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Effects of Contemplative Dyads on Engagement and Perceived Social Connectedness Over 9 Months of Mental Training
A Randomized Clinical Trial

Bethany E. Kok, PhD; Tania Singer, PhD

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Supplemental content

IMPORTANCE Loneliness is a risk factor for depression and other illnesses and may be caused and reinforced by maladaptive social cognition. Secularized classical meditation training programs address social cognition, but practice typically occurs alone. Little is known about the effectiveness of contemplative practice performed in dyads.

OBJECTIVE To introduce and assess the effectiveness of contemplative dyadic practices relative to classical-solitary meditation with regard to engagement and perceived social connectedness.

DESIGN, SETTING, AND PARTICIPANTS The ReSource Project was a 9-month open-label efficacy trial of three, 3-month secularized mental training modules. Replacement randomization was used to assign 362 healthy participants in Leipzig and Berlin, Germany. Eligible participants were recruited between November 11, 2012, and February 13, 2013, and between November 13, 2013, and April 30, 2014. Intention-to-treat analyses were conducted.

INTERVENTIONS Breathing meditation and body scan (the presence module), loving-kindness meditation and affect dyad (the affect module), and observing-thoughts meditation and perspective dyad (the perspective module).

MAIN OUTCOMES AND MEASURES Primary outcomes were self-disclosure and social closeness. Engagement measures included compliance (ie, the mean [95% margin of error] number of meditation sessions that a participant engaged in per week), liking, and motivation to practice.

RESULTS Thirty participants dropped out after assignment to 3 experimental groups; 90 participants were assigned to a retest control that did not complete the main outcome measures; 16 participants provided no state-change data for the affect and perspective modules (226 remaining participants; mean age of 41.15 years; 59.3% female). Results are aggregated across training cohorts. Compliance was similar across the modules: loving-kindness meditation (3.78 [0.18] sessions), affect dyad (3.59 [0.14] sessions), observing-thoughts meditation (3.63 [0.20] sessions), and perspective dyad (3.24 [0.18] sessions). Motivation was higher for meditation (11.20 [0.40] sessions) than the dyads (9.26 [0.43] sessions) and was higher for the affect dyad (10.11 [0.46] sessions) than the perspective dyad (8.41 [0.46] sessions). Social closeness increased during a session for the affect dyad (1.49 [0.12] sessions) and the perspective dyad (1.06 [0.12] sessions) and increased over time for the affect dyad (slope of 0.016 [0.003]) and the perspective dyad (slope of 0.012 [0.003]). Self-disclosure increased over time for the affect dyad (slope of 0.023 [0.004]) and the perspective dyad (slope of 0.006 [0.005]), increasing more steeply for the affect dyad ($P < .001$).

CONCLUSIONS AND RELEVANCE Contemplative dyads elicited engagement similar to classical contemplative practices and increased perceived social connectedness. Contemplative dyads represent a new type of intervention targeting social connectedness and intersubjective capacities deficient in participants who experience loneliness and in many psychopathologies.

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Author Affiliations: Department of Social Neuroscience, Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, Germany.

Corresponding Author: Tania Singer, PhD, Department of Social Neuroscience, Max Planck Institute for Human Cognitive and Brain Sciences, Stephanstraße 1A, 04103 Leipzig, Germany (singer@cbs.mpg.de).

Many disorders (including autism, schizophrenia, depression, and borderline and narcissistic personality disorders) are marked by deficiencies in social cognitive processes such as empathy and theory of mind.[1-7] These deficiencies make it difficult to form and maintain social connections. Loneliness, a perceived lack of social connectedness, is a longitudinal risk factor for pain and fatigue, clinical depression, and dementia, as well as myocardial infarction and high blood pressure, culminating in premature mortality.[8-13] Interventions to increase perceived social connectedness are few in number and only weakly effective, with a mean effect size of 0.2 in a meta-analysis of randomized controlled trials.[14] Directly targeting deficiencies in social cognition has been proposed as a more effective method for fostering social connectedness.[15]

Secularized meditation training programs counteract and prevent maladaptive social cognition by cultivating skills such as empathy, compassion, and a better understanding of self and others.[16-18] Meditation training shows promise in fostering social connectedness, but the extant work is either short term (≤5 days of practice) or uses only wait-list control groups.[19-25] In addition, training is mostly conducted via solitary classical meditation. Although participation in structured dyadic interactions is part of a number of therapeutic and spiritual traditions and is sometimes integrated into the teacher-led group component of some contemplative training programs, there is no extant data concerning the distinct psychological effects of implementing contemplative dyads as a daily mental training practice.[17,26-29]

Here we introduce an interpersonal implementation of secularized daily meditation practice, the contemplative dyad, designed to increase social connectedness via enhancing social capacities, including social cognition. In the contemplative dyad, 2 partners are assigned to disclose their thoughts and feelings to one another in structured meditation-based interactions. Contemplative dyads are a "loud meditation": the speaker voices whatever comes to mind regarding a topic as the listener's presence promotes focus for the other's contemplation.

Two types of contemplative dyad were developed within a large-scale 9-month longitudinal study of secularized contemplative practices, the ReSource Project[30] (**Figure 1**). Each dyad was taught in combination with a content-matched classical meditation. The overarching purpose of the ReSource Project was to develop a mental training program that focused on training 3 types of mental capacities: (1) mindfulness-based present-moment–focused attention (presence module, which lacks the dyadic element); (2) socioaffective capacities including loving-kindness and compassion, acceptance of difficult emotions, and prosocial motivation (the affect module); and (3) sociocognitive capacities including metacognitive abilities and perspective-taking on self and others (the perspective module); the latter is also described as theory of mind.[6,31]

Here we focus on the effects of training intersubjective skills. The division into affect and perspective modules reflects current neuroscientific evidence for distinct brain networks underlying socioaffective and sociocognitive processes.[6,31] Although both forms of social understanding are necessary for social interactions, they are dissociable in healthy populations, as well as in psychopathologies such as autism, characterized by deficits in theory of mind but not necessarily empathy, and psychopathy, characterized by a lack of empathy but a functional theory of mind.[6,7,31-33] Such evidence suggests that these 2 processes can be trained separately.

The affect module trains socioaffective capacities via the affect dyad and loving-kindness meditation (LKM; Figure 1). In the affect dyad, speaker and listener take turns describing feelings and bodily sensations during a difficult situation and a gratitude-eliciting situation experienced during the last day.[30] The listener does not respond, either verbally or nonverbally, instead focusing on active, empathic listening. In LKM, participants learn to self-generate loving feelings and prosocial motivation toward themselves and others.[34]

The perspective module trains sociocognitive capacities via the perspective dyad and observing-thoughts meditation (OTM; Figure 1). In the perspective dyad, the speaker is asked to describe a recent situation from the perspective of a randomly assigned "inner part."[35] The concept of "inner parts" is drawn from internal family systems therapy, which views the self as nonunitary, interdependent, and ever changing.[35-38] Examples of inner parts are "the judge" or "the loving mother," names that describe certain distinct patterns of thoughts, feelings, and behaviors.[37] As the speaker practices taking different perspectives on his or her inner parts, the listener attends mindfully to infer which perspective is currently being taken. Participants then switch roles. In OTM, participants first learn to label their thoughts and, later, are taught to observe mental events without automatically reacting.

Because this implementation of contemplative dyads is new, our intent in this work is first to validate dyadic engagement in comparison to content-matched meditations with respect to compliance, subjective reports of motivation, liking, and changes in affect and arousal. Second, we test whether the dyads were successful at fostering social connectedness, assessed through changes in social closeness and self-disclosure.

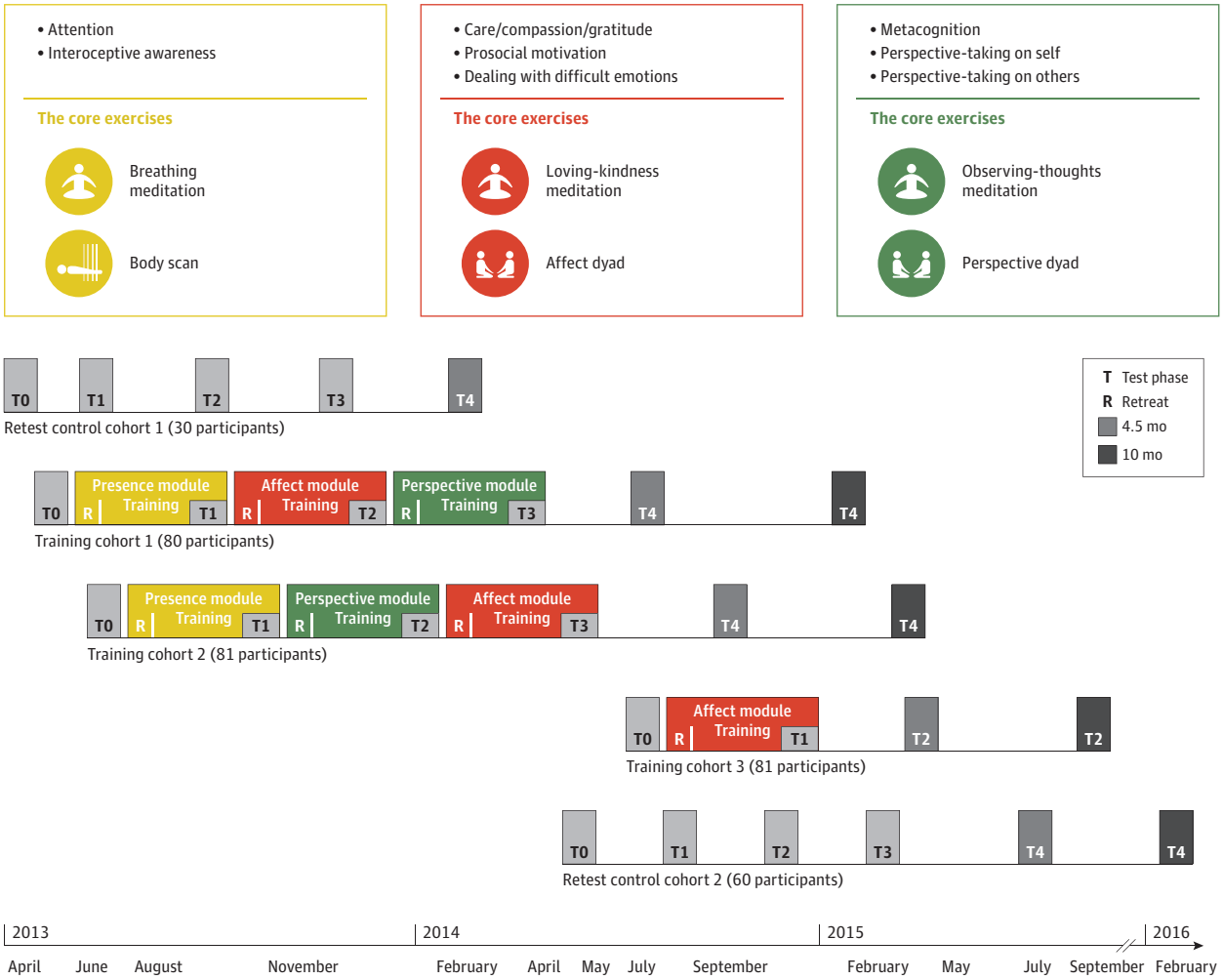
Key Points

Question Can 2 newly developed dyadic contemplative exercises increase perceived social connectedness?

Findings In this randomized clinical trial of 242 healthy adults, social closeness increased during a 10-minute dyadic practice session for both the socioaffective affect dyad and the sociocognitive perspective dyad. Furthermore, predyad social closeness and self-disclosure increased significantly for both dyads over the 3 months of a given training module.

Meaning Contemplative dyadic exercises may effectively prevent or reduce the detrimental effects of loneliness and the social deficits often observed in many psychopathologies by increasing perceived social connectedness.

Figure 1. ReSource Project Conceptual Model and Timeline



Data from the presence module, retest control cohorts 1 and 2, and the 4.5- and 10-month follow-ups for all cohorts are not included in the analyses because they do not include the contemplative dyads. Used with permission from Singer et al.[30]

Methods

The study was approved by the Research Ethics Committee of the University of Leipzig (No. 376/12-ff) and the Research Ethics Committee of the Humboldt University in Berlin (Nos. 2013-02, 2013-29, and 2014-10). Participants provided written informed consent (Trial Protocol in Supplement 1).

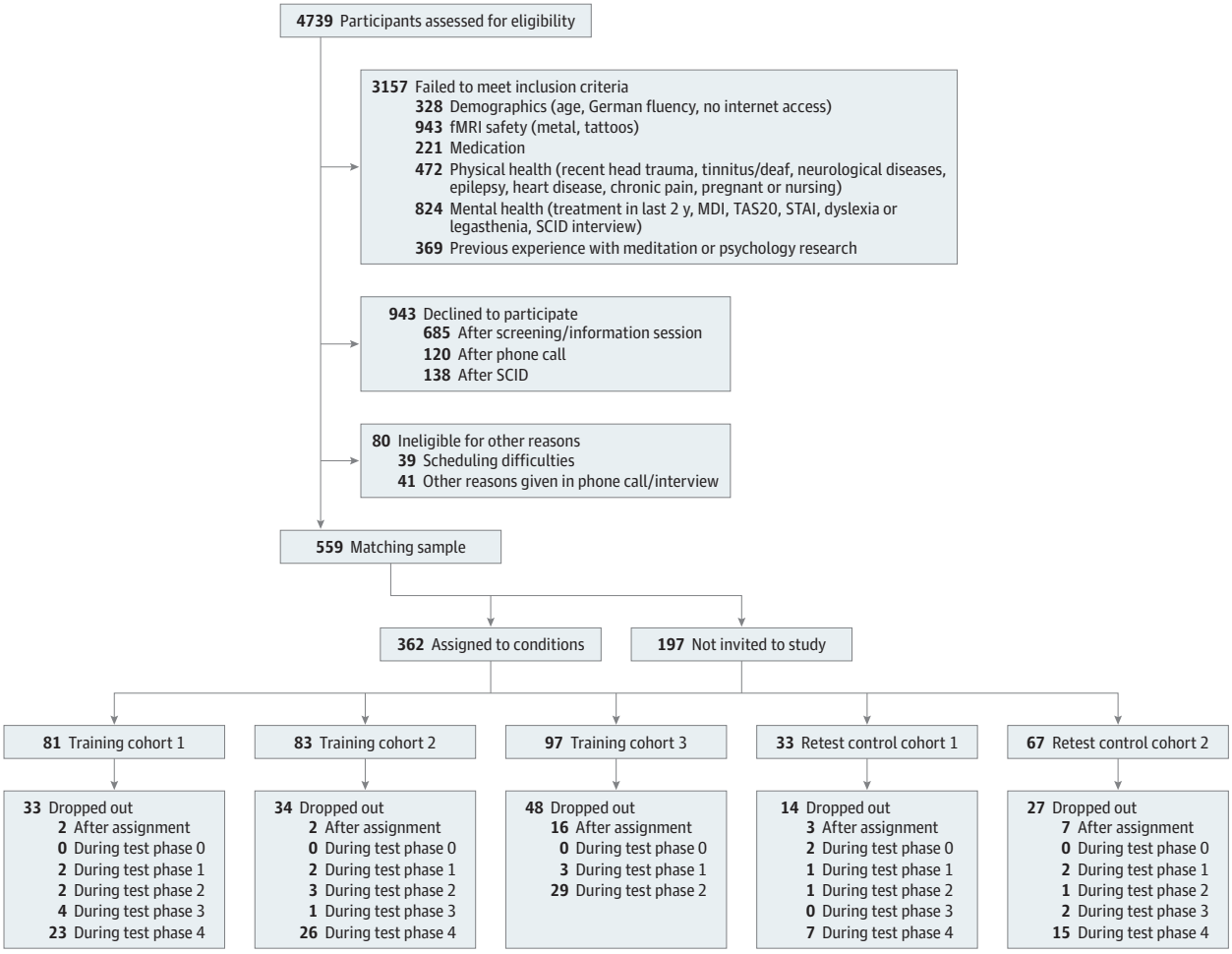
Sample and Demographics

Potential participants (N = 4739) were screened to exclude individuals from vulnerable populations and those with previous formal meditation practice experience (see eAppendices 1-5, eTable 1, and eFigures 1 and 2 in Supplement 2 for all inclusion and exclusion criteria, additional details of the recruitment process and dropout rates, and study design). Of these 4739 participants, 559 met all eligibility criteria (**Figure 2**). From the latter pool, 362 were randomly assigned to cohorts. Thirty participants dropped out before data collection began, leaving 80 in training cohort 1 (TC1), 81 in training cohort 2 (TC2), 81 in training cohort 3 (TC3), and 90 assigned to a retest control condition. Because the participants assigned to the retest control condition did not engage in the dyads or meditations, they did not contribute data to the analyses discussed here. Participants in TC3 completed only the affect module. Sixteen participants provided no state-change data (3 from TC1, 6 from TC2, and 7 from TC3). In TC1 and TC2, 1 participant completed the meditations but did not provide data for any dyadic exercises. In TC3, 1 participant completed the dyads but not the meditations. Four additional participants in TC1 and 2 participants in TC2 provided data only for the first module completed. The overall by-participant data loss rate by the last module completed was 8.8% for TC1, 9.9% for TC2, and 8.6% for TC3.

Procedure

Training cohorts 1 and 2 attended a 3-day retreat to begin the presence module.[30] After 3 months of presence training, participants in TC1 began the affect module, and participants in

Figure 2. CONSORT Flow Diagram



Training cohort assignment and retention "dropouts" left the study before the start of the testing period listed (132 participants were not included because they applied too late). Adapted with permission from Singer et al.[30] fMRI indicates functional magnetic resonance imaging; MDI, Major Depression Inventory; SCID, Structured Clinical Interview for *DSM*; STAI, State-Trait Anxiety Inventory; TAS20, 20-item Toronto Alexithymia Scale.

TC2 began 3 months of the perspective module (Figure 1). After completing the second module, participants in TC1 were assigned to the perspective module, and participants in TC2 were assigned the affect module. Training cohort 3 completed only the affect module.

Participants were asked to engage in each practice 5 times a week at home, using guided recordings for the meditation. Participants completed questions about their subjective state before and after each daily practice. For the dyads, participants met with a randomly assigned partner using a custom-designed website or smartphone app. One participant was randomly assigned to speak first for 5 minutes. During this time, the listener was asked to silently focus and not to respond. After 5 minutes, both participants completed some questions and then switched roles. The dyad ended after both participants had spoken and listened. Participants were instructed to answer the dyadic prompt from the moment, without any preconceived goals. In addition to daily practice, participants attended 2-hour weekly training sessions with meditation teachers.

Measures

The ReSource Project involved a wide range of assessments.[30] Here we report the results of all daily state measures (before and after practice) shared across dyads and meditations, as well as all daily state measures common between dyads and not assessed for meditations.

Engagement Measures

Compliance was operationalized as using the online and smartphone-based guided contemplation recordings and responding to questions. Before starting practice, participants reported their motivation level using a sliding scale from 1 ("not at all") to 20 ("very much"). After completing each module, participants retrospectively reported how much they liked the practices using a scale from 1 ("not at all") to 5 ("very much").

Outcome Measures

Closeness to the dyadic partner was assessed before and after completing the dyadic exercise, using the Inclusion of Other

Table 1. Engagement by Module and Training Cohort (TC1-3)

		Mean (95% CI)					
		Compliance, No. of Meditation Sessions		Motivation, Score		Liking[a]	
Module	Cohort	Dyad	Meditation	Dyad	Meditation	Dyad	Meditation
Affect	TC1	3.87 (3.65-4.09)	3.89 (3.63-4.14)	9.89 (9.02-10.76)	10.38 (9.55-11.21)	52/70	28/70
Perspective	TC1	3.12 (2.85-3.39)	3.57 (3.28-3.85)	8.37 (7.56-9.18)	11.39 (10.60-12.19)	39/70	39/69
Affect	TC2	3.35 (3.10-3.60)	3.38 (3.08-3.68)	10.65 (9.84-11.47)	11.76 (11.08-12.44)	47/70	39/70
Perspective	TC2	3.37 (3.13-3.61)	3.69 (3.41-3.98)	8.65 (7.90-9.40)	11.41 (10.71-12.11)	47/73	36/74
Affect	TC3	3.55 (3.30-3.79)	4.05 (3.70-4.40)	9.76 (9.08-10.43)	10.87 (10.26-11.48)	49/72	44/69

[a] Proportion scoring higher than the scale midpoint of "somewhat."

in the Self scale.[39] This scale is a pictorial 1-item measure of perceived closeness to a specific other. After completing a dyadic session, participants also reported how personal their self-disclosures had been, using a sliding scale from 1 ("not at all") to 20 ("very much"). Together, these measures represent both the subjective feeling of being socially connected (using the Inclusion of Other in the Self scale) and the tendency to engage in intimacy-promoting communication (self-disclosure).[40,41]

Secondary outcome measures of valence and arousal were assessed before and after all practices using an affect grid with scales ranging from 0 to 8. Analyses of these secondary outcomes are available in eAppendix 6 and eTables 2, 3, 4, and 5 in Supplement 2.[42]

Statistical Analysis

All analyses were intent-to-treat analyses. The 3 training cohorts act as replications for one another; thus, models were fitted for each training cohort separately. To highlight reliable training effects, only effects that were significant in the same direction for all cohorts were interpreted. Mixed-effects linear multivariate regression models with person-level random effects were used for most analyses; when appropriate, a dyad-level random intercept was also included. Code and omnibus tests for all models are available in eAppendix 7 and eTables 6, 7, 8, and 9 in Supplement 2. All multilevel models include the following covariates, unless otherwise noted: sex, weekend, and device (smartphone or computer) as binary covariates with values of 0.5 and −0.5, and mean-centered age. Significant omnibus effects were probed using contrasts. Estimates and 95% CIs for 2-sided tests are reported for each contrast using the format of mean estimated value ± margin of error (representing a 95% CI). Unless otherwise noted, models were fitted using *lme4* version 1.1-12 in R version 3.2.5.[43,44] *P* values were calculated using *car* version 2.1-1.[45] $P < .05$ was considered to be statistically significant.

Results

Engagement

Compliance

Mean weekly person-level compliance rates were compared within modules (**Table 1**; eAppendix 8 and eFigure 3 in Supplement 2). Compliance did not differ significantly between LKM and the affect dyad for TC1 or TC2 (TC1 had a mean [95% margin of error] difference score of 0.13 [0.26], with $P = .31$; TC2 had a mean [95% margin of error] difference score of 0.25 [0.29], with $P = .09$), but was higher for LKM than the affect dyad in TC3 (mean [95% margin of error] difference score of 0.46 [0.30]; $P = .003$). Participation rates did not differ between OTM and the perspective dyad (mean [95% margin of error] difference score of 0.14 [0.25] in TC1 [$P = .27$] and 0.10 [0.29] in TC2 [$P = .49$]). Note that for TC2 only, the averages for the perspective module do not include weeks 1 and 2 because technical problems in the website and phone app interfered with recording. Overall, participation rates were significantly higher for the affect dyad than for the perspective dyad (mean [95% margin of error] difference score of 0.75 [0.22]; $P < .001$) in TC1 but did not differ in TC2 (mean [95% margin of error] difference score of 0.02 [0.14]; $P = .83$).

Motivation

Mean motivation levels were compared within modules. Across all 3 cohorts, motivation was higher for the meditations relative to the dyads (mean [95% margin of error] difference score of 1.76 [0.31] in TC1 [$P < .001$], 1.93 [0.43] in TC2 [$P < .001$], and 1.12 [0.49] in TC3 [$P < .001$]). Participants were significantly more motivated to perform the affect dyad than the perspective dyad (mean [95% margin of error] difference score of 1.52 [0.45] in TC1 [$P < .001$] and 2.01 [0.46] in TC2 [$P < .001$]).

Self-reported Liking

Ordinal liking ratings were compared within modules. In TC1, participants were less likely to give favorable ratings to LKM than to any other practice: 0.44 (95% CI, 0.32-0.60) times less likely for OTM ($P = .01$), 0.22 (95% CI, 0.16-0.31) times less likely for the affect dyad ($P < .001$), and 0.55 (95% CI, 0.40-0.75) times less likely for the perspective dyad ($P = .06$). Participants were also more likely to give favorable ratings to the affect dyad than to any other practice: 4.53 (95% CI, 3.26-6.30) times more likely than for LKM ($P < .001$), 1.99 (95% CI, 1.44-2.74) times more likely than for OTM ($P = .03$), and 2.47 (95% CI, 1.79-3.41) times more likely than for the perspective dyad ($P = .01$).

Table 2. Outcome Change by Module and Training Cohort (TC1-3)

Outcome, Cohort	Affect Module Change in Score[a] (95% CI)	P Value	Perspective Module Change in Score[a] (95% CI)	P Value	Affect Module Slope[b] (95% CI)	P Value	Perspective Module Slope[b] (95% CI)	P Value
Social closeness								
TC1	1.54 (1.34-1.73)	<.001	0.77 (0.58-0.96)	<.001	0.020 (0.015-0.025)	<.001	0.010 (0.005-0.015)	<.001
TC2	1.10 (0.94-1.26)	<.001	1.06 (0.90-1.21)	<.001	0.007 (0.003-0.011)	<.001	0.014 (0.010-0.017)	<.001
TC3	1.77 (1.54-2.01)	<.001			0.021 (0.014-0.028)	<.001		
Self-disclosure	**Mean Score (95% CI)**		**Mean Score (95% CI)**		**Slope (95% CI)**	**P Value**	**Slope (95% CI)**	**P Value**
TC1	11.43 (10.85-12.02)		11.35 (10.75-11.95)		0.028 (0.023-0.034)	<.001	0.008 (0.001-0.015)	.03
TC2	11.97 (11.34-12.59)		10.37 (9.84-10.90)		0.018 (0.013-0.024)	<.001	0.008 (0.002-0.014)	.01
TC3	11.41 (10.76-12.06)				0.020 (0.009-0.031)	<.001		

[a] Change from beginning to end of a daily session.

[b] Change in predyadic-session scores.

For TC2, liking differed significantly between dyads and meditations only. Independent of module, participants were 2.04 (95% CI, 1.63-2.55) times more likely to give dyads a more favorable liking rating than meditations ($P = .002$). For TC3, there was no significant difference in liking ratings between practices (odds ratio, 0.98 [95% CI, 0.71-1.35]; $P = .95$).

Outcomes

Self-disclosure

Overall self-disclosure did not differ between dyads in TC1 (mean [95% margin of error] difference score of 0.08 [0.45]; $P = .71$) but was significantly lower for the perspective dyad in TC2 (mean [95% margin of error] difference score of 1.60 [0.44]; $P < .001$) (**Table 2** and **Figure 3**). Over time, all self-disclosures became more personal (Table 2 and Figure 3). Disclosures within the affect dyad became more personal more rapidly than within the perspective dyad (mean [95% margin of error] difference in slope of 0.02 [0.008] in TC1 [$P < .001$] and 0.01 [0.006] in TC2 [$P = .001$]).

Social Closeness

Both dyads significantly increased felt closeness from before to after practice for all training cohorts (Table 2 and Figure 3). In TC1, the affect dyad was significantly more effective than the perspective dyad at increasing felt closeness to others during a session (mean [95% margin of error] difference score of 0.76 [0.08]) ($P < .001$), but this difference was not significant in TC2 (mean [95% margin of error] difference score of 0.05 [0.09]) ($P = .31$; Figure 3).

The rate of growth in prepractice closeness was significant for all modules in all cohorts (Table 2 and Figure 3). The first dyad learned (affect for TC1, perspective for TC2) was associated with a more rapid growth in felt closeness relative to the second dyad learned (mean [95% margin of error] difference in slope of 0.010 [0.004] in TC1 [$P < .001$] and 0.006 [0.004] in TC2 [$P = .004$]).

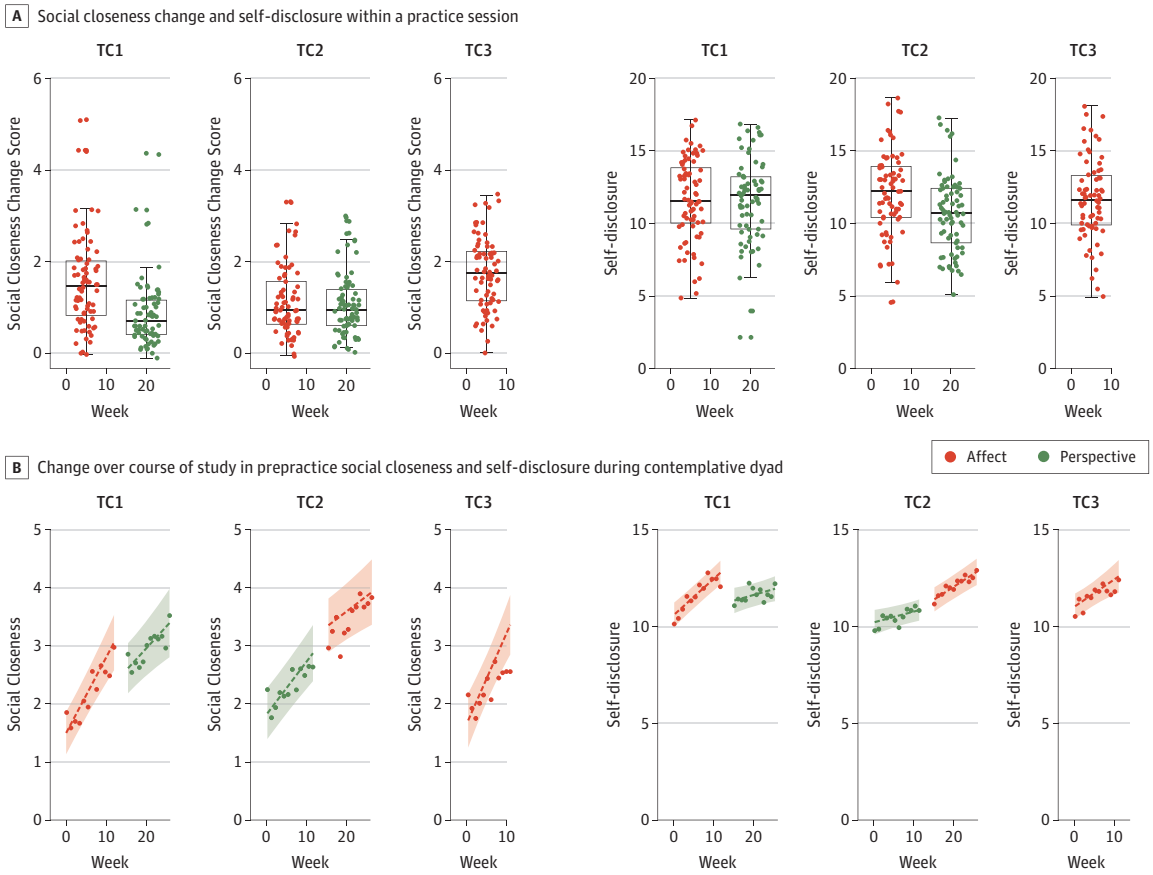
Discussion

A new daily practice format, the contemplative dyad, was introduced in the context of a 9-month large-scale longitudinal mental training program, the ReSource Project.[30] The affect dyad cultivates socioaffective capacities, such as empathy, gratitude, and dealing with difficult emotions, and the perspective dyad cultivates cognitive perspective taking on the self and others. First, dyadic engagement, assessed via compliance, motivation, and liking, was compared with engagement for content-matched classical meditations. Engagement was similar across the dyads and classical meditations. Secondary analyses, shown in eAppendix 6 in Supplement 2, also revealed that the contemplative dyads and classical meditations elicited comparable positive changes in affect, with the highest increase in positivity occurring for the affect dyad, although the contemplative dyads were less arousing.

Second, we assessed the ability of the contemplative dyads to increase perceived social connectedness. Both dyads led to increased social closeness to the other participants after a dyadic session, growth in social closeness to the other participants over time, and growing self-disclosure over the course of the training.

The effects of the structured, electronically mediated contemplative dyads are in line with the effects of unscripted, in-person social interactions; self-disclosure, even without feedback, increases psychological well-being and activity in brain areas associated with reward.[46] Consistent with research showing that emotion sharing is pleasant, the affect dyad was liked more, and experienced as more affectively positive, than LKM or OTM (and, in TC1, it was also liked more than the perspective dyad).[47,48] The perspective dyad was not liked more or less than the meditations. The intrinsic linkage between social interactions and affect may have amplified the hedonic impact of the more emotional affect dyad relative to the more cognitive perspective dyad. Note, however, that while our results sug-

Figure 3. Effect of Contemplative Dyads on Social Closeness and Self-disclosure



A, Raw person-mean change in social closeness before and after practice, and self-disclosure during practice. Data from 1 participant in training cohort 3 (TC3) included social closeness change values greater than 6 but are not pictured. Analyses excluding these outliers did not change the pattern of significance. B, Model-estimated (lines) and weekly-mean raw (points) change over time in prepractice social closeness and during practice self-disclosure over the 3-month training modules. Shaded areas represent 95% CIs. The TC2 perspective module is longer owing to a scheduled break in practice during the Christmas holiday in the middle of the module.

gest a slight advantage of the affect dyad compared with the perspective dyad with respect to liking, positive affect, and self-disclosure, the perspective module was designed to selectively target theory of mind, which is expressed in other ways.

Perceiving oneself as socially connected is deeply embedded in human functioning, and the absence of feeling connected prospectively predicts both mental and physical illness and premature mortality.[8-13,49] Because many mental illnesses are characterized, in part, by social dysfunctions that threaten social connectedness, interventions that bolster connectedness have a particular relevance to clinicians.[1-7] Here we provide evidence that regular dyadic contemplative practice at home can be used to foster perceived social connectedness. Individuals currently experiencing chronic loneliness, which is often accompanied by abnormalities in social cognition, may benefit from dyadic contemplative practices as a way to undo maladaptive sociocognitive tendencies.[50] In addition, the finding that social connectedness can be reliably increased through 10-minute dyads has implications for improving health by serving as a preventative measure to shore up existing social connections.

Limitations

Because this initial trial of the contemplative dyads is embedded within the context of a larger mental training study of healthy adults, future research is needed to investigate the effects of contemplative dyads in the absence of other contemplative training. Further work with populations such as older adults, who are more vulnerable to loneliness, and individuals currently having maladaptive social cognitions is needed to evaluate the utility of the dyads as a treatment for current loneliness in addition to a method of improving perceived social connectedness in the present to prevent loneliness in the future.[51]

Conclusions

Two types of daily 10-minute contemplative dyadic exercises teaching adaptive socioaffective and sociocognitive skills increased perceived social connectedness, measured as social closeness and self-disclosure, over 6 months of training. The dyads were comparable to classical meditations in compli-

ance, motivation to practice, and liking. These findings have implications for the treatment and prevention of the perceived social isolation and maladaptive social cognition that accompany many psychopathologies.

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Study concept and design: Singer.
Acquisition, analysis, or interpretation of data: Both authors.
Drafting of the manuscript: Kok.
Critical revision of the manuscript for important intellectual content: Singer.
Statistical analysis: Kok.
Obtained funding: Singer.
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