Effectiveness of Care Farming on Veterans' Life Satisfaction, Optimism, and Perceived Loneliness

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Effectiveness of Care Farming on Veterans' Life Satisfaction, Optimism, and Perceived Loneliness

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Abstract

Care farming is the practice of using working farms and agricultural landscapes to promote mental and physical health. Military veterans are increasingly using care farms to heal their psychological wounds and reconnect socially. We examined the effectiveness of care farming using a smartphone data collection app and single-case design to determine its effect on veterans' life satisfaction, optimism, and perceived loneliness. Care farming improved life satisfaction in 60% of participants and optimism about future life satisfaction in 40% of participants. Perceived loneliness decreased in 40% of participants. Findings support care farming as a treatment for languishing veterans.

Keywords: care farming, veterans, life satisfaction

Effectiveness of Care Farming on Veterans' Life Satisfaction, Optimism, and Perceived Loneliness

Since 2001, 2.4 million active duty and reserve military personnel have been deployed to the wars in Iraq and Afghanistan. Nearly 750,000 of those will have a mental health condition requiring treatment (Schell & Tanielian, 2011; Thomas, Wilk, Riviere, McGurk, Castro, & Hoge, 2010; National Council for Behavioral Health, 2012). Although many receive care through the Veterans Administration (VA) or counseling agencies, nearly half of those meeting diagnostic criteria for a psychological disorder do not receive medical and psychological evaluation or counseling (The National Council for Behavioral Health, 2012). Without treatment, these veterans' may struggle to reintegrate into civilian life and face challenges from such mental illness correlates as high unemployment, divorce, homelessness, substance abuse, and suicide (Prigerson, Maciejewski, & Rosenheck, 2001; Tanielian & Jaycox, 2008)

Despite numerous mental health challenges affecting veterans' well-being and life satisfaction, many veterans avoid professional help. Common justifications include concerns for privacy, fears that others will lose confidence in them (Corrigan, 2004), and worries over medication side effects (Kime, 2015). Additionally, many veterans experience poor access to mental health services. In 2013, for example, the VA had a backlog of more than 600,000 disability claims, an exorbitantly high number that as of 2015 has been reduced to about 125,000 (Shane, 2015). Such institutional delays further exacerbate the burden for veterans by asking them to complete complicated application procedures at a time when they most need service. The stigma often associated with therapy in the military's "warrior culture" may also prevent some veterans from seeking help (Corrigan, 2004; Held & Owens, 2013). After being socialized

within the military sub-culture, some veterans are more likely to equate mental health services with weakness or a diminished ability to perform professional roles and responsibilities.

Care Farming

To address these barriers and improve mental health care for veterans, practitioners must begin exploring new and effective approaches. One approach growing in popularity among veterans is care farming. Care farming refers to the activity of using working farms and agricultural landscapes to promote mental and physical health (Di Iacovo, Senni, & De Knight, 2006). Clients participate in various horticultural activities, including crop and vegetable production, animal husbandry, and woodland management. Consequently, they learn useful skills within a safe community and green environment, a setting shown to improve mental and social wellbeing (Hine, Peacock, & Pretty, 2008). Care farming is well documented within clinical populations in Europe. In 2005, for instance, 10,000 mental health clients visited almost 800 care farms in the Netherlands alone (Hassink, Zwartbol, Agricola, Elings, & Thissen, 2007).

A salient characteristic of care farms is time spent outdoors. Researchers have found that when participants spend time in green environments they feel more active, energetic, and connected with others (Elings & Hassink, 2006; Hassink, Elings, Zweekhorst, van den Nieuwenhuizen, & Smit, 2010). Community gardening, for instance, has been shown to promote social wellbeing, group cohesion (Kweon, Sullivan, & Wiley, 1998) and social communication skills (Sempik, Aldridge, & Becker., 2003). Furnass (1996) and Lewis (1996) found that co-gardening builds social networks and enhances social capital. It may also provide a sense of intimacy with others (Cobley, 2003) and improve people's social interaction (Moore, 1989) and social functioning (Kuo, Bacaicoa, & Sullivan, 1998).

Although care farms remain rare in the United States, we estimate that approximately twenty have been established recently—primarily for veterans. Empirical support for their efficacy with veterans is lacking, but existing research suggests their potential with similar difficult-to-treat populations. Researchers have found that farming activities helped participants with diagnosed psychological disorders and addiction histories feel greater self-esteem, self-respect, responsibility, and usefulness to society (Elings & Hassink, 2008). Participants appreciated the socialization of teamwork and belonging to a group, and felt a sense of structure and discipline, two things veterans often feel is missing after leaving the military.

Theoretical Foundations for the Nature-Wellness Link

Explanations for why care farming might positively influence human well-being are still mostly underdeveloped. But growing research demonstrates that exposure to nature positively affects holistic well-being, suggesting the nature-wellness link is a key factor in care farming's success. Wilson (1984) has offered the biophilia hypothesis as a way of understanding the link between nature and positive health outcomes. The biophilia hypothesis posits that human beings have evolved over 350,000 generations to affiliate with their natural environment. As a result, human DNA now readies people to respond positively to nature. This connection to nature manifests in such things as our affinity for pets and screensavers of mountains, forests, and waterfalls; in our visits to zoos and state and national parks; and in our dreams of vacations to mountains or tropical beaches. Such anecdotes, Wilson (1984) argued, reveal a biological need to interact with plants, animals, and landscapes—the natural environment in its totality—a need that when fulfilled supports our cognitive, emotional, and social well-being.

Kaplan (1995) argued that nature works on human well-being primarily through its restorative qualities on cognitive functioning. Modern societies present people with often an

overwhelming array of events and circumstances that require an immense amount of direct psychological attention. Without restoration, prolonged effortful attention can lead to mental fatigue. According to Kaplan's (1995) Attention Restoration Theory (ART), 'restorative environments' are places of refuge where focused attention is not necessary, and thus the mind can relax. Because interacting with nature does not typically require direct psychological attention, Kaplan argued, nature experiences are frequently restorative. Kaplan (1995) suggests that for an environment to be restorative it must include: fascination (an involuntary form of attention requiring effortless interest and curiosity); a sense of being away (temporary escape from one's usual setting or situation); compatibility with an individual's preferences or inclinations (whether the setting satisfies the individual's purposes); and a sense of extent (a sense of being part of something much larger than the individual). When these elements combine, a restorative effect can be experienced.

Reese and Myers (2012) have also advanced an eco-wellness model highlighting the influence of nature on holistic well-being. One component of their model, transcendence, relies on Maslow's (1971) concept of *peak experiences*—experiences that occasion deeply meaningful connections to others and the natural world. Two aspects of peak experiences, spirituality and community connectedness, are often experienced in nature. When interacting with nature, people often experience a sense of awe, wonderment, and unity with all things, leading to feelings of love, peace, and emotional well-being, and generosity and consideration of others' needs (Sweatman & Heintzman, 2004). This shift from self to others is an important catalyst for improving relationships and community wellness (Weinstein, Przybylski, & Ryan, 2009).

As a treatment intervention deeply embedded in nature, care farms hold promise for helping heal veterans' "hidden wounds" and aiding their return to society. But more systematic

evaluation is needed to demonstrate their therapeutic value. Little is known, for instance, about how farming activities affect common wellness indicators such as loneliness, life satisfaction, and optimism.

Perceived Loneliness

Compounding the problem facing many veterans is a profound sense of social isolation from loved ones, friends, and communities. Despite being surrounded by concerned others, many veterans socially withdraw and isolate themselves while transitioning to civilian life. This is a common response following traumatic events, but for combat veterans the kind of loneliness they feel as a result may be different. Besides emotional or social isolation, veterans often feel what Stein and Tuval-Mashiach (2014) call *experiential loneliness*. They feel disconnected despite having emotional or social bonds with others, and believe those around them do not understand or "get it." Some veterans may see themselves living in a different world than civilians, a world marked by combat experiences so removed from civilian life that others cannot relate or accurately empathize. Effects of this disconnect can include profound loneliness, relationship problems, alcohol and drug abuse, and unemployment (Stein & Tuval-Mashiach, 2014).

Life Satisfaction

For veterans, difficulties reintegrating may be captured in a general indicator of positive human health called *life satisfaction* (Ryan & Deci, 2001). Life satisfaction is one part of hedonic or emotional wellbeing that suggests emotionally healthy people experience (a) high levels of positive emotions, (b) low levels of negative emotions, and (c) overall life satisfaction (Diener, 2009). Life satisfaction is a measure of how one sees the whole of life, its overall quality and track. It differs from a discrete emotion in that it is an aggregate appraisal of such

emotions, a sense of how positive feelings balance with negative ones over time. A person feeling high life satisfaction, for example, perceives more pleasure than pain in life (Avsaroglu, Deniz & Kahraman, 2005). Life satisfaction is also thought to include self-assessments of how well one is achieving goals, performing in comparison to others, and feeling generally happy in life. In general, life satisfaction refers to an individual's well-being, quality of life, and level of thriving (Veenhoven, 1996). As an indicator of psychological health, it represents a metaphorical barometer measuring the overall harmony that one experiences in the inner and outer self.

Several important physical and emotional health outcomes have been found related to life satisfaction. People satisfied with their lives have fewer psychological and physical health problems, including reduced negative emotions like anger, sadness, and worry, and increased positive emotions like happiness, enjoyment, and social closeness (Keyes, 2006; Cantrill, 1965). Life satisfaction has been found to positively correlate with happiness (Gamble & Garling, 2011) and life purpose (Bronk, Hill, Lapsley, Talib, & Finch, 2009); and negatively correlate with depression (Saunders & Roy, 2000), hopelessness (Guney, Kalafat, & Boysan, 2010), anxiety and post-traumatic stress disorder (Zanon, Hutz, Reppold, & Zenger, 2016).

Optimism

Optimism about future life satisfaction has also shown salubrious effects. Similar to present life satisfaction, optimism refers to a person's expectation that good things will generally happen more so than bad things. Optimism is negatively related to depression and suicidality (Yu, 2013), and positively related to numerous mental and physical health outcomes, including adjustment to stressful life events, contentment (Jambheshwar & Haryana, 2009), quality of life (Carr & Alan, 2004), and perceived social support (Brissette, Carver, & Scheier, 2002). Optimism also positively correlates with positive affect (Carver, Schier, & Segerstrom, 2010),

extensive and supportive social networks (Brissette, Carver, & Scheier, 2002), and motivation, effort, and engagement with one's goals, especially in the face of difficulty (Carver & Scheier, 1998).

Purpose of the Study

In this study, we sought to identify how care farming effects veterans' perceived life satisfaction, optimism, and loneliness. We asked the following questions:

- Does care farming increase veterans' perceived life satisfaction?
- Does care farming decrease veterans' perceived loneliness?
- Does care farming increase veterans' optimism about future life satisfaction?
- Is there a relationship between veterans' presenting symptoms of PTSD and depression and their response to care farming?

We hypothesized that care farming would (a) increase perceived life satisfaction, (b) increase optimism about future life satisfaction, and (c) decrease perceived loneliness. Additionally, we expected presenting PTSD and depression symptoms to negatively covary with care farming's effects—that is, as presenting symptoms increased, changes attributable to farming decreased.

Method

Participants and Placement

Five veterans of foreign wars (4 male, 1 female) living in Washington state participated in exchange for $250 gift cards. Their ages ranged from 21 to 60. Ethnicity was not recorded. Participants were recruited from a veterans' care farm in northwestern Washington. When they first contacted the farm, participants were told of the study and asked to join. Access to the farm was not contingent on study participation. Study participants were required to have served in a

branch of the U.S. military and own a smartphone with six megabytes of available data each month. Participants were also required to visit the care farm once a week for eight consecutive weeks and, during this time, respond to at least five push notifications per week. Interested and qualified participants were emailed an informed consent form and links for downloading a data collection app from iTunes or Google Play.

Design

To evaluate data collected from the app, we used a nonconcurrent multiple baseline design. A multiple baseline design repeatedly measures a dependent variable (DV) at different points in time from multiple participants before and after the start of an intervention (Richards, Taylor, & Ramasamy, 2013). Participants' starting times are staggered to allow researchers to conclude that changes in DVs are due to the intervention rather than chance factors. A multiple baseline design may be conceptualized as a series of independent, staggered AB time-series designs for which A indicates pre-treatment measures of the DV and B indicates post-treatment measures. The value of this method is that it does not require a minimum number of participants or inferential statistical analysis to make causal inferences. Analysis occurs instead through visual inspection of data (Gast, 2010; Richards, Taylor, & Ramasamy, 2013).

After installing the app on their phones, participants received a one-time push notification requesting they complete both the Beck Depression and PTL-5 inventories. The next day they began receiving daily push notifications at random times between 9AM and 7PM. Daily notifications consisted of five questions from three scales measuring loneliness, present well-being, and future well-being. Unopened daily notifications remained on participants' phones for 1-hour, after which they were automatically removed. Participant responses were recorded electronically through the app and stored on a secure, password protected online platform. To

ensure confidentiality, each participant was assigned a de-identified numerical code to which their responses were paired for the duration of the study.

After participants responded to at least three daily push notifications, they were invited to the farm. Push notifications continued thereafter for eight weeks. Responses before attending the farm functioned as a participant's baseline measure, whereas those received after their first visit functioned as their intervention measure. Consistent with single-case design methodology, preintervention data served as a control against which postintervention data were compared (Kratochwill et al., 2010). Participants were allowed to join the study at any time, making it a nonconcurrent (delayed) multiple baseline design (Gast, Lloyd, & Ledford, 2014) rather than a traditional multiple baseline design that requires concurrent baselines. To avoid preventing access to the farm, there was no specified timeline for acquiring baseline data. However, a minimum of three baseline data points were required for subsequent analysis. All participants met this criterion.

Materials

The app was designed using a third-party data collection app platform compatible with iOS and Android mobile operating systems. Its user interface was customized with the farm's logo and colors and an emergency contact number for a mental health professional. Scale and inventory items were entered manually using the app's online researcher portal. Items appeared individually on users' screens. Exposure to subsequent items was contingent on responding to an earlier item. All items featured touch-sensitive multiple choice response options.

Researchers have similarly used hand held electronic devices to record participants' perceptions in descriptive studies of various affective states and mental health indicators (Hektner, Schmidt, & Csikszentmihalyi, 2007). Two such popular methods are *experience*

sampling methods (ESM) and *ecological momentary assessments* (EMS). Recently, Csikszentmihalyi and Larson (2014) have reviewed the literature on ESMs and EMSs and argued for their reliability and validity when used to assess (a) frequency and patterning of daily activity; (b) frequency, intensity, and patterning of psychological states; and (c) frequency, patterning, and intensity of thoughts and thought disturbance.

The one-time push notification delivered at the start of the study featured 41 questions from two inventories. The Beck Depression Inventory is a 21-item questionnaire for assessing the severity of depression (see Beck, Steer, Ball, & Ranieri, 1996). It has been found reliable and valid (Arnau, Meagher, Norris, & Bramson, 2001). The post-traumatic stress disorder checklist for DSM-5 (PCL-5) is a 20-item questionnaire for assessing PTSD symptoms (see Weathers, Litz, Keane, Palmiere, Marx, & Schnurr, 2013). It, too, has been found reliable and valid (Bliese, Wright, Adler, Cabrera, Castrol, & Hoge, 2008; Harrington & Newman, 2007).

The daily push notification delivered throughout the study featured two inventories. The Cantril Self-Anchoring Striving Scale used by Gallop to assess global wellbeing (Harter & Gurley, 2008) is a two-item instrument for measuring perceived present and future life satisfaction (see Cantril, 1965). It has been found reliable and valid (Beckie & Hayduk, 1997; McIntosh, 2001). The Loneliness scale is a three-item instrument for measuring participants' perceived loneliness (see Hughes, Waite, Hawkely, & Cacioppo, 2004). It, too, has been found sufficiently reliable and valid (Hughes, Waiter, Hawkely, and Cacioppo, 2004).

Analysis

Data were analyzed graphically and statistically. For visual analysis, data were first organized by participant, time, and outcome. An x-y graph was created for each participant with the dependent variable of interest on the y-axis and the passage of time on the x-axis. Data

points were then plotted and a vertical phase change line overlaid indicating the introduction of the farming intervention. To illustrate data paths, lines connected data points. Each participant's x-y graph was stacked on one another's so that units of time aligned. Staggered phase change lines illustrated how farming began at different times across participants.

To visually analyze farming's effect, we sought immediate and overall changes in data paths across phases. Consistent with traditional approaches to single-case data analysis, we first visually inspected data for changes in two measures: level and trend (Richards et al., 2013). Level refers to a data path's general vertical position, whereas trend refers to the general direction of the data path within a phase. We refer to changes in these measures across phases as phase change and slope change, respectively. To augment visual analysis, descriptive data for each phase's central tendency (mean), variation (standard deviation), and change (percent change) were calculated.

Following visual analysis, data were analyzed using inferential statistics. Kazdin (2010) has argued this is often needed when researchers fail to establish stable baselines, when visual analysis fails to reveal weak effects, and when research environments prevent tight controls. We determined a priori such concerns were likely in a naturalistic setting, and decided to couple inferential statistics with each graphical representation of data.

To analyze data statistically, Huitema's (2011) strategy for time-series regression was used. Each participant's data for a single dependent variable were analyzed independently. Because data were drawn from a single participant and were susceptible to autocorrelation, *t*-tests were not used. Instead, a model was created using three predictor variables: time (T), phase (D), and slope change (SC). Their associated parameters represented baseline trend, level change between phases, and trend change between phases, respectively. A second model with

only the phase predictor (D) was then constructed, and a model comparison test was conducted to determine which of these models best described the data.

Using the best fitting model, a Durbin-Watson test was then conducted to determine if the assumption of independent errors was met. If so, the select model was used and the statistical analysis complete. If, however, the Durbin-Watson test indicated autocorrelation, an analysis of unstandardized residuals and time was conducted to verify an autoregressive 1 (AR1) process with lag-1 autocorrelation. The select model was then adjusted to include a lag-1 autocorrelation coefficient using the Cochrane-Orcutt procedure. A Durbin-Watson test was again conducted to ensure corrected autocorrelation, after which the statistical analysis was complete.

Results

Loneliness

The results of the nonconcurrent multiple baseline analysis for loneliness with veterans are presented in Figure 1. [Insert Figure 1 here] Data points represent repeated self-report loneliness scores obtained through the data collection app. Vertical phase change lines indicate the onset of care farming. Of the five participants, P1, P2, P3, and P4 had lower mean loneliness scores during the farming intervention than before the intervention (see Table 1). [Insert Table 1 here] Downtrends following the onset of farming were noticeable in P2, P3, and P4. High response variation in P1 during baseline and intervention phases prevented visual interpretation. For P5, stable responses across phases indicated no change.

Statistical analysis confirmed two of five participants had changes in level or trend across phases. For P1, a model comparison test showed a four parameter model with phase change and slope change parameters was no better fit than a two parameter model with a phase change parameter, $R^2\Delta = 0.011$, $F(1, 39) = 0.231$, $p = .795$. The two parameter model, however, failed to

predict loneliness, $R^2 = .022$, $F(1, 48) = 0.916$, $p = .344$. The data met the assumption of independent errors ($d = 2.182$). Phase change was not significant ($b = -0.600$, $t(42) = -0.957$, $p = .344$), suggesting the level of perceived loneliness did not change across phases.

For P2, a model comparison test showed a three parameter model with phase change and slope change parameters was a better fit than a two parameter model with a phase change parameter, $R^2\Delta = .36$, $F(1, 45) = 35.01$, $p < .01$. Given P2's short baseline ($n = 3$), a baseline slope parameter was not included in the second model per Huitema's (2011) recommendations. The three parameter model significantly predicted loneliness, $R^2 = .54$, $F(2, 45) = 26.31$, $p < .01$. The data met the assumption of independent errors ($d = 2.11$). Slope change was significant ($b = -0.07$, $t(45) = -5.92$, $p < .01$), suggesting the trend of perceived loneliness changed across phases. Importantly, the baseline trend was assumed zero because of the short baseline.

For P3, a model comparison test showed a four predictor model with phase change and slope change parameters was no better fit than a two parameter model with a phase change parameter, $R^2\Delta = 0.05$, $F(1, 46) = 1.79$, $p = 0.18$. The phase change model significantly predicted loneliness, $R^2 = .26$, $F(1, 48) = 16.7$, $p = .000$. The data did not meet the assumption of independent errors ($d = 1.29$), so the Cochrane-Orcutt procedure was implemented. The revised model was corrected for autocorrelation ($d = 1.83$) and again predicted loneliness, $R^2 = .17$, $F(1, 46) = 9.44$, $p < .01$. Phase change was significant ($b = -1.43$, $t(46) = -3.07$, p = .004), suggesting the level of perceived loneliness decreased in the treatment phase.

For P4, a model comparison test showed a four predictor model with phase change and slope change parameters was no better fit than a two parameter model with a phase change parameter, $R^2\Delta = .10$, $F(1, 45) = 2.714$, $p = 0.077$. The phase change model significantly predicted loneliness, $R^2 = .084$, $F(1, 47) = 4.326$, $p = .043$. The data did not meet the assumption

of independent errors (d = 1.29), so the Cochrane-Orcutt procedure was implemented. The revised model was corrected for autocorrelation (d = 1.99), but did not predict loneliness, R^2 = .04, $F(1, 45) = 1.95$, $p > .05$. Phase change was not significant (b = -1.43, t (47) = -1.40, p = .17), suggesting the level of perceived loneliness did not change across phases.

For P5, a model comparison test showed a four predictor model with phase change and slope change parameters was no better fit than a two parameter model with a phase change predictor, $R^2\Delta$ =.00, $F(2, 45) = 0.01$, p = .99. The phase change model did not predict loneliness, R^2 = .00, $F(1, 47) = 0.18$, p = .67. The data met the assumption of independent errors (d = 2.1). Phase change was not significant (b = 0.09, $t(47) = 0.43$, p = .67), suggesting the level of perceived loneliness did not change across phases.

Using participants' mean loneliness change scores (see Table 1), two bivariate correlational analyses were then conducted to determine the relationship between participants' presenting symptoms of post-traumatic stress disorder (PTSD) and depression and their response to care farming. There was no relationship between mean loneliness change score and presenting PTSD symptoms, r = -.38, p = .53, or depression symptoms, r = -.50, p = .39. This suggests presenting symptom severity was unrelated to how farming affected a participant's perceived loneliness.

Present Life Satisfaction

The results of the nonconcurrent multiple baseline analysis for present life satisfaction with veterans are presented in Figure 2. [Insert Figure 2 here] Of the five participants, P2, P3, P4, and P5 had higher mean present life satisfaction scores during the farming intervention than before the intervention (see Table 2). [Insert Table 2 here] Uptrends following the onset of farming were noticeable for P2, P3, and P5. There appeared no change across phases for P1 or

P4. Again, P1 showed high response variation, twice reporting floor and ceiling scores on closely adjacent responses. Similarly, the upward trend of P4's baseline mirrored later trends in the treatment phase following periods of nonresponding. This cyclical variability prevented us from visually interpreting these data.

Statistical analysis confirmed three of five participants had changes in level or trend across phases. For P1, a model comparison test showed a four parameter model with phase change and slope change parameters was a better fit than a two parameter model with a phase change parameter, $R^2\Delta = .18$, $F(2, 39) = 4.20$, $p = .02$. The four parameter model significantly predicted present life satisfaction, $R^2 = 2.91$, $F(3, 39) = 2.911$, $p = .046$. The data met the assumption of independent errors ($d = 1.87$). Phase change was not significant ($b = 3.34$, $t(40) = 1.49$, $p = .14$), suggesting the level of perceived loneliness did not change across phases. Slope change was also not significant ($b = 0.60$, $t(40) = -1.03$, $p = .31$), suggesting the trend of perceived present life satisfaction did not change across phases.

For P2, a model comparison test showed a three parameter model with phase change and slope change parameters was a better fit than a two parameter model with a phase change parameter, $R^2\Delta = .55$, $F(1, 45) = 90.67$, $p < .01$. The three parameter model significantly predicted present life satisfaction, $R^2 = .73$, $F(2, 45) = 59.74$, $p < .01$. The data met the assumption of independent errors ($d = 2.06$). Slope change was significant ($b = 0.05$, $t(45) = 9.52$, $p < .01$), suggesting the trend of perceived present life satisfaction changed across phases.

For P3, a model comparison test showed a four parameter model with phase change and slope change parameters was no better fit than a two parameter model with a phase change parameter, $R^2\Delta = 0.03$, $F(1,48) = 0.81$, $p = .43$. The phase change model significantly predicted present well-being, $R^2 = .274$, $F(1, 47) = 18.12$, $p = < .001$. The data met the assumption of

independent errors (d = 1.68). Phase change was significant (b = 0.551, t(47)= 4.26, p < .001), suggesting the level of perceived present well-being changed across phases.

For P4, a model comparison test that a four parameter model with phase change and slope change parameters was no better fit than a two parameter model with a phase change predictor, $R^2\Delta$ = 0.085, F(2, 45) = 2.089, p = 0.136. The phase change model did not significantly predict present well-being, R^2 = .003, F(1, 47) = 0.153, p = .697. The data did not meet the assumption of independent errors (d = 1.01), so the Cochrane-Orcutt procedure was implemented. The revised model was corrected for autocorrelation (d = 1.89), but did not predict present well-being, R^2 = .01, F(1, 45) = 0.39, p > .05. Phase change was not significant (b = -0.30, t (47) = -0.63, p = .53), suggesting the level of perceived present well-being did not change across phases.

For P5, a model comparison test showed that a four parameters model with phase change and slope change factor was no better fit than a two predictor model with a phase change parameter, $R^2\Delta$ =0.028, F(2, 45) = 0.776, p = .466. The phase change model significantly predicted present well-being, R^2 = .155, F(1, 47) = 8.629, p = .005. The data met the assumption of independent errors (d = 1.67). Phase change was significant (b = 0.55, t(47)= 4.26, p < .001), suggesting the level of perceived present well-being changed across phases.

Using participants' mean present life satisfaction change scores (see Table 2), two bivariate correlational analyses were conducted to determine the relationship between participants' presenting symptoms of PTSD and depression and their response to care farming. There was no relationship between mean present life satisfaction change score and presenting PTSD symptoms, r = -.09, p = .88, or depression symptoms, r = -.07, p = .91. This suggests presenting symptom severity was unrelated to how farming affected a participant's perceived present life satisfaction.

Optimism About Future Life Satisfaction

The results of the nonconcurrent multiple baseline analysis for optimism about future life satisfaction with veterans are presented in Figure 3. [Insert Figure 3 here] Of the five participants, P1, P2, and P3 had higher mean optimism scores during the farming intervention than before the intervention (see Table 3). [Insert Table 3 here] An uptrend following the onset of farming was noticeable for P2, as well as an increased level for P3. Again, high variability prevented visual interpretation of P1's data. Interestingly, a downtrend after farming was noticeable for P4, and P5 showed possible ceiling effects with no variation across phases.

Statistical analysis confirmed two of five participants had changes in level or trend across phases. For P1, a model comparison test showed a four parameter model with phase change and slope change parameters was a better fit than a two parameter model with a phase change parameter, $R^2\Delta = 0.18$, $F(2, 39) = 4.24$, $p = .02$. The four parameter model significantly predicted optimism, $R^2 = .183$, $F(3, 39) = 2.91$, $p = .046$. The data met the assumption of independent errors ($d = 1.87$). Phase change was not significant ($b = 3.35$, $t(40) = 1.49$, $p = .14$), suggesting the level of optimism did not change across phases. Slope change was also not significant ($b = 0.60$, $t(40) = 1.03$, $p = .31$), suggesting the trend of optimism did not change across phases.

For P2, a model comparison test showed a three parameter model with phase change and slope change parameters was a better fit than a two parameter model with a phase change parameter, $R^2\Delta = .50$, $F(1, 45) = 88.9$, $p < .01$. The three parameter model significantly predicted optimism, $R^2 = .75$, $F(2, 45) = 66.39$, $p < .01$. The data met the assumption of independent errors ($d = 1.82$). Slope change was significant ($b = 0.03$, $t(45) = 9.43$, $p < .01$), suggesting the trend of

optimism changed across phases. Phase change was also significant (b = 0.47, $t(45)$ = 2.42, p = .02), suggestion the level of optimism increased across phases.

For P3, a model comparison test showed a four parameter model with phase change and slope change parameters was a better fit than a two parameter model with a phase change parameter, $R^2\Delta$ = 0.08, $F(2, 46)$ = 3.39, p = .04. The phase change and slope change model significantly predicted optimism, R^2 = .43, $F(3, 46)$ = 11.5, p = < .01. The data met the assumption of independent errors (d = 1.94). Phase change was significant (b = 0.86, $t(47)$= 3.97, p < .01), suggesting the level of optimism increased across phases. Slope change was also significant (b = 0.48, $t(47)$= 2.60, p = .01), suggesting the trend of optimism changed across phases.

For P4, a model comparison showed that a four parameter model with phase change and slope change parameters was a better fit than a two parameter model with a phase change predictor, $R^2\Delta$ = 0.16, $F(2, 45)$ = 6.74, p = .04. The phase change and slope change model significantly predicted optimism, R^2 = .46, $F(3, 45)$ = 12.76, p < .01. The data met the assumption of independent errors (d = 1.63). Phase change was significant (b = -1.03, t (47) = -3.00, p < .01), suggesting the level of optimism decreased across phases. Slope change was also significant (b = -0.15, t (47) = -2.14, p = .04), suggesting the trend of perceived future well-being changed across phases.

For P5, statistical analysis was unnecessary as scores remained constant across phases. Using participants' mean future well-being change scores (see Table 3), two bivariate correlational analyses were conducted to determine the relationship between participants' presenting symptoms of PTSD and depression and their response to care farming. No relationship was found between mean optimism change score and presenting depression

symptoms, $r = .69$, $p = .19$, although the correlation coefficient was large. There was, however, a relationship between mean optimism change score and presenting PTSD symptoms, $r = .87$, $p = .04$, suggesting that those with higher presenting PTSD scores demonstrated larger changes in optimism after beginning farming.

Discussion

We set out to empirically document changes in veterans' emotional and social well-being as a result of care farming. Our findings show that participating in care farming can improve veterans' life satisfaction, optimism, and perceived loneliness. Importantly, we discuss these findings and their external validity as we would those of a preliminary study comparing group means. Kazdin (2010) has argued that there is no clear evidence showing findings from between-group experiments or quasi-experiments are any more generalizable than those from single-case studies. This is likely because (a) comparing means across groups prevents us from identifying individuals who demonstrated change or determining if their change was practically significant; (b) comparing samples composed of diverse people does not necessarily mean there are enough of those people to represent a particular group; (c) randomly assigning people to groups is not randomly sampling people from a population; and (d) using specific inclusion and exclusion group criteria limits a sample's representativeness and does not aid or further generalization. Additionally, the process required to generalize findings is largely the same in SCRDs and group-designs: replication (Kazdin, 2010; Morgan & Morgan, 2009). We therefore take care to not overly generalize these findings due to their inchoate nature rather than overriding methodology.

The results of this study fit into larger efforts to find treatments that not only heal veterans' psychological wounds but appeal to them. Veterans too often forego mental health

care because they struggle with lengthy VA delays and stigmas arising from their "warrior culture." But an even greater barrier may be a dearth of treatments that veterans actually prefer. When professionals ask veterans to match their needs to existing offerings and "best practices," some veterans expectedly choose to avoid care and suffer unnecessarily from treatable forms of mental illness. New empirically sound avenues that veterans find helpful and enjoyable are greatly needed.

Prior to this study, findings supporting care farming with veterans have been largely anecdotal. Hundreds of veterans have reported that farming activities with other veterans have profoundly affected their sense of well-being and hope and allowed them to reconnect with people after time in relative isolation. When we first met veterans at the care farm in 2014, we heard from many that time at the farm had helped them heal from combat trauma. We observed a close-knit community of veterans choosing to farm, often in inclement weather, because for the first time since their discharge they felt a part of something important. Their lives had purpose and structure again, two things the military once provided but were now desperately missed.

Changes in Perception of Life Satisfaction

A principle finding of our study was improved life satisfaction. Three of five (60%) participants showed statistically significant improvement in their present well-being after farming. Because there are currently no published studies of care farming as a wellness approach for veterans, our results cannot be fit into a broader research program. However, these results do align with growing evidence showing a relationship between regular contact with the natural environment and enhanced physical health and mental well-being (Greenleaf, Bryant, & Pollock, 2013; Hine, Peacock, & Pretty, 2008). The emerging message from this research is that contact with nature improves psychological health by reducing stress levels, enhancing mood

and self-esteem, and offering a 'restorative environment' as a protectant from future stresses. A restorative environment is one that promotes recovery from attention fatigue by allowing people to escape customary roles and distance themselves from the stressors of daily life. Our findings suggest that care farms may represent a restorative environment for some veterans.

Some veterans in our study, however, did not experience these results. This suggests other factors may be moderating the relationship between care farming and life satisfaction, or influencing life satisfaction independently. The influence of stressful environmental events related to such things as money, work, and relationships may have prevented or decreased gains to life satisfaction. Because life satisfaction is a gestalt assessment of life's overall quality, direction, and composition of positive and negative emotions, life events beyond this study's reach likely influenced the outcome. Research has shown that extratherapeutic factors account for the largest proportion of variance in therapeutic change (Duncan & Miller, 1999). Future research should attempt to identify such experiences among farm participants to see how they relate to life satisfaction. The success rate observed in this study, however, is similar to other treatments for enhancing emotional well-being, such as cognitive behavioral therapy (CBT), acceptance and commitment therapy (Ruiz, 2010), positive psychology interventions (Sin & Lyubomirsky, 2009), and mindfulness techniques (Khoury et al., 2013).

Symptom Severity and Present Life Satisfaction

We additionally hypothesized that veterans' presenting symptoms of PTSD and depression would negatively covary with gains in present life satisfaction. Our findings did not support this hypothesis. Symptom severity was unrelated to farming's effect on present well-being. Whether veterans entered the treatment phase with high, medium, or low symptomology was inconsequential to changes in present life satisfaction. This suggests that veterans with

varying symptomology may benefit equally from care farming. Currently, we are conducting additional research to better understand the relationship between care farming and PTSD and depression symptoms.

Changes in Optimism

Another of our findings was improved optimism. Two of five participants (40%) showed increased optimism after beginning farming. Like present life satisfaction, optimism about future life satisfaction is a form of hedonic or emotional well-being (Diener, 2009; Keyes, 2006). Researchers have shown that emotional well-being may be improved through interacting with nature (Kahn, Severson, & Ruckert, 2009; Mayer, Frantz, Bruehlman-Senecal, & Dolliver, 2009; McMahan & Estes, 2015), but to this point little research exists showing nature's effect on optimism. Malouff and Schutte (2016) meta analyzed the current literature and found a medium effect size (d = .44) for interventions targeting optimism. Although we were unable to calculate effect size statistics for mean differences (e.g., Cohen' d), the mean Pearson's correlation coefficient derived from each participant's coefficient of determination (R^2), suggests a large overall effect, r = 0.60. Additional studies are needed, but initially it appears care farming is similarly effective to other approaches targeting optimism.

Although findings were significant, fewer participants showed gains in optimism than present life satisfaction. This may be due to optimism's dispositional quality. Optimism is a "hopeful disposition" about the future. Tiger (1979) has argued that optimism is a mood or attitude associated with expecting a socially desirable, advantageous, and pleasurable future. Within this idea are two constructs: mood and attitude. Mood has been defined as "a mild, usually transient, emotional state" or "a predisposition or receptivity toward an emotional reaction" (Corsini, 1999, p. 607), whereas attitude has been described as "a relatively stable

predisposition to react in a specific way to something" (p. 76). If optimism possesses such stable properties, it could be more difficult to change. Future research should explore whether longer periods of time care farming will produce effects similar to those on perceived present life satisfaction.

Symptom Severity and Optimism

We hypothesized that veterans' presenting symptoms of PTSD and depression would negatively covary with gains in optimism. Although we did not see this relationship with presenting depression symptoms, the correlation was large (r = .69). We did, however, find that participants with higher presenting PTSD scores showed larger changes in optimism. We suggest a testable explanation for this finding involving negative correlations between optimism and symptomology. Veterans' symptoms of PTSD and depression may have lessened due to care farming, and consequently their optimism increased. Veterans with higher presenting symptomology, then, saw larger gains in optimism because they were able to experience larger reductions in symptomology. Research has shown that optimism is strongly correlated with adaptive coping skills (Scheier, Weintraub, Jagdish, & Carver, 1986) across a variety of stressful situations (Carver, Scheier, & Segerstrom, 2010). Why symptoms covaried with veterans' optimism and not current life satisfaction is puzzling. An alternative explanation, perhaps better explored through qualitative research, is that participants' symptoms were severe enough to overwhelm positive changes to their current life satisfaction but that spending time at the care farm gave them the sense that their lives will eventually improve. Metaphorically, one might say that though they are still in the tunnel, a light has for the first time appeared at its end.

Changes in Perception of Loneliness

Another of our findings was reduced loneliness. Two of five participants (40%) showed decreased or decreasing loneliness after beginning farming. As noted earlier, veterans often feel experiential loneliness despite the presence of people who care. They may struggle to relate to civilians whom they perceive as not understanding their combat experiences. When this happens loneliness can produce deleterious effects on cognition and behavior (Cacioppo & Hawkley, 2005) and cyclically increase the likelihood of chronic loneliness (Cacioppo & Hawkley, 2009). Interventions to reduce chronic loneliness in the veteran population are crucial to addressing underlying risk factors for many mental and physical health problems (Danese et al., 2009). We see care farming as a way of giving veterans opportunities to build relationships with others of similar backgrounds, thus improving their sense of social connection and decreasing their perceived loneliness.

These findings suggest that care farming may reduce loneliness more so than other interventions. Generally, therapeutic efforts to reduce loneliness have been found largely ineffective. Masi, Chen, Hawkley, and Cacioppo (2013) meta analyzed the literature on loneliness reduction interventions and found a mean effect size of $d = -0.198$ for randomized group comparison studies. This falls below the fifteenth percentile of Lipsey & Wilson's (2001) summation of over 300 social and behavioral science meta-analyses. "Loneliness interventions, to date, have not attained the degree of efficacy achieved by interventions targeting other social and behavioral outcomes" (Masi, Chen, Hawkley, & Cacioppo, 2013, p. 24). More research is needed therefore to understand veterans' qualitative experiences at the farm and why some felt less lonely as a result of their time there.

Simply providing veterans with social support and opportunities for social interaction is likely not enough to reduce all participants' loneliness. The causes of peoples' loneliness are

unique. Care farming does, however, appear promising in this area. Identifying specific elements of the farming experience that improved loneliness for some may prove valuable in better understanding its effect.

Conclusion

There are approximately twenty veteran care farms in the United States. Though they vary by organizational structure and focus, they share a mission to support veterans in their rehabilitation from the psychological wounds inflicted while in service. This study empirically supports their efforts. More research, though, is needed to substantiate and build upon our findings. We believe that if these efforts continue to support care farming's therapeutic value, there is an opportunity for veteran care farms in nearly every community in the United States. Europe has already provided a working model. There, hundreds of small, for-profit farms have cooperated with local and national agencies to give people an opportunity to work on a farm to improve their well-being. Thousands of small farms exist in the United States—in small and large cities, and rural and urban environments—that could partner with public and private sector organizations to provide veterans a restorative environment to heal. The question of how to help returning veterans lead healthy and productive lives has not yet been answered, and it will likely not be answered by current approaches alone. Alternative approaches like care farming may help us better understand the question and meet the needs of those who deserve our best efforts.

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Table 1

Means, Standard Deviations, and Percent Changes of Loneliness for Baseline and Intervention Phases

	Phase A		Phase B		% Change
Participant	*M*	*SD*	*M*	*SD*	$\Delta M * 100$
P1	14.6	0.89	14.0	1.36	-4.1%
P2	11.7	0.58	9.2	1.30	-20.8%
P3	10.7	0.10	9.4	1.12	-12.3%
P4	9.0	0.00	7.9	1.44	-12.7%
P5	6.0	0.00	6.1	0.47	0.0%

Table 2

Means, Standard Deviations, and Percent Changes of Present Life Satisfaction for Baseline and Intervention Phases

	Phase A		Phase B		% Change
Participant	*M*	*SD*	*M*	*SD*	$\Delta M * 100$
P1	4.2	2.28	3.4	2.71	-14.3%
P2	4.0	1.00	5.6	0.84	35.0%
P3	7.2	0.39	7.7	0.45	6.9%
P4	8.4	0.79	8.6	0.74	1.4%
P5	8.2	0.45	8.8	0.45	7.3%

Table 3

Means, Standard Deviations, and Percent Changes of Optimism for Baseline and Intervention Phases

	Phase A		Phase B		% Change
Participant	*M*	*SD*	*M*	*SD*	$\Delta M * 100$
P1	2.8	0.84	3.6	2.11	28.6%
P2	8.3	0.58	9.5	0.51	14.2%
P3	8.4	0.49	8.9	0.29	6.0%
P4	9.7	0.49	8.9	0.45	-8.2%
P5	10.0	0.00	10.0	0.00	0.0%

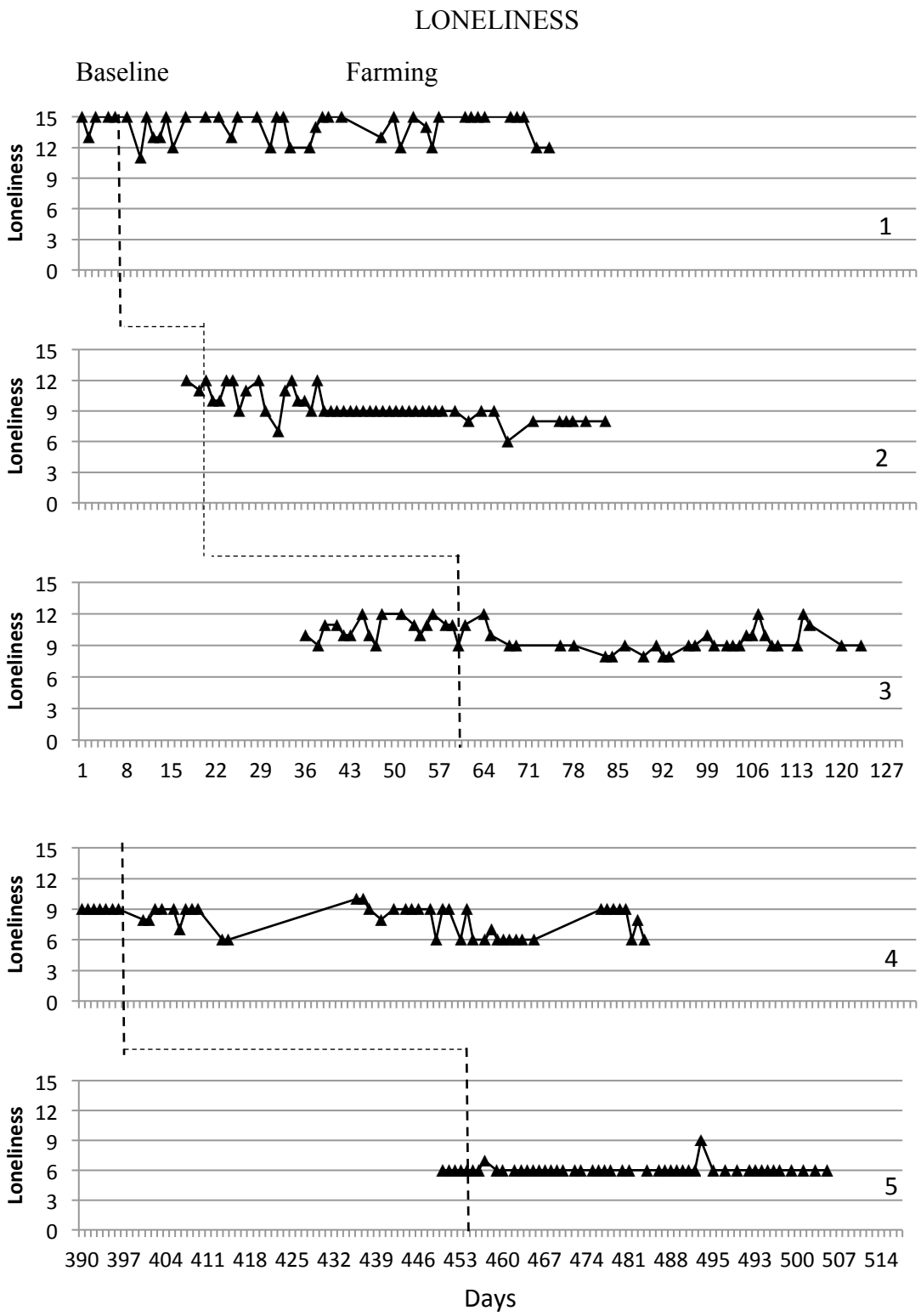

Figure 1. Participants' self-report of loneliness across baseline and farming intervention. A lag of 267 days occurred between participant 3's end date and participant 4's start date.

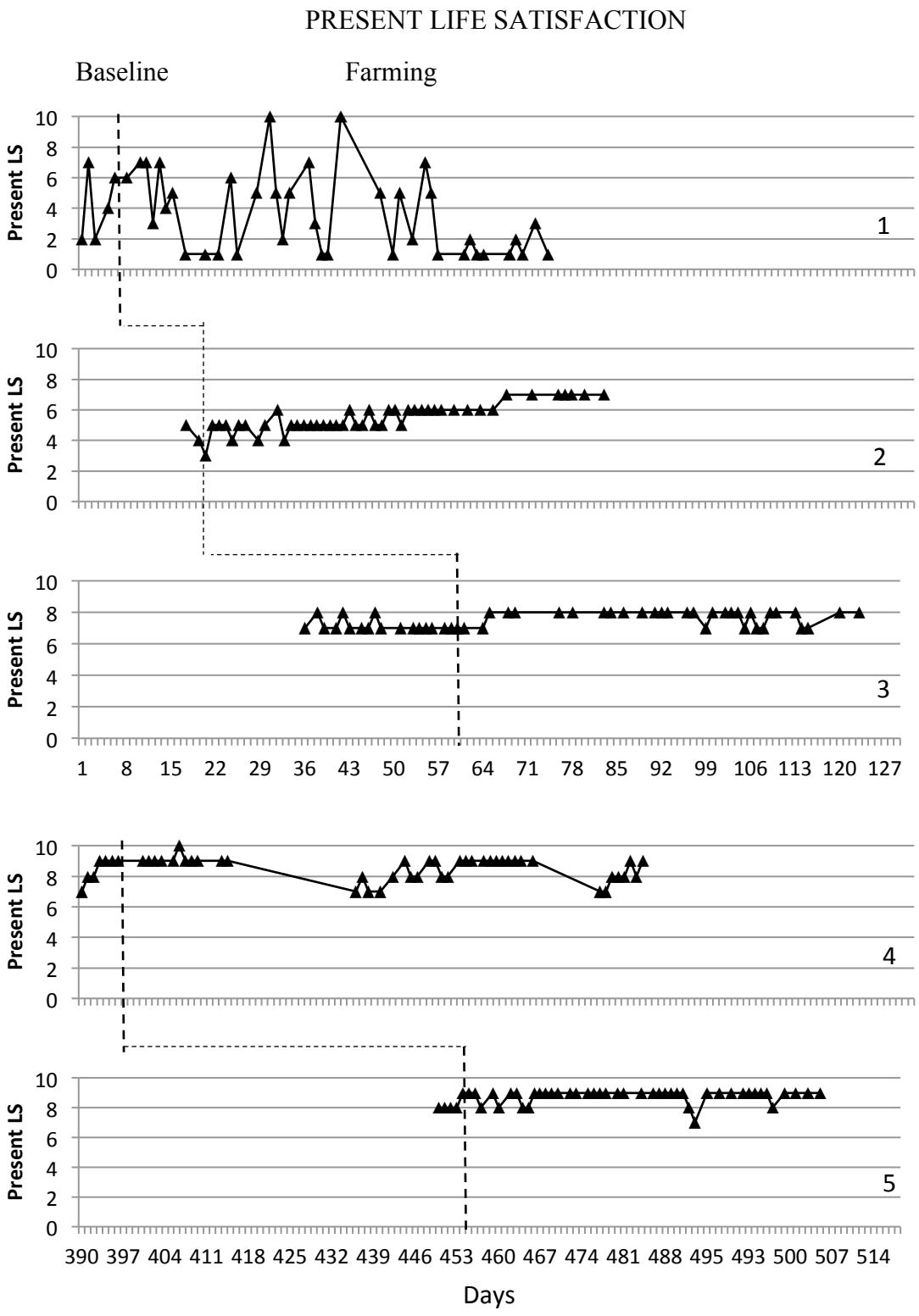

Figure 2. Participants' self-report of present life satisfaction (LS) across baseline and farming intervention. A lag of 267 days occurred between participant 3's end date and participant 4's start date.

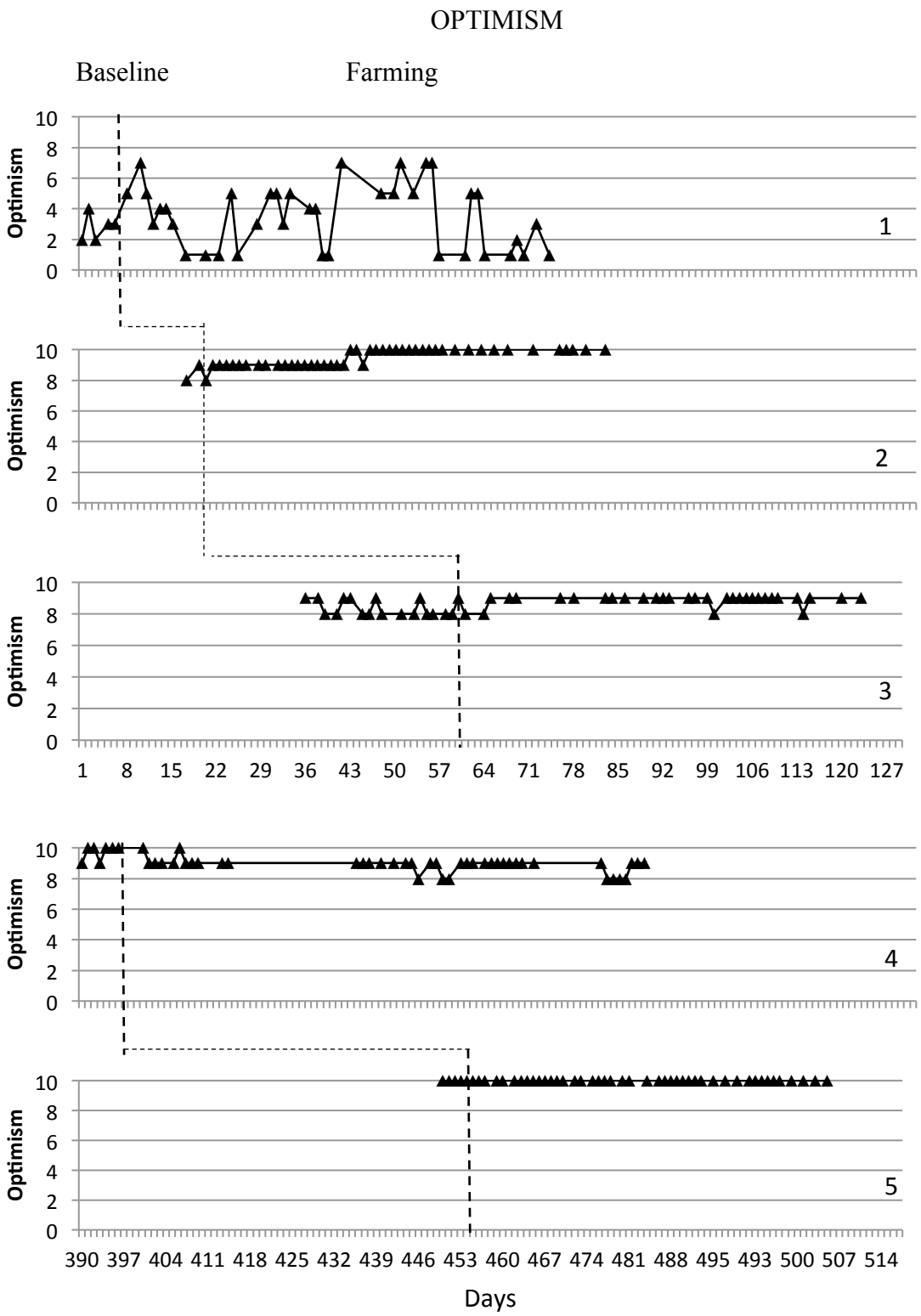

Figure 3. Participants' self-report of optimism across baseline and farming intervention. A lag of 267 days occurred between participant 3's end date and participant 4's start date.