < .001$) in their level of negative affect at session 1 ($\mu_{NAt1} = 4.419$, *s.e.* = 0.198, $p < .001$), and negative affect showed a stable course over the duration of the MBCL intervention (i.e., the final model did not contain a slope factor nor a slope variance).

When looking at the interplay between self-compassion and negative affect on a session-to-session basis, negative CL effects from self-compassion to negative affect were found ($b_{SC(t-1),NA(t)} = -0.182$, *s.e.* = 0.076, $p = .017$). This indicates that higher levels of self-compassion at a certain session predicted lower levels of negative affect at the subsequent session. CL effects from negative affect towards self-compassion were not found ($p = .375$).

4. Discussion

The aim of the current study was to investigate the possible interplay between self-compassion and positive/negative affect on a session-to-session basis in MBCL in recurrently depressed individuals ($n = 104$) using bivariate autoregressive latent trajectory (ALT) modeling. Results showed no cross-lagged (CL) effects from self-compassion at one session to positive affect at the subsequent session nor vice versa. Higher levels of self-compassion at each session did however predict lower levels of negative affect at the subsequent session, but not vice versa.

4.1. Interplay between self-compassion and positive affect

Against expectations, no reciprocal session-to-session CL effects between self-compassion and positive affect were found. This is in contrast with previous literature that supports higher baseline levels of self-compassion to be associated with subsequent higher levels of positive affect (Krieger et al., 2015), and that self-compassion interventions lead to higher levels of positive affect (e.g., Shapira & Mongrain, 2010; Sommers-Spijkerman et al., 2018). Even neurobiological changes associated with positive affect seem to support this (Engen & Singer, 2015). One reason for these non-significant session-to-session effects might be the items used to assess positive affect in the current study. The two items assessing positive affect in the current study (i.e., "Active" and

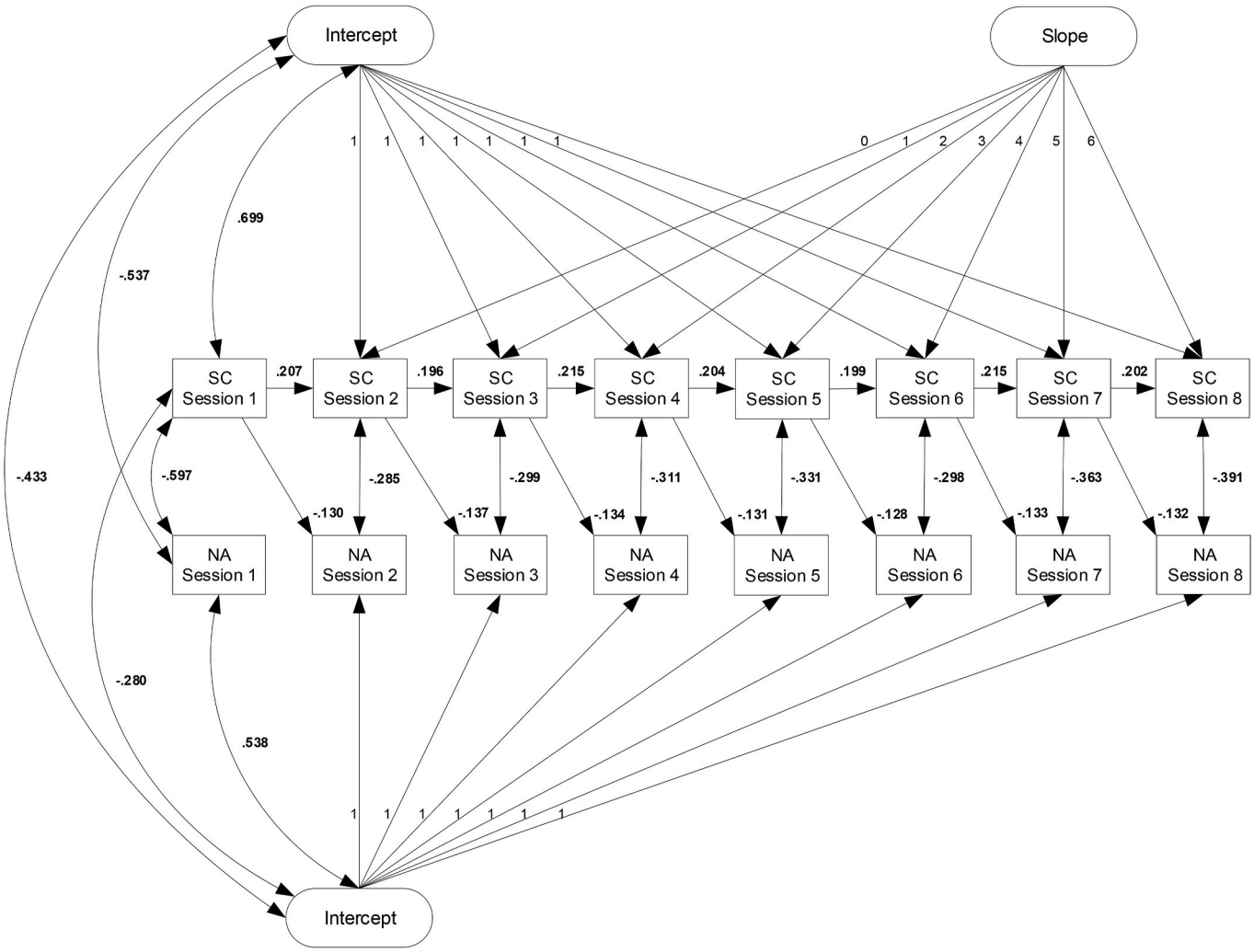

Fig. 2. Standardized parameter estimates of the final bivariate ALT model of self-compassion (SC) and negative affect (NA). Note that when having set (unstandardized) parameters to be equal over time, the standardized effects may still slightly differ over time. Only significant estimates of (error) correlations, autoregressive and cross-lagged parameters are shown. Double-headed arrows represent correlations.

"Excited") represent quite aroused, energetic forms of positive affect. However, during MBCL one is invited to soothe oneself in difficult times, promoting feelings of relaxation, connectedness, safety, and wellbeing. It might be that a different results would have been found if these more subtle positive emotions had been included. Another reason could be the differences in analytical strategies used. For example, Krieger et al. (2015) used multilevel modeling, which does not account for the overall course and previous values over time of each variable. However, when not accounting for the overall courses of both variables over the duration of the MBCL intervention, spurious CL effects might appear (Voelkle, 2008). The current study used ALT modeling, which investigates CL effects, while accounting for both the intercept, slope, and previous value of each variable over time. This analyzing technique enables a more reliable and conservative interpretation of the processes of stability and change.

4.2. Interplay between self-compassion and negative affect

In contrast to the univariate ALT model for negative affect, no slope was modelled for negative affect in the bivariate ALT model for self-compassion and negative affect. This suggests that -after accounting for the influence of self-compassion on negative affect-negative affect did not decrease over the duration of the MBCL intervention. As such, it seemed that the observed decrease of negative affect over time might have been (partially) accounted for by the negative CL effects from self-compassion towards negative affect. As hypothesized, higher levels of self-compassion at a certain session predicted lower levels of negative affect at the subsequent session. This is in line with previous experimental research into individuals with MDD, which found a decrease in experimentally induced depressed mood after self-compassion was employed ($N = 48$; Diedrich et al., 2014).

4.3. Strengths and limitations

The current study is the first study to investigate the possible interplay between self-compassion and positive/negative affect during MBCL in recurrently depressed individuals. The inclusion of multiple measurements and the use of the ALT modeling technique, which allows to investigate CL effects while controlling for a variables' previous value and overall course of each variable (i.e., intercepts and slopes), is of great value to infer possible causation. However, it cannot be ruled out that other variables that currently were not modelled also play a role. A second strength is that only a few exclusion criteria were applied and both individuals with and without a current depression were allowed to participate, which increases the generalizability of the current findings. Finally, the assessments and high quality of mindfulness teacher competency is another strength of this study. Indeed, both teachers had long-standing experience in teaching MBCT and were trained by the MBCL

developers themselves. This supports the quality of the intervention and its effects on outcome.

There were also some limitations. First of all, the current study did not include process data of a control group. Therefore, it cannot be ruled out that the associations found in the current study, might not also have been found without MBCL or during another active control condition. In future research, multiple measurements should ideally be conducted both during MBCL and during an active control condition to infer specificity of findings to MBCL. Another limitation is that in order to reduce participants' burden in completing biweekly assessments shorter versions of the original questionnaires for self-compassion and positive/negative affect were used. For the Self-Compassion Scale - Short Form (SCS-SF; Raes et al., 2011) this resulted in a still adequate to good internal consistency. For affect, however, this resulted in a poorer content validity and internal consistency compared to the original Positive and Negative Affect Scale (PANAS; Watson et al., 1988). The use of self-report measures only is another limitation of the current study. As commonly known, self-report measures are more prone to certain biases (e.g., social desirability). The (additional) use of more objective measures during MBCL for depression might be of interest for future research. Lastly, there is a debate whether the negative subscale of the SCS (i.e., self-judgment, isolation, and over-identification; reverse--scored items) "contaminates" the total self-compassion score, given that this negative subscale has been found to be responsible for the association between self-compassion and psychopathological symptoms such as negative affect (e.g., López et al., 2015; Muris et al., 2018). However, others support the notion that both subscales represent the relative balance of compassionate and uncompassionate responses to suffering, and that both are important contributors to the overall concept of self-compassion (e.g., Krieger et al., 2016; Neff, 2016), which is why we used both subscales to obtain a total score in our study.

4.4. Conclusions and implications

The current study shows that during MBCL for recurrently depressed individuals higher levels of self-compassion at each session predicts lower levels of negative affect at the subsequent session. This seems to be in line with the hypothesis that during MBCL negative affect is alleviated through increasing the ability to tolerate and regulate negative emotions. These changes might not be specific to MBCL, and might be found in other interventions as well (e.g., exposure therapy, schema therapy). Further research into possible mediators, predictors and moderators of MBCL compared to other interventions should be conducted to give us more insight into how MBCL works and for whom it works best. This might help the optimal integration of MBCL for recurrently depressed individuals.

Animal rights

No animal studies were carried out by the authors for this article.

Ethical approval

All procedures performed involving human participants were in accordance with the ethical standards of the ethical review board CMO Arnhem-Nijmegen (2013/220) and with the 1964 Helsinki declaration and its later amendments.

Informed consent

Informed consent was obtained from all individual participants included in the study.

CRediT authorship contribution statement

M.J. ter Avest: Conceptualization, Methodology, Formal analysis, Data curation, Writing – original draft, Visualization, Project administration. **R. Schuling:** Investigation, Data curation, Writing – review & editing. **C.U. Greven:** Conceptualization, Writing – review & editing. **M. J. Huijbers:** Conceptualization, Writing – review & editing. **T.F. Wilderjans:** Methodology, Validation, Writing – review & editing. **P. Spinhoven:** Conceptualization, Methodology, Writing – review & editing. **A.E.M. Speckens:** Investigation, Conceptualization, Writing – review & editing.

Declaration of competing interest

The authors declare that they have no conflict of interest.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.brat.2021.103946.

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