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Loving-kindness meditation: A field study

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Beatrice Alba is a PhD student at Macquarie University, under the supervision of Doris McIlwain and Ladd Wheeler. She is currently undertaking her doctoral research in the area of social and personality psychology.

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Keywords: loving-kindness, metta, meditation, meditation retreat, Buddhism, compassion

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The author declares that she has no conflict of interest.

Abstract

Surveys were conducted at two metta meditation retreats in order to examine the psychological effects of metta meditation. Participants were invited to complete the survey at the beginning of the retreat, at the end of the retreat, and two weeks after the end of the retreat. Participants completed the same scales at each time phase, which included measures of happiness, compassionate love, revenge and avoidance motivation, gratitude, and a depression, anxiety and stress scale. Significant increases were found in happiness and compassionate love, reductions in avoidance and revenge, and reductions on the depression, anxiety and stress subscales.

Scientific interest in the effects of meditation goes back as far as the 1930s (Murphy & Donovan, 1988). A great deal of research was carried out in the 1970s on transcendental meditation, (Hjelle, 1974; Smith, 1978; Turnbull & Norris, 1982; Wallace, 1970), as well as some work examining the therapeutic effects of meditation (D. H. Shapiro & Giber, 1978). More recently, an increasing amount of research has focused on mindfulness meditation (Easterlin & Carde, 1999; Jha, Stanley, Kiyonaga, Wong, & Gelfand, 2010), particularly on its psychotherapeutic effects (Baer, 2003; Melbourne Academic Mindfulness Interest Group, 2006). Research has found that mindfulness practice can lead to a reduction in depression (Geschwind, Peeters, Drukker, Van Os, & Wichers, 2011; Ma & Teasdale, 2004; Teasdale et al., 2002; Teasdale et al., 2000), anxiety (Evans et al., 2008; Hofmann, Sawyer, Witt, & Oh, 2010; Kabat-Zinn et al., 1992; Miller, Fletcher, & Kabat-Zinn, 1995) and stress (Astin, 1997; Grossman, Niemann, Schmidt, & Walach, 2004; Oman, Shapiro, Thoresen, Plante, & Flinders, 2008; S. L. Shapiro, Schwartz, & Bonner, 1998).

However, it is only very recently that has attention been placed on the effects of loving-kindness (or metta) meditation (LKM) (Kristeller & Johnson, 2005). Buddhaghosa's *Visuddhimagga* provides systematic instructions for metta mediation (Buddhaghosa, 2010), upon which many modern forms of LKM are based (Hofmann, Grossman, & Hinton, 2011; Salzberg, 2008). The practice involves holding in mind a particular person (or being) and repeatedly wishing for them to be well and happy. The details of the technique can differ, but often begin with directing that wish toward oneself, and moving progressively to a loved person (but with whom one has an uncomplicated relationship), a neutral person (someone whom towards one feels no strong positive or negative feelings), a disliked or hated person, and then to all beings.

Some of the research on LKM has focused on its therapeutic effects, such as studies that found that LKM reduced back pain, anger and psychological distress (Carson et al., 2005), increased quality of life in people with AIDS (Williams et al., 2005), and reduced the negative symptoms of schizophrenia (Johnson et al., 2011; Johnson et al., 2009). Further work has investigated the effects of LKM in comparison to other meditative techniques (Crane, Jandric, Barnhofer, & Williams, 2010; Feldman, Greeson, & Senville, 2010), as well as examining loving-kindness meditators in EEG studies (Barnhofer, Chittka, Nightingale, Visser, & Crane, 2010), and in studies of cognitive abilities (Burgard & May, 2010; May et al., 2011). A study by Hutcherson, Seppala and Gross (2008) found that LKM increased feelings of social connectedness, and other studies have found that LKM increases positive

emotions (Cohn & Fredrickson, 2010; Fredrickson, Cohn, Coffey, Pek, & Finkel, 2008). LKM has also been found to protect from social stress (Law, 2011) and increase pro-social behaviour (Leiberg, Klimecki, & Singer, 2011; Reb, Narayanan, & Su, 2010).

Other research has incorporated compassion practices into psychological interventions. While these methods differ to LKM as described above, the practices bear some similarity to each other and may have comparable effects. Paul Gilbert and colleagues developed Compassion Focused Therapy, in which the practice of Compassionate Mind Training has been found to reduce shame, self-criticism, depression, anxiety, submissive behaviour and feelings of inferiority (Gilbert, 2009; Gilbert & Irons, 2005; Gilbert & Procter, 2006). Kristin Neff and colleagues have also found self-compassion to be linked to positive psychological functioning (Neff, 2003; Neff, Kirkpatrick, & Rude, 2007; Neff & Pommier, 2013), and another study using a compassion meditation training program also found that it buffered against stress (Pace et al., 2009). Recent research has found that self-compassion was a better predictor of psychological health than mindfulness (Van Dam, Sheppard, Forsyth, & Earleywine, 2011). A recent review of the research on LKM and Compassion Meditation can be found in Hofman, Grossman and Hinton (2011).

The following study attempts to build on the current research by investigating the effects of participating in a metta meditation retreat. Unlike the studies described above, this study attempts to examine changes in psychological variables among the participants of two metta meditation retreats by surveying them before and after the retreats. This can be considered to be a pre-experimental pilot study since no control or comparison group was used. Since the participants were simply people from the community who signed up to participate in the retreat, it would not have been possible to randomly allocate participants to either an experimental or a control group, and therefore no conclusions can be drawn about causality. Nonetheless, whatever limitations exist in this sense, this research is valuable because it is a field study of individuals who chose to attend a metta meditation retreat and provides an informative examination of their experiences. So far there has been little or no research of this nature, and as such, this study offers insight into a relatively unexplored source of data.

In order to examine the psychological effects of participating in a metta meditation retreat, this research administers measures of a number of variables, as described below, which are predicted to undergo changes due to participation in the retreat. The general design

of the study involves administering questionnaires containing measures of all these variables immediately before the retreat, immediately after the retreat and two weeks after the end of retreat. The scores on these variables can then be statistically compared across the time phases to examine any potential changes.

It is hypothesised that participants should feel happier after the retreat. Previous research has found that committing acts of kindness has been found to boost happiness (Lyubomirsky, Sheldon, & Schkade, 2005), and therefore meditation on kindness may have similar effects. It is also expected that metta meditation should increase feelings of kindness and compassion since this is its purpose, and previous research has found it to increase social connectedness (Hutcherson, et al., 2008) and love (Fredrickson, et al., 2008). Therefore it is hypothesised that participants would score higher on a measure of kindness and compassion after the retreat. For similar reasons it is expected that metta meditation should increase feelings of forgiveness, especially since the practice involves cultivating feelings of loving-kindness to a disliked or hated person. Therefore it is hypothesised that feelings of avoidance and revenge against a person who had hurt the participant recently would be lower after the retreat. Reason would also support the prediction that participation in the retreat should lead to increased scores on a measure of gratitude, and previous research has indeed found LKM to increase such feelings (Fredrickson, et al., 2008). Finally it is expected that participation in the metta meditation retreat would also lead to increased psychological well-being, as previous studies have found the practice of LKM to do so (Fredrickson, et al., 2008). Therefore a measure of depression, anxiety and stress is included, and it is hypothesised that scores on this scale would be lower after the retreat.

Study 1

Method

Participants

The study was conducted at a metta meditation retreat in April, 2011 in the New South Wales Southern Highlands. There were approximately 30 people at the retreat, and of those, 23 individuals chose to complete the survey at time one. Out of this initial sample, 20 completed the survey at time two and 13 participated in all three phases. However, one participant did not complete the whole questionnaire at time three, leaving only 12 that

completed the entire study. No demographic information was collected about the participants since the researcher was present at the retreat and wanted to preserve the participants' anonymity.

Materials

The survey administered at all three time phases contained the following variables in the order shown:

The Fordyce Emotions Questionnaire (Fordyce, 1988)

As a measure of happiness, participants are asked to circle how happy they usually feel on a scale ranging from 10 (extremely happy – feeling ecstatic, joyous, fantastic) to 0 (extremely unhappy – utterly depressed, completely down). Participants are then also asked to consider further the percentage of time on average that they feel happy, unhappy and neutral. They are asked to write down their best estimate, making sure that the three figures add up to 100%.

The Compassionate Love Scale (Sprecher & Fehr, 2005)

Participants completed the Compassionate Love Scale, which measures the tendency to support, help and understand other people. The version of the scale that was administered in this study was the 'stranger-humanity' version, where the questions referred to strangers or humanity in general, rather than a close other. Participants are asked to respond 21 items on a 7-point Likert-type scale where 1 = 'not at all true of me' and 7 = 'very true of me'. An example item from the scale is "I feel considerable compassionate love for people from everywhere". The Compassionate Love Scale has good reliability, with a Cronbach's alpha of .95 (Sprecher & Fehr, 2005).

Transgression Motivation questionnaire (McCullough et al., 1998)

This questionnaire is assumed to be associated with feelings of forgiveness. People are asked to think of someone who hurt them recently, and one subscale with seven items measures current feelings of avoidance towards that person and the other subscale with five items measures current feelings of revenge towards that person. Participants respond on a 5-point Likert-type scale where 1 = 'strongly disagree' and 5 = 'strongly agree'. An example item from the avoidance subscale is "I am trying to keep as much distance between us as

possible" and an example from the revenge subscale is "I wish that something bad would happen to him/her". The avoidance subscale has a Cronbach's alpha of .86, and the revenge subscale has a Cronbach's alpha of .90 (McCullough, et al., 1998).

The short version of the Depression, Anxiety and Stress Scale (DASS-21) (Antony, Bieling, Cox, Enns, & Swinson, 1998)

This scale measures the severity of the symptoms of depression, anxiety and stress, with three separate subscales. Participants respond to 21 items asking how much each statement applied to them over the past week on a 4-point Likert-type scale (0 = 'did not apply to me at all' and 3 = 'applied to me very much, or most of the time'). An example item on the depression subscale is "I felt down hearted and blue", an example from the anxiety subscale is "I felt I was close to panic" and an example from the stress subscale is "I found it difficult to relax". The Cronbach's alphas for each subscale from a group of nonclinical volunteers are: depression = .94, anxiety = .87 and stress = .91 (Antony, et al., 1998).

In order to calculate total scores on every scale except the Fordyce emotions questionnaire, the score for all items on the scale or subscale are added up and divided by the number of items on the scale or subscale.

At time one, participants were also asked some background questions about their meditation experience, how they rate themselves as a meditator, and their quality of sleep and general physical well-being over the past two weeks. At time two they were asked some questions about their meditation experiences during the retreat. At time three they were again asked to rate themselves as a meditator, their quality of sleep and general physical well-being over the past two weeks, and to what extent they believe that their participation in the retreat has lead to a change in their behaviour. The questionnaire in Study 1 also contained twelve items relating to social status, which were of interest to the researcher. Since this is an unpublished scale and no significant changes were found, the results from this measure will not be further discussed in this paper.

Procedure

Participants were invited to participate in this study upon arrival at the retreat, and if they agreed to participate, they completed the survey before the retreat formally began. They were given an information and consent form along with the questionnaire and were told that

the questionnaire should take approximately 20 minutes to complete. They were instructed to take note of their ID code (also supplied on the information sheet) so that their data could be tracked longitudinally. Participants submitted the survey by placing it in an envelope provided by the researcher.

The retreat was lead by Bhante Sujato, the abbot of Santi Forest Monastery in the New South Wales Southern Highlands in Australia. The retreat was four nights and was held at a retreat centre in Bundanoon, New South Wales. During the retreat, participants attended nightly dhamma talks in which they were given instructions on metta meditation practice. They received guided metta meditation sessions in the morning, and also had several opportunities to have one-on-one interview sessions with the retreat leader. The participants were encouraged to practice meditation throughout the day, but this time was free for them to spend as they wished. Meals were provided and participants were instructed to maintain silence as much as possible throughout the retreat, except during the interviews and the question time after the dhamma talks.

The participants were not given any explicit suggestion that they should expect benefits on any of the variables measured in the questionnaire due to their participation in the retreat. In the information statement for the study, participants were told that the purpose of the study is to examine whether metta meditation has measurable effects on forgiveness, compassion and subjective well-being. However, the retreat was provided as an opportunity for spiritual practice without any pre-defined goals, rather than for any potential psychotherapeutic benefits.

At the end of the retreat, participants were invited to complete the survey for the second time phase. The participants were free to complete the survey in their own time at the end of the retreat, and placed the completed survey marked with their unique ID in another envelope.

Two weeks after the end of the retreat, participants were emailed an invitation to complete the survey for time three, which was conducted online using Qualtrics software. Again they were asked to provide their unique code. They were thanked for their participation and invited to provide feedback about the study if they wished.

Results

The results for all participants who completed time phases 1 and 2 were compared using paired samples *t*-tests, and are shown in Table 1.

Results for the sample of participants who took part in all three time phases were analysed with a one-way repeated measures ANOVA. The findings for each time phase and statistical tests are presented in Table 2. In order to determine whether any individual time phases were statistically different to each other in this analysis (Table 2), Bonferroni pairwise comparisons were calculated. They revealed that the difference between time one (T1) and time two (T2) for the stress subscale was significant at the .01 level and the difference between T1 and time three (T3) was significant at the .05 level.

Participants' ratings of quality of sleep and general physical well-being at T1 and T3 were not significantly different. The data on previous meditation experience and experiences of the retreat are not reported since few significant correlations were found between these variables.

The statistical tests mentioned above allow us to examine changes in the variables across the time phases, and decide whether the results obtained are likely to be due to chance or to meaningful changes on scores. The *p* values allow us to judge whether there was a statistically significant effect (when $p<.05$), and Cohen's *d* and η^2 provide us with a measure of the effect size.

Discussion

In the analysis of the first two time phases, the percentage of time that people said that they felt happy increased significantly. The data show that both avoidance and revenge decreased in the analysis across the three time phases and in the analysis of T1 and T2. Scores on the anxiety and stress subscales of the DASS also decreased significantly in both analyses. Depression decreased significantly in the analysis of T1 and T2 but not in the analysis of the three time phases, which may simply be due to the smaller sample size in this analysis. The pairwise comparisons in the second analysis also showed that for the stress subscale, the decreases between T1 and T2 as well as T1 and T3 were also significant. All of these significant findings support the hypotheses, and the lack of significant findings on the remaining measures may perhaps be due to the small sample size.

Even though there were significant changes on the percentage of time that people said that they felt happy, revenge motivation, depression and anxiety in the analysis of the first two time phases, the effect sizes found here would be classed as small. However, the effect sizes for avoidance motivation and stress were medium. In the analysis of all three time phases, the significant effects on avoidance motivation, revenge motivation, and anxiety were all small, and the effect on stress was medium.

It is important to note that the statistically significant changes that were found, particularly on the measures of depression, anxiety and stress, do not signify a clinically significant change. The statistical tests indicate only that the change in the group means on each measure across time phases was not likely to be due simply to chance. Furthermore the group means on these measures were below clinical thresholds to begin with, meaning that the average scores of the group were already in the healthy ranges on the symptoms of depression, anxiety and stress at time one. When the changes on these symptoms were significant, the participants as a group went from having a healthy average score, to an even lower average score.

In order to examine whether these effects could be replicated, the same study was conducted in a larger sample of participants at another retreat.

Study 2

Method

Participants

This study was conducted at a metta meditation retreat in June 2011 at Jhana Grove Retreat Centre in Western Australia, again lead by Bhante Sujato. There were approximately 60 people at the retreat, and of those, 39 individuals chose to complete the survey at time one. Out of this initial sample, 33 completed the survey at time two and 19 participated in all three phases. However, some participants did not retain their codes, leaving a sample of 31 participants for the first two phases and 15 for all three. The participants were 28 females and 11 males. They were aged 24 to 72 years, with a mean age of 50.21 years (SD = 14.41 years). Twenty-two participants were Australian, five stated that they were of Australians of

dual nationality, 11 stated another nationality, and one participant did not state their nationality.

Materials

The questionnaire was almost identical to that in study one, except that this study included the Gratitude Questionnaire–6 (McCullough, Emmons, & Tsang, 2002) instead of the questions about social status. This scale measures the tendency to feel gratitude and asks participants to respond to six items on a 7-point Likert-type scale where 1 = 'strongly disagree' and 7 = 'strongly agree'. An example item from this scale is "I have so much in life to be thankful for". Two items on the scale are reverse scored, and the scale has a Cronbach's alpha of .82 (McCullough, et al., 2002).

Procedure

The procedure for this study was much the same as that for Study 1, except that the questionnaire was administered by a volunteer assistant rather than the researcher, who was not present at this retreat. The format of the retreat itself was also much the same as the first one, except that this retreat was ten nights rather than four.

Results

As in Study 1, the results for all participants who completed time phases 1 and 2 were compared using paired samples *t*-tests, and are shown in Table 3.

The results for the sample of participants who took part in all three time phases were again analysed with a one-way repeated measures ANOVA. The findings for each time phase and statistical tests are presented in Table 4. Once again, Bonferroni pairwise comparisons were calculated in order to determine whether any individual time phases were statistically different to each other in this analysis (Table 4). For the percentage of time that people said that they felt happy, Bonferroni pairwise comparisons found that the difference between T1 and T2 was significant at the .05 level, and the difference between T1 and T3 was significant at the .001 level. For the stress subscale of the DASS, the difference between

T1 and T2 was significant at the .05 level, and the difference between T1 and T3 was significant at the .001 level.

There were no significant changes in well-being and quality of sleep from T1 to T3, and once again, data regarding the background experience questions and experiences of the retreat will not be reported due to few significant findings.

The datasets from the two retreats were also combined and examined together. The only variable on which the participants from the two retreats differed significantly was avoidance motivation. At T1, participants from the first retreat (M = 25.26, SD = 6.63) were higher on avoidance motivation than participants on the second retreat (M = 19.98, SD = 7.89), $t(60) = 2.70$, $p < .01$. The same effect occurred at T2, where participants from the first retreat (M = 21.70, SD = 7.71) were higher on avoidance than participants on the second retreat (M = 17.43, SD = 6.80), $t(49) = 2.08$, $p < .05$. Even with the datasets combined, there was still no significant effect on the Fordyce happiness question, the Compassionate Love Scale or depression, which were the only variables that were not significantly different across the three time phases in either of the datasets.

Discussion

The percentage of time that participants reported that they felt happy increased in both the analysis of just the first two times phases and the analysis of all three time phases. The pairwise comparisons for the second analysis also revealed that the percentage of time that participants felt happy was also greater in both T2 and T3, compared to T1. The percentage of time that participants felt unhappy decreased in the analysis of the first two time phases.

In the analysis comparing times one and two, there was a significant increase on the Compassionate Love Scale, and a significant decrease on the avoidance scale.

In the analysis across the three time phases as well as that of just times one and two, there was a significant reduction in scores on the stress subscale of the DASS. The pairwise comparison in the analysis of all three time phases revealed that scores on stress were significantly lower on both T2 and T3, compared to T1. There was also a significant decrease in anxiety in the analysis of all three time phases. As in Study 1, participants in Study 2 were in the healthy range of depression, anxiety and stress to begin with.

Looking at the effect sizes in the analysis of the first two times phases, the significant differences found on the percentage of time that participants reported that they felt happy, the percentage of time that participants reported that they felt unhappy, the Compassionate Love Scale and avoidance motivation were all small, and the difference on stress was medium. In the analysis of all three time phases the effect sizes for the percentage of time that participants reported that they felt happy and stress were both small, and the effect size for anxiety was very small.

All of these findings are in line with the hypotheses, and the lack of significant findings and the differences in the two analyses may once again be due to issues surrounding the small sample size. The lack of change on the gratitude scale may, however, have much to do with the fact that participants were quite high on this scale to begin with and there was little room for improvement.

General Discussion

Overall, significant changes were not found on all variables measured, but all the significant findings were in line with the hypotheses.

The lack of effect on the Fordyce happiness question may be because this question was interpreted as referring to long-term happiness and the time span of the study was too short. It would be interesting to investigate whether a longitudinal study of long-term metta meditators would find a change on this variable. There was an increase in the percentage of time that people felt happy in three out of the four analyses, and a decrease in the percentage of time that people felt unhappy in one of the analyses, suggesting that after the retreat there is evidence of an increase in happiness.

Only one of the analyses found a significant change on the Compassionate Love Scale, which was quite small. However, scores on this scale were already reasonably high in both samples. An interesting question for future research would be to see if metta meditation could raise compassionate love in people who are low to begin with.

The decrease in avoidance and revenge motivation was quite prominent in Study 1. The same effect was not found in Study 2, besides an effect for avoidance in the analysis of the first two time phases. These differences may in part be due to the fact that the

participants in Study 1 were significantly higher on avoidance motivation at times 1 and 2 compared to participants in Study 2.

Both studies revealed somewhat similar findings for the DASS subscales. Although there were differences in which subscales differed significantly in all the analyses, the decrease in stress was significant in all four and the decrease in anxiety was significant in three out of the four analyses. On the other hand, depression showed a significant difference in only one analysis, suggesting that it is less likely to be affected by participation in a metta meditation retreat.

Study 1 found that the largest effects occurred on avoidance motivation and stress, and Study 2 found that the largest effects occurred on stress and the percentage of time that participants reported that they felt happy. Despite the differences across the two studies, stress consistently showed the largest effect, suggesting that perhaps this in particular seems to have been affected by participation in the metta meditation retreats.

Future research could continue to collect similar data from meditation retreats, since the sample sizes in these studies are quite small, particularly in the retention rates in the final phases. Increasing retention rates is an important issue, since it may be the case that individuals who choose to complete all three phases of the study benefitted differently from the retreat compared to those who opted-out of participation in the final phase. Another avenue for further study could be to examine assessments of the participants by family members and close friends before and after the retreat. While the retreat participants may not report differences on traits such as compassionate love, there may be changes in this trait after participation in the retreat that are discernible by close others. However, not all changes that the participants report about themselves would necessarily be apparent to others.

Similar studies could also be conducted at retreats where different types of meditation are practiced. For example, it would be interesting to examine whether or not similar changes occur after a Vipassana meditation retreat.

Finally, future research should attempt to investigate these effects experimentally, since a control group is needed to show that the effects found here really are due to metta meditation practice, rather than some other factor. While this would be difficult to do with the type of field sample used in this study, volunteers in laboratory studies could be compared on these variables when allocated to practice different meditation techniques. This kind of

study would indicate that any effects found are due to metta meditation specifically, and not simply the effects of going on a retreat or some other aspect of meditation practice. As mentioned in the introduction, some research of this nature has been conducted, but very little has been done on metta meditation specifically, particularly in comparison to other techniques.

Despite any limitations in the study design, these are valuable and encouraging findings since this research suggests that participation in a metta meditation retreat impacts positively on psychological well-being. This study has broken new ground by examining the experiences of a field sample of meditators through questionnaires, which can help inform future research on the effects of metta meditation.

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Table 1

Means, standard deviations, t-tests and effect sizes for each variable measured for all participants in time phases 1 and 2 (n=20).

Variable	Mean (SD) Time 1	Mean (SD) Time 2	*df*	*t*	*d*	*p*
Fordyce happiness	7.20(1.01)	7.50(1.54)	19	-1.55	.24	.14
%Happy	44.00(18.25)	49.75(21.37)	19	-3.29	.29	.004
%Unhappy	19.25(8.47)	17.00(10.18)	19	1.21	-.24	.24
%Neutral	36.25(16.45)	32.25(19.57)	19	1.63	-.22	.12
Compassionate Love Scale	5.18(0.73)	5.32(0.96)	18	-1.30	.16	.21
Avoidance	25.40(6.63)	21.70(7.71)	19	2.79	-.52	.01
Revenge	9.85(5.11)	7.93(3.67)	19	2.36	-.44	.03
Depression	5.94(8.10)	3.68(5.18)	18	2.43	-.34	.03
Anxiety	4.99(5.45)	2.77(4.05)	18	2.55	-.47	.02
Stress	12.32(8.20)	6.95(6.61)	18	3.85	-.73	.001

Note. %Happy, %Unhappy and %Neutral refer to the percentage of time that participants reported feeling happy, unhappy and neutral. Depression, Anxiety and Stress represent scores on the subscales of the DASS.

Table 2

Means, standard deviations, ANOVAs and effect sizes for each variable measured for the sample participants of all three time phases (n=13).

Variable	Mean (SD) Time 1	Mean (SD) Time 2	Mean (SD) Time 3	*df*	*F*	η^2	*p*
Fordyce happiness	7.08(1.12)	7.15(1.77)	6.92(1.85)	2, 24	.33	.03	.72
%Happy	37.69(18.44)	42.69(20.58)	43.46(22.02)	1.31, 15.68	1.10	.08	.33
%Unhappy	21.15(8.45)	20.38(9.46)	16.92(12.51)	2, 24	2.37	.17	.12
%Neutral	40.38(16.89)	35.38(20.66)	38.08(19.85)	2, 24	.62	.05	.55
Compassionate Love Scale	5.16(0.76)	5.27(0.99)	5.18(1.04)	2, 24	.44	.04	.65
Avoidance	27.01(7.06)	24.00(7.72)	22.33(8.96)	2, 22	4.70	.30	.02
Revenge	10.00(5.72)	7.67(3.70)	8.00(3.59)	2, 22	4.42	.29	.02
Depression	6.67(9.81)	4.33(6.14)	4.50(7.39)	2, 22	1.75	.14	.20
Anxiety	5.17(6.74)	3.50(4.76)	2.00(3.41)	1.49, 16.35	4.25	.28	.04
Stress	12.33(9.68)	7.00(7.46)	7.67(8.35)	2, 22	11.78	.52	<.001

Note. %Happy, %Unhappy and %Neutral refer to the percentage of time that participants reported feeling happy, unhappy and neutral. Depression, Anxiety and Stress represent scores on the subscales of the DASS.

Table 3

Means, standard deviations, t-tests and effect sizes for each variable measured for all participants in time phases 1 and 2 (n=31).

Variable	Mean (SD) Time 1	Mean (SD) Time 2	*df*	*t*	*d*	*p*
Fordyce happiness	6.75(1.76)	7.20(1.84)	27	-1.18	.25	.25
%Happy	44.77(21.13)	55.87(24.51)	30	-3.79	.49	.001
%Unhappy	20.87(16.46)	14.74(14.54)	30	2.50	-.40	.02
%Neutral	31.77(17.60)	29.71(21.83)	30	.69	-.10	.49
Compassionate Love Scale	5.06(0.92)	5.33(0.94)	30	-2.97	.29	.01
Avoidance	20.71(7.90)	17.43(6.80)	30	2.59	-.45	.02
Revenge	8.26(4.69)	7.57(4.00)	30	1.37	-.16	.18
Gratitude	6.29(0.92)	6.45(0.88)	30	-1.11	.18	.28
Depression	3.94(4.69)	3.85(5.33)	30	.09	-.02	.93
Anxiety	6.45(8.05)	5.10(5.97)	30	1.71	-.19	.10
Stress	11.74(9.00)	7.66(6.73)	30	3.27	-.52	.003

Note. %Happy, %Unhappy and %Neutral refer to the percentage of time that participants reported feeling happy, unhappy and neutral. Depression, Anxiety and Stress represent scores on the subscales of the DASS.

Table 4

Means, standard deviations, ANOVAs and effect sizes for each variable measured for the sample participants of all three time phases (n=15).

Variable	Mean (SD) Time 1	Mean (SD) Time 2	Mean (SD) Time 3	*df*	*F*	η^2	*p*
Fordyce happiness	7.00(1.24)	7.04(2.27)	7.57(1.74)	2, 26	.64	.05	.53
%Happy	45.33(19.59)	59.00(20.81)	66.00(12.98)	2, 28	11.94	.46	<.001
%Unhappy	20.00(17.53)	14.80(17.87)	11.67(6.99)	2, 28	2.16	.13	.13
%Neutral	31.33(17.06)	26.20(20.84)	22.33(14.25)	2, 28	2.65	.16	.09
Compassionate Love Scale	5.24(0.78)	5.50(0.83)	5.44(1.12)	2,28	1.96	.12	.16
Avoidance	21.73(7.41)	17.55(5.51)	18.73(5.59)	1.57, 21.99	3.17	.19	.07
Revenge	8.40(3.94)	8.05(3.54)	7.93(2.99)	2, 28	.22	.02	.81
Gratitude	6.41(0.80)	6.41(0.85)	6.42(0.69)	2, 28	.001	.00	.999
Depression	4.67(5.79)	5.24(6.91)	3.33(7.58)	2, 28	.40	.03	.68
Anxiety	6.00(6.55)	5.80(4.22)	3.20(4.26)	2, 28	3.33	.19	.05
Stress	13.20(10.11)	7.47(6.12)	6.27(7.32)	2, 28	8.63	.38	.001

Note. %Happy, %Unhappy and %Neutral refer to the percentage of time that participants reported feeling happy, unhappy and neutral. Depression, Anxiety and Stress represent scores on the subscales of the DASS.