

Running Head: Daily Diary Investigations of Self-Location

**Heads of Worry, Hearts of Joy:
Daily Diary Investigations of Self-Location and Well-Being**

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(https://osf.io/jxa8e/?view_only=deaa7c84a85447e0b157a4a9b5b85fd5).

Abstract

When people are asked to locate the self, they frequently choose the head and heart regions of the body. These bodily regions, in turn, are linked to an extensive set of metaphors, including those that conceptualize the heart as the locus of authenticity, love, and passion. Based on such considerations as well as frameworks within the self and well-being literatures, four samples of participants in three studies (total $N = 527$) were asked whether, on particular days, they perceived themselves to be located in their head regions of their bodies or their heart regions. When the self was perceived to be in the heart to a greater extent, participants reported higher levels of affective and eudaimonic well-being, as mediated by processes related to reward perception (Study 1), savoring (Study 2), and social activity (Study 3). In terms of daily experiences, the heart-located self is a happier self.

Keywords: Head, Heart, Conceptual Metaphor, Daily, Well-Being

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The self is clearly embodied in an important sense because it is typically perceived to exist in its body. But, perhaps surprisingly, this location seems to vary. Limanowski and Hecht (2011) asked participants to place spatial markers on a silhouette to reflect the location of their own selves. Some participants chose the head region to represent the self and some chose the heart region. Alsmith and Longo (2014) found similar results in a self-pointing task and Alsmith, Ferrè, and Longo (2017) found similar results in a subtle misalignment paradigm that asked participants to indicate whether a ball was located to the left or right of a figure whose head was tilted sideways. In the latter task, some participants favored a head-centric frame of reference and others favored a torso-centric frame of reference. Other studies suggest that the self can be perceived to be in both the head and torso regions (Hanley, Lecy, & Hanley, in press), that the heart is the most frequently-chosen location for the soul (Anglin, 2014), and that virtual reality paradigms can alter self-location, suggesting a degree of malleability to these perceptions (van der Veer, Alsmith, Longo, Wong, & Mohler, 2018).

The head and heart regions are interesting in part because these regions, in particular, have been linked to distinct attributes, values, and modes of processing since ancient Greece (Swan, 2009). Locating the self in one region or the other might therefore be associated with distinct modes of apprehending the self and its world. What we know about the correlates of self-location primarily derives from studies in which self-location has been treated as an individual difference variable. In a series of studies, Fetterman and Robinson (2013) found that head-locators (i.e., those who associated the self with the brain rather than the heart) described

themselves as more logical, favored rational thinking styles, and head-locators also obtained higher scores on a cognitive reflection test thought to capture system 2 processing (Frederick, 2005). Heart-locating individuals, by contrast, valued their emotions to a greater extent, favored experiential thinking styles, and responded to moral dilemmas in ways that suggested the use of deontological principles (i.e., one should not hurt another person even if doing so might benefit a larger number of people: Wojciszke, Parzuchowski, & Bocian, 2015). In another series of studies, Fetterman et al. (2020) found that heart-locators scored higher in several emotion-related traits (extraversion, neuroticism, and agreeableness) and they believed in God, which is thought to follow from intuitive modes of thinking (Shenhav, Rand, & Greene, 2012), to a greater extent.

By emphasizing individual differences, previous research has neglected the important point that the modes of processing that have been linked to self-location – such as reflection and reliance on feelings (Fetterman & Robinson, 2013) – almost certainly vary in within-person terms. For example, Kahneman (2011) suggests that people rely on system 1 (fast, intuitive) processing under many circumstances, but recruit system 2 (slower, more reflective) processing with respect to certain types of problems (e.g., math problems). Sjöberg (2003) makes the related point that people prefer to rely on intuitive processing when making certain types of decisions (e.g., concerning one's romantic life), but not others. Reliance on logic versus feelings can also be primed by suggesting that a particular way of making judgments (e.g., using logic) is likely to produce a more satisfactory outcome (Martel, Pennycook, & Rand, 2020). Locating the self in the head versus the heart could, potentially (Hanley et al., in press), exhibit a similar degree of within-person malleability and a major purpose of the present studies was to examine this possibility.

Previous research has also been silent on the question of whether self-locations matter for well-being, but there are reasons for thinking that relationships of this type may exist. Analyses of heart-related metaphors, within and across cultures, suggest that people link the heart, but not the head, to a mode of being that is spontaneous, authentic, and passionate (Afreh, 2015; Berendt & Tanita, 2011). To “follow one’s heart” suggests intrinsic motivation, for example, and intrinsic motivation, relative to extrinsic motivation, is more conducive to well-being (Sheldon, Arndt, & Houser-Marko, 2003). To “speak from one’s heart”, similarly, suggests that one is communicating deeply felt material, while sharing it in authentic manner. People have a sense of when they are acting authentically (Rivera et al., 2019) and doing so is also conducive to well-being (Rathi & Lee, 2021). People think of the heart as a communal entity – that is, it cares about others and seeks to connect with them (Niemeier, 2000) – and communal motives have been shown to predict the well-being of both one’s self and one’s interaction partners (Le, Impett, Lemay, Muise, & Tskhay, 2018). Finally, it is the heart, and not the head, that is perceived to be the container for joyous feelings (Niemeier, 1997).

Extracting from these analyses (Afreh, 2015; Berendt & Tanita, 2011; Niemeier, 1997, 2000) suggests the following. The heart is perceived to be the locus of authentic feelings and those feelings are primarily positive ones. When the person follows that which is in the heart, they are doing what they want to do rather than what they think they have to do (Werner & Milyavskaya, 2019), and they are living in accordance with some deeper self that operates intuitively (Maurer & Daukantaitė, 2020). They are open to their experiences rather than defensive (Rogers, 1963) and they are capable of appreciating the goodies (both social and non-social) that life has to offer (Jose, Lim, & Bryant, 2012). All of these are reasons for thinking that individuals should experience relatively high levels of well-being when they locate the self in the

heart. In further support of these ideas, Park and Peterson (2010) found that residents of cities emphasizing “heart” strengths (e.g., gratitude, hope, kindness) experienced greater positive affect and meaning than residents of cities low in these strengths.

The head, by contrast, solves problems in a relatively intellectual way (Niemeier, 2000) and people may sense themselves to be in the head primarily when some degree of cognitive effort is required (Kahneman, 2011). Having to use cognitive effort is not particularly conducive to happiness (Westbrook, Kester, & Braver, 2013) and this mode of processing may also be linked to mechanisms, such as rumination and worry, that tend to give rise to anxious feelings (McLaughlin, Borkovec, & Sibrava, 2007). The head is thought to operate better when it is rationally cool rather than emotionally warm (Niemeier, 2008) and some degree of emotional suppression (which undermines well-being: Rathi & Lee, 2021) might occur. In previous research, head-locators scored lower in interpersonal warmth (Fetterman & Robinson, 2013) and social connections may languish in head-located states. In sum, there are multiple reasons for thinking that people should experience higher levels of well-being when they locate themselves in the heart (versus the head) to a greater extent.

The empirical portion of the paper consists of four daily diary studies that examine possible relations between self-location and well-being. We have suggested that the heart is typically perceived to contain positive feelings (Niemeier, 1997) and self-locations in the heart should be associated with higher levels of daily positive affect. By contrast, we have suggested that the head is recruited to deal with effortful tasks (Alter, Oppenheimer, Epley, & Eyre, 2007), which should be associated with stress and negative affect (Kool & Botvinick, 2018). Beyond this focus on affective well-being (Jovanović, 2015), we entertained the possibility (in Studies 2 and 3) that self-locations favoring the heart would be more conducive to eudaimonic well-being,

defined as living in accordance with one's potential (Henderson & Knight, 2012). The heart is metaphorically linked to a type of motivation that is authentic and intrinsically motivated (Niemeier, 2000) and both authenticity (Hicks, Schlegel, & Newman, 2019) and intrinsic motivation (Ryan, Huta, & Deci, 2008) seem to facilitate eudaimonic goal pursuit (Werner & Milyavskaya, 2019). Self-locations favoring the heart could therefore be linked to both types of well-being.

In addition, and although not the central purpose of the studies, we attended to questions of mechanism. Because multiple mediators seemed possible (Fetterman et al., 2020; Niemeier, 2000), we focused on different possible mediators in particular studies. In Study 1, we focused on the possibility that the heart-located self perceives the environment to be more rewarding than the head-located self does, in turn explaining a portion of the variance linking self-locations to experiences of positive affect (Roseman & Smith, 2001). In Study 2, we focused on the related possibility that the heart-located self, because of its greater hedonic capacity (Niemeier, 2008), may be more capable of savoring positive events, in turn bolstering well-being (Jose et al., 2012). In Study 3, we focused on daily activities. Metaphors for the heart suggest its involvement in social and leisure activities (Afreh, 2015), which are often conducive to well-being (Helliwell & Wang, 2014; Kuykendall, Tay, & Ng, 2015). Although we will not pit these mediators against each other, the inclusion of possible mediators of diverse types should provide some insights into questions of mechanism.

A final purpose of Study 3 should be highlighted. In this protocol, we obtained morning and afternoon reports of self-location and the other measures. This allowed us to examine whether morning variations in self-location predict afternoon well-being and whether morning variations in well-being predict afternoon self-locations. Current thinking on metaphor-related

processes suggests that they operate in a bidirectional manner (Gibbs, 2019; Lee & Schwarz, 2012) and this led us to predict bidirectional associations.

Study 1

Method

Power-Related Considerations

Power estimation was based on simulation data for multilevel modeling studies (Nezlek, 2012). On the basis of their simulation data, Maas and Hox (2005) recommended at least 50 level 2 (in our case, participant) units and we sought to exceed this number. Other simulation data suggest that 100 participants (Ohly, Sonnentag, Niessen, & Zapf, 2010) or 900 observations (Scherbaum & Ferreter, 2009) would provide sufficient (.80) power to detect relationships in the medium-sized range, which were expected (Robinson, Irvin, Wu, & Fetterman, 2023). We sought to meet or exceed these benchmarks in all studies and power in detecting within-person relationships was estimated to be greater than .80 (Raudenbush & Liu, 2000; Scherbaum & Ferreter, 2009). Datasets for all studies can be found at https://osf.io/jxa8e/?view_only=deaa7c84a85447e0b157a4a9b5b85fd5.

Participants and General Procedures

Undergraduate students from a Midwestern University in the United States signed up for a “daily experiences study” using SONA software. They completed an initial demographic survey and then began a daily diary protocol that ran for 14 days in a row. At 5 p.m. on each day, participants received an email with subject number information and a link to a daily questionnaire, programmed with SurveyMonkey. They were given until 8 a.m. the next morning to complete each report or it was considered missing. Given the interest in within-person relationships, we retained data from participants who completed at least 9 of 14 daily surveys

(West, Ryu, Kwok, & Cham, 2011), which was an a priori criterion. In Study 1a and 1b, respectively, 15 and 10 individuals were dropped for failing to complete 9 surveys, which resulted in final sample sizes of 136 (68.38% female; 88.97% White; M age = 19.03; M reports = 12.71) and 137 (48.91% female; 89.05% White; M age = 19.36; M reports = 12.38).

Daily Measures

Daily surveys were identical in Studies 1a and 1b and included a number of measures (e.g., somatic symptom reports, impulsive behavior) not pertinent to the current focus on affective well-being. Late in the survey, but presented first for the sake of conceptual clarity, was a self-location item modeled on Fetterman and Robinson (2013). Participants were asked which body part they most closely associated the self with on a given day, with options ranging from 1 (head) to 4 (heart). Across days, the average self-location score was 2.42 in Study 1a and 2.39 in Study 1b, suggesting somewhat equal levels of head and heart infusion. Standard deviations were 1.07 and 1.08, however, indicating a flux in perceived self-location across days.

Affective well-being was assessed in the form of daily experiences of positive and negative affect (Diener et al., 2010). Participants were asked to indicate the extent to which (1 = not at all; 4 = very much) they felt “excited” and “enthusiastic” on a given day, with markers taken from the PANAS PA scale (Watson, Clark, & Tellegen, 1988), and an average daily PA score was computed (Study 1a: $M = 2.60$; $SD = 0.91$; $\alpha = .92$; Study 1b: $M = 2.58$; $SD = 0.88$; $\alpha = .92$). Participants were also asked to indicate the extent to which they felt “distressed” and “nervous”, with markers taken from the PANAS NA scale (Watson et al., 1988), and an average daily NA score was also computed (Study 1a: $M = 1.87$; $SD = 0.80$; $\alpha = .65$; Study 1b: $M = 1.66$; $SD = 0.71$; $\alpha = .55$).

The heart, relative to the head, is frequently perceived to be more capable of appreciating the rewarding aspects of one's experiences (Niemeier, 1997; Zeng, Wang, Oei, & Leung, 2019). To examine appraisal processes of this type, we asked participants to indicate whether (1 = strongly disagree; 5 = strongly agree) they "viewed events as rewarding today" (Study 1a: $M = 2.69$; $SD = 0.89$; Study 1b: $M = 2.64$; $SD = 0.88$). For comparison purposes, and because the heart is perceived to be hedonically sensitive, potentially to threat as well as reward (Niemeier, 2008), we additionally asked participants whether they "viewed events as threatening today" (Study 1a: $M = 1.44$; $SD = 0.55$; Study 1b: $M = 1.35$; $SD = 0.67$). To the extent that locations in the heart are linked to higher levels of well-being, they may be linked to appraisals of reward but not threat.

In dual process terms, individuals are likely to locate the self in the heart when circumstances are benign and/or when such circumstances encourage experiential processing, which favors affect and intuition rather than logic and cognitive effort (Epstein, 2003). Many similar models have suggested that rational processing, which is metaphorically linked to the head (Niemeier, 2008), is recruited when there are problems and/or cognitive stressors to deal with (Alter et al., 2007). To examine possible relationships of this type, we asked participants whether (1 = not at all true today; 5 = very much true today) particular days were ones associated with cognitive stressors (deadlines, obligations, responsibilities), using a daily stressor scale that has been used in many previous studies (e.g., Compton et al., 2008). The average day was not very stressful (Study 1a: $M = 2.16$; $SD = 0.90$; $\alpha = .88$; Study 1b: $M = 1.84$; $SD = 0.75$; $\alpha = .84$), but more stressful days were hypothesized to shift self-locations in a head-favoring direction.

Results

How Malleable Are Self-Locations?

To speak to the malleability of self-locations, we computed intraclass correlation coefficients (ICCs), which quantify the extent to which variance in a repeated measure can be attributed to stable between-person differences (West et al., 2011). Only about 30% of the measure could be attributed to individual differences (Study 1a: .32; Study 1b: .28), meaning that there is considerable within-person flux in self-locations over time. The ICC figures for self-location were comparable to those for positive affect (Study 1a: .26; Study 1b: .30), negative affect (Study 1a: .37; Study 1b: .29), reward perceptions (Study 1a: .31; Study 1b: .31), threat perceptions (Study 1a: .38; Study 1b: .28), and daily stressor occurrences (Study 1a: .31; Study 1b: .31).

Are Heart Locations Conducive to Well-Being?

To examine within-person relationships between self-location and well-being, we performed multilevel modeling (MLM) analyses, using SAS PROC MIXED (Singer, 1998). The self-location predictor was person-mean centered (also termed group-mean centered: Wang & Maxwell, 2015), which will remove between-person mean differences between individuals (Enders & Tofghi, 2008). This predictor was further person z-scored, such that each individual's mean was 0 and each individual's standard deviation was 1, as this transformation facilitates the calculation of estimated means (Klein, Liu, Diehl, & Robinson, 2017). In primary analyses, daily outcomes retained their original units. In a second set of models, though, we z-scored outcome variables, which results in a standardized *b* coefficient that can be considered a measure of effect size (Lorah, 2018). In accordance with ICC results, intercepts were allowed to vary at random.

As displayed in Table 1, participants experienced higher levels of positive affect on days on which they were heart-located to a greater extent. Although less pronounced, they also experienced lower levels of negative affect when they were heart located. As hypothesized,

higher levels of heart location were linked to greater perceptions that the daily environment was rewarding, but not threatening.

Mediation and Additional Analyses

Individuals are likely to locate the self in the head when there are stressful tasks to perform. Consistent with this idea, higher levels of daily stress were predictive of head-linked self-locations, both in Study 1a, $b = -.139$ [-.190, -.087], $t = -5.27$, $p < .001$, standardized $b = -.130$, and Study 1b, $b = -.099$ [-.155, -.043], $t = -3.49$, $p < .001$, standardized $b = -.091$. Even when controlling for daily stress levels, though, within-person links involving positive affect, $ts > 3.50$, $ps < .001$, standardized $bs > .090$, as well as reward appraisals, $ts > 2.20$, $ps < .05$, standardized $bs > .050$, remained significant. That heart locations were protective against negative affect (see Table 1) was no longer true when controlling for daily stress levels, $|ts| < 2.00$, $ps > .05$, standardized $|bs| < .070$.

In an additional set of models, we explored the possibility that greater perceptions of reward might mediate the relationship between self-location and affective well-being, defined in terms of higher levels of positive affect and lower levels of negative affect (Diener et al., 2010). To examine such ideas, we person-z-scored (person-mean centered divided by person's standard deviation) all relevant variables and performed multilevel within-person mediation analyses using the lme4 and mediation macros of R version 4.2.0. Mediation with respect to positive affect was significant in Study 1a, $b = .050$ [.026, .074], $p < .001$, accounting for 33% of the variance linking self-location to positive affect, and Study 1b, $b = .027$ [.005, .049], $p = .020$, 24% of variance. Mediation with respect to negative affect was also significant in Study 1a, $b = -.024$ [-.038, -.010], $p < .001$, 25% of variance, and Study 1b, $b = -.008$ [-.015, -.001], $p = .029$, 11% of variance. Although perceptions of environmental reward are not sufficient in accounting

for links between self-location and affective well-being, they are nonetheless implicated in these relationships.

Discussion

The perceived location for the self appears to vary substantially across days, sometimes favoring the head region of the body and sometimes favoring the heart region. These self-migrations mattered, such that participants experienced higher levels of positive affect (as well as lower levels of negative affect) when they were heart-located to a greater extent. When participants had stressful cognitive tasks to perform, they perceived themselves to be more head located, but daily stressor occurrences were not sufficient in accounting for the link between heart locations and positive affect. Instead, heart locations seem to encourage more benevolent perceptions of the environment, which play some role in linking heart locations to higher levels of well-being.

Study 2

The self-location item of Study 1 was a bit awkward in that it asked participants whether they associated themselves with a given bodily region on a given day. In Study 2, we developed a more direct measure that asked which area of the body seemed to contain more of the self on a given day, following the idea that the head and heart are perceived to be containers for the self (Niemeier, 2000). Another purpose of Study 2 was to expand the scope of daily outcomes by considering eudaimonic, as well as hedonic, conceptions of well-being (Ryff & Singer, 2008). Finally, we focused on the idea that the metaphoric heart may be more capable of savoring positive events (Jose et al., 2012), which may in turn explain variance linking self-locations in the heart to higher levels of daily well-being.

Method

Participants and General Procedures

Power considerations were identical to Study 1 and we sought a sample size of over 100 (Ohly et al., 2010), which would afford greater than .80 power to detect within-person relationships of a medium size (Scherbaum & Ferreter, 2009). Undergraduate students from a Midwestern University in the United States initially signed up for a “daily diary study” and then completed demographic surveys. Subsequently, 160 students were sent emails, with participant number information and a link to a secure Qualtrics-programmed website, for 14 consecutive days. They were given from 6 p.m. to 2 a.m. to complete a daily report or it was considered missing. Compliance with the protocol was marginally worse than in Study 1 and, prior to data analysis, we decided to accept participants ($n = 124$; 70.16% female; 83.87% White; M age = 20.65) who completed at least 8 of 14 surveys. The average included participant completed 12.20 reports ($SD = 2.60$), resulting in a dataset with 1513 rows.

Daily Measures

Instructions for the self-location measure stated that most of the time, we sense ourselves as being located primarily in the head or the heart (Limanowski & Hecht, 2011). Participants were straightforwardly asked to indicate which bodily region seemed to contain more of the self on a given day. The measure was also improved by using a slider with 201 unique positions. Participants were asked to move the slider, using a mouse, with endpoints labeled -100 (you were 100% in your head today) and +100 (you were 100% in your heart today). When the slider was in the correct position (as mirrored by numeric feedback), participants pressed a next button, which recorded the answer. This measure is more intuitive than that administered in Study 1 and it is likely to be more sensitive as well. The average day received a score of 3.30 (ever so slightly

heart-favoring), but the standard deviation was substantial ($SD = 54.50$), indicating a great deal of flux across days.

Daily experiences of affective well-being were assessed in a manner parallel to Study 1, except that (in Study 2) we favored the broader markers of the SPANE (Diener et al., 2010) to the high-arousal markers of the PANAS (Watson et al., 1988). Participants were asked to rate the extent (1 = not at all; 5 = extremely) they felt six feelings on a given day. Three items (“happy”, “positive”, and “excited”) were averaged to quantify positive affective feelings ($M = 3.27$; $SD = 0.98$; $\alpha = .87$) and three additional items (“sad”, “negative”, and “distressed”) were averaged to quantify negative affect ($M = 1.77$; $SD = 0.80$; $\alpha = .76$).

Several authors have suggested that well-being should not be equated with affective states because there are additional dimensions of functioning that should be considered (Deci & Ryan, 2008). We sought to contact this literature, which is concerned with eudaimonic features of well-being, by administering items from the psychological well-being inventory (PWB: Ryff, 1989) that would reasonably exhibit daily variations (Robinson, Roiger, & Irvin, 2022). Participants were asked whether they agreed (1 = strongly disagree; 6 = strongly agree) with 6 statements, one each for autonomy ($M = 3.69$; $SD = 1.56$), mastery ($M = 4.03$; $SD = 1.41$), personal growth ($M = 3.40$; $SD = 1.51$), positive relations with others ($M = 4.49$; $SD = 1.42$), purpose in life ($M = 3.49$; $SD = 1.71$), and self-acceptance ($M = 3.43$; $SD = 1.73$). A total PWB score was also computed ($M = 3.75$; $SD = 1.17$; $\alpha = .84$).

Well-being was also assessed using global characterizations of one’s daily state, which, relative to the feeling measures, may capture more cognitive (or judgment-related) perspectives on the day (Fleeson, 2001; Robinson et al., 2022). In this connection, participants were asked whether they agreed (1 = strongly disagree; 5 = strongly agree) with two statements. One

statement focused on happiness (“Today, I was happy”: $M = 3.74$; $SD = 1.08$) and the other focused on misery (“Today, I was miserable”: $M = 1.67$; $SD = 0.99$).

In Study 1, it was found that stressful days shifted self-locations in a head-favoring direction. We sought to replicate this pattern and we used the same 4 items (e.g., “I had a deadline to worry about today”) used in Study 1 (Compton et al., 2008). The items, however, were paired with a frequency-based response format (1 = not a single time; 4 = more than 2 times: $M = 1.88$; $SD = 0.80$; $\alpha = .82$).

When people react to and savor positive events, they tend to experience higher levels of daily happiness (Jose et al., 2012). We reasoned that a heart-located self would be more capable of capitalizing on such events and we therefore included a pertinent set of mechanism-related questions. Following precedent (e.g., Larsen, Diener, & Emmons, 1986), participants were asked to recall the best and worst events that had happened to them on each day. For both events, participants were asked how strong (1 = not very strong; 5 = very strong) their emotional reaction to the event had been as well as how long in duration (1 = a few minutes; 5 = several or many hours) it had lasted. Participants indicated that they tended to have stronger and longer reactions to the best events of the day (strength: $M = 3.15$; $SD = 1.31$; duration: $M = 2.45$; $SD = 1.25$) than the worst events of the day (strength: $M = 2.31$; $SD = 1.30$; duration: $M = 2.00$; $SD = 1.23$), but both event types were considered in analyses.

Results

How Malleable Are Self-Locations?

Self-locations, which were indicated by slider placements, exhibited a great deal of malleability ($ICC = .20$). This ICC estimate was lower than that observed for positive (.43) and negative affect (.44) as well as for the other daily measures that were administered (autonomy =

.43; mastery = .43; growth = .34; positive relations = .59; purpose = .58; self-acceptance = .49; psychological well-being = .60; happiness = .42; misery = .30; stress = .50; reactivity to best event = .36; duration of reactivity to best event = .34; reactivity to worst event = .26; duration of reactivity to worst event = .26).

Are Heart Locations Conducive to Well-Being?

We hypothesized that heart locations (relative to head locations) would be more conducive to well-being. To investigate within-person relationships of this type, we person z-scored the self-location measure (such that each person's mean was 0 and each person's standard deviation was 1; Klein et al., 2017) and used it to predict the well-being outcomes in level 1 (within-person) models, allowing intercepts to vary at random. As displayed in Table 2, the results for affective well-being replicated Study 1, in that heart locating days were associated with higher levels of positive affect and lower levels of negative affect. Extending Study 1, participants reported higher levels of psychological well-being on days on which they were more heart located and effect sizes were particularly pronounced for features of well-being that would seem to be affectively-infused to a greater extent, such as experiences related to personal growth and self-acceptance. Mechanisms related to savoring were also implicated in that participants had stronger and longer reactions to the best events of the day (but not the worst events of the day) when they located themselves in the heart to a greater extent.

Mediation and Additional Analyses

As in Study 1, participants were more likely to locate themselves in the head when there were stressful tasks to perform, $b = -3.814 [-6.436, -1.192]$, $t = -2.85$, $p = .004$, standardized $b = -.070$. Nonetheless, the self-location measure continued to predict all major outcomes (positive affect, negative affect, PWB total score, happiness, misery, and reactivity to the best events of

the day) when controlling for daily stress levels, $|ts| > 2.50$, $ps < .010$, standardized $|bs| > .080$. In Study 2, but not Study 1, we also retained information concerning the date of the particular survey and we used this information to prepare a second dataset that excluded weekend days, which often involve more leisure and social activity (Helliwell & Wang, 2014). Even when excluding weekend days, self-location continued to predict all major outcomes in a manner parallel to Table 2 results, $|ts| > 2.00$, $ps < .05$, standardized $|bs| > .070$. For example, participants reported greater happiness when they heart located to a greater extent, $b = .162$ [.097, .226], $t = 4.93$, $p < .001$, standardized $b = .150$.

Participants were able to enjoy the best events of the day to a greater extent when they located themselves in their hearts relative to their heads. In a set of within-person mediational models, we explored the possibility that savoring mechanisms of this type might provide some explanation for why people were happier when they located the self in the heart. Stronger reactions to the best events of the day mediated the relationship between self-location and positive affect, $b = .075$ [.046, .104], $p < .001$, accounting for 31% of the variance, and similar results were obtained with the PWB total score, $b = .052$ [.031, .073], $p < .001$, 35% of variance, and daily happiness, $b = .059$ [.035, .083], $p < .001$, 29% of variance. Longer reactions to the best events of the day functioned similarly with respect to positive affect, $b = .074$ [.048, .100], $p < .001$, 32% of variance, total PWB, $b = .051$ [.032, .070], $p < .001$, 36% of variance, and daily happiness, $b = .060$ [.039, .081], $p < .001$, 30% of variance. Thus, a capacity to appreciate positive events provides some (though not sufficient) explanation for why people tend to be happier when they locate themselves in the heart region of the body.

Discussion

Replicating Study 1, Study 2 found that levels of affective well-being were higher on heart-located days and stressors also shifted self-locations in a head-favoring direction. Extending Study 1, the results indicated that heart locations were broadly predictive of well-being, whether defined in hedonic or eudaimonic terms. When people locate themselves in the heart, finally, they appear to be more capable of appreciating positive events that happen to them. The heart-located self, that is, appears to have greater hedonic capacity than then head-located self.

Study 3

Study 3 pursues a new set of mediators, namely those involved in time expenditure. We have suggested that the heart, relative to the head, is metaphorically linked to higher levels of social sentiment. Accordingly, participants may be more inclined toward social interaction on days on which they perceive themselves to be more heart-located. In addition, Study 3 obtained twice-daily reports, which allowed us to speak to questions of temporal precedent. Conceptual metaphors are thought to operate bidirectionally (Huang, Tse, & Xie, 2018; Lee & Schwarz, 2012) and we expected to find bidirectional associations in cross-temporal analyses.

Method

Participants and General Procedures

Power considerations were identical to prior studies and we sought a sample size of over 100 (Ohly et al., 2010), which would provide sufficient power for primary hypotheses (Scherbaum & Ferrer, 2009). As in prior studies, undergraduate students from a Midwestern University in the United States signed up for a “daily diary study” and completed demographic surveys. Subsequently, they were given as many as 19 consecutive days to complete twice daily surveys for 8 full days (16 total surveys). One survey, which was meant to cover the morning in

question, was sent out at 12 p.m. and needed to be completed by 2 p.m. The other survey, which was meant to cover the afternoon in question (2 p.m. to 6 p.m.), was sent out at 6 p.m. and this survey needed to be completed by 8 p.m. Participants who completed 8 pairs of surveys were told that they were finished, whereas participants falling short of this goal were given additional days (again, up to 19) to meet criterion.

Following data collection, but before performing analyses, we created decision rules for inclusion (West et al., 2011). This led to the creation of an “occasion” dataset that consisted of 130 participants (63.08% female; 88.46% White; M age = 18.65) who completed at least 7 total reports that did not need to be paired by day, given that the interest was in particular reports rather than those that were paired by day. Within this dataset, the average participant completed 16.68 reports and the total number of observations was 2169. We also prepared a second “lagged” dataset that consisted of 117 participants who completed paired (both morning and afternoon) reports for at least 5 days. Within this dataset, the average participant had 7.55 days of paired reports and the total number of day-rows was 883. For the sake of clarity, we should state that most of the analyses were performed on the occasion-level dataset and the lagged dataset was used in follow-up analyses focused on temporal trends. Surveys were completed on a Qualtrics-programmed website.

Daily Measures

Perceived locations for the self were assessed using the slider measure also used in Study 2, with the exception that the time frame was either “this morning” or “this afternoon”, depending on whether morning or afternoon reports were involved. The average self-location score was -4.07 (ever so slightly head-favoring), but there was considerable variability across reports ($SD = 61.39$).

Affective well-being was assessed in a manner parallel to prior studies. The positive affect scale asked individuals to report on the extent (1 = not at all; 5 = extremely) to which they were “happy” and “excited” during the relevant time period ($M = 3.14$; $SD = 1.04$; $\alpha = .82$). Participants also reported on the extent to which they were “sad” and “distressed” during the relevant time period and these ratings were averaged to quantify occasion-specific experiences of negative affect ($M = 1.81$; $SD = 0.86$; $\alpha = .64$).

Two global measures were included in the brief survey. With respect to hedonic processes, participants were asked to characterize their experiences during the reporting period along a 1 (miserable) to 5 (very happy) scale ($M = 3.56$; $SD = 0.99$). With respect to eudaimonic processes, participants were asked how successful they had been (e.g., in reaching their goals or in demonstrating competence) during the reporting period (1 = incompetent; 5 = very successful: $M = 3.29$; $SD = 1.27$).

As in prior studies, we were interested in the occurrence of concurrent stressors. Participants were asked whether they had “too many things to do at once” during the reporting period and this item was paired with a frequency-based format (1 = not a single time; 4 = more than two times: $M = 1.86$; $SD = 1.00$). The stress measure was not as extensive as in prior studies, but we expected it to function similarly.

Finally, we assessed mediators related to time expenditure. We thought it likely that higher levels of heart location would be linked to a more social orientation to the environment. We therefore asked participants how much time they had spent socializing during the reporting period (1 = none; 5 = a lot: $M = 1.13$; $SD = 1.30$). We also thought it likely that the heart-locating self would be more inclined toward leisure. Participants were therefore asked whether they had

engaged in entertainment or leisure during the time period in question (1 = none; 5 = a lot: $M = 3.02$; $SD = 1.27$).

Results

How Malleable Are Self-Locations?

Self-locations, which were indicated by slider placements, exhibited a great deal of malleability ($ICC = .18$). This figure was comparable to the time expenditure measures (socializing = .19; leisure = .18) and lower than the remaining measures in the survey (positive affect = .38; negative affect = .40; happiness = .30; success = .24; stress = .32).

Are Heart Locations Conducive to Well-Being?

We hypothesized that heart locations, relative to head locations, would be more conducive to well-being and Table 3 reports results pertaining to these within-person multilevel models, which were performed using the occasion-level dataset. Again, participants experienced higher levels of positive affect as well as lower levels of negative affect when they located themselves in their hearts to a greater extent. Heart locations were conducive to happiness and, to a lesser degree, to success in ongoing goal pursuits. As predicted, when participants were more heart located, they spent more time socializing with others and they were more inclined toward leisure activities.

Mediation and Additional Analyses (Occasion-Level Dataset)

When participants perceived that they had too many things to do at once, they tended to locate themselves in their heads (relative to hearts), $b = -3.280$ $[-6.117, -0.443]$, $t = -2.27$, $p = .024$, standardized $b = -.053$. Nonetheless, the self-location measure continued to predict all outcomes when controlling for momentary stress levels, $|ts| > 3.50$, $ps < .001$, standardized $|bs| >$

.100. The self-location measure also continued to predict all outcomes when deleting weekend reports from the dataset, $|ts| > 2.50$, $ps < .01$, standardized $|bs| > .150$.

In a series of within-person mediational models, we focused on the question of whether links between self-location and the well-being outcomes were mediated by activity involvement (social activities or leisure). Social activities explained some portion of the link between self-location and positive affect, $b = .065$ [.047, .083], $p < .001$, accounting for 21% of the variance of the total effect. Social activities also played some mediating role with respect to negative affect, $b = -.024$ [-.035, -.013]. $p < .001$, 13% of variance, happiness, $b = .060$ [.043, .077], $p < .001$, 22% of variance, and success, $b = .049$ [.034, .064], $p < .001$, 47% of variance. Mediational pathways involving leisure activities accounted for trivial percentages of variance (0-7%), however, probably because only some leisure activities are conducive to well-being (Hutchinson & Kleiber, 2005).

Analyses Involving the Lagged Dataset

We used the lagged dataset to examine questions of temporal precedent. In all of the relevant multilevel models, predictors were person z-scored, thus focusing on within-person processes (Enders & Tofighi, 2008), and intercepts were allowed to vary at random. A first observation was that self-locations in the morning predicted self-locations in the afternoon, $b = 10.055$ [5.669, 14.440], $t = 4.50$, $p < .001$, attesting to some degree of temporal stability in perceived locations for the self.

We then conducted analyses in which the morning self-location score was used to predict afternoon outcomes, controlling for the morning version of the same outcome. In these relatively conservative analyses, morning self-locations predicted afternoon happiness, $b = .091$ [.030, .152], $t = 2.95$, $p = .003$, standardized $b = .094$, and leisure pursuits, $b = .113$ [.033, .194], $t =$

2.76, $p = .006$, standardized $b = .092$, but not the other outcomes, $|ts| < 1.5$, $ps > .20$, standardized $|bs| < .050$.

We also performed analyses in which a morning outcome was used to predict afternoon self-location, controlling for morning self-location. Greater PA in the morning, $b = 11.420$ [7.405, 15.435], $t = 5.58$, $p < .001$, standardized $b = .182$, lesser NA in the morning, $b = -4.852$ [-9.005, -0.700], $t = -2.29$, $p = .022$, standardized $b = -.077$, greater happiness in the morning, $b = 9.263$ [5.158, 13.368], $t = 4.43$, $p < .001$, standardized $b = .148$, and greater social activity in the morning, $b = 6.170$ [2.205, 10.135], $t = 3.05$, $p = .002$, standardized $b = .098$, predicted higher levels of heart location in the afternoon, though the remaining models were not significant, $|bs| < 2.0$, $ps > .05$, standardized $|bs| < .16$. Self-locations therefore appear to be responsive to affective experiences as well as stressful events.

Discussion

We primarily emphasize the point that the results of Study 3 replicated those of Studies 1 and 2. Participants located themselves in their heads when they had too many tasks to perform, but self-location continued to predict well-being outcomes when controlling for this class of stressors. In extending prior studies, Study 3 found that the heart-located self was more inclined to socialize as well as more inclined toward leisure, though only the former type of activity mediated relationships between self-location and well-being. Study 3 also found some hints that the location of the self in the morning predicted levels of happiness later in the day, perhaps suggesting broaden-and-build processes (Fredrickson, 2013), though associations appeared to operate bidirectionality in these analyses. That is, self-locations appear to reflect the experiences of the day but may also play some role in producing them.

General Discussion

The self is perceived to be in its body and the most common loci of self-perception are the head and the heart (Alsmith & Longo, 2014; Limanowski & Hecht, 2011). The head and the heart, in turn, are thought of in metaphoric terms, such that the head operates by objective rationality and the heart operates according to intuition and warmth (Fetterman et al., 2020; Niemeier, 2008). To the extent that migration of the self occurs, individuals may operate quite differently when they perceive themselves to be more head-located versus heart-located. Four daily diary studies sought to examine such ideas.

A first observation was that there was considerable variation in the perceived location of the self across days (Studies 1 and 2) or parts of days (Study 3). In Study 3, for example, the mean self-location score was -4.07 (on a -100 to +100 scale), but the standard deviation of these scores was substantial ($SD = 61.39$). A decomposition of variance indicated that about 20% of the variance in self-locations could be attributed to persons, meaning that 80% of the variance reflected within-person fluctuations due to occasion. And these movements were associated with robust changes in stress and well-being. All studies found that cognitive stressors (responsibilities, obligations) shifted self-locations in a head-favoring direction, presumably because the head is the area of the body that is perceived to solve problems in an effortful manner (Kahneman, 2011). When individuals were heart-located, by contrast, they were happier. In the remainder of the General Discussion, we consider further implications of the findings as well as questions, limitations, and future directions.

Implications, Limitations, and Future Directions

In previous research (Fetterman & Robinson, 2013), self-locations have been treated as individual difference variables, but they appear to operate in largely state-related terms. In this respect, the findings highlight a duality that exists within each of us and this duality can be

thought of in a number of ways. Bakan (1966) contrasted strivings related to agency (independence, mastery of the environment) and communion (connection, caring) and the heart-located self is a more communal one (Robinson et al., 2023). Kahneman (2011) contrasted two cognitive systems, one of which operates according to affect and intuition (system 1) and the other of which is recruited when effortful processing may be required (system 2). This distinction maps well onto metaphors for the head and the heart (Niemeier, 2008), perhaps with one exception. System 1 is viewed as a default system (Kahneman, 2011), but the present data suggested somewhat equal frequencies of head- and heart-location. Epstein (2003) similarly contrasted a rational system that uses logic and reasoning with an experiential system that is reliant on affect. This distinction seems to capture an essential element of the head-heart distinction (also see Park & Peterson, 2010). In any case, what we emphasize is the fact that the two systems of apprehension vary appreciably with perceived locations for the self. Because this is true, one can use perceived locations for the self as a clue to the mode of processing or existential stance that will be adopted.

In an intriguing analysis, Epstein (2003) further stated that happiness is reliant on satisfying the needs and desires of the experiential system, not the rational system. Presuming a link between the heart-located self and the experiential system (Fetterman et al., 2020), the present findings provide important support for this premise in that participants were appreciably happier when they were heart-located, relative to head-located. The studies highlighted several mechanisms for this relationship, including more benevolent perceptions of the environment when heart-located (Study 1), a greater capacity to react to favorable events (Study 2), and greater social activity (Study 3). Beyond these mechanisms, one could point to the fact that it is the heart and not the head that is perceived to contain one's true essence (Niemeier, 2000) and it

is the heart but not the head that is more commonly perceived to be the locus of one's soul (Anglin, 2014). When people locate themselves in their heart, they are likely to feel that they are living in accord with a deep and natural source of wisdom that Rogers (1964) referred to as an organismic valuing process (Maurer & Daukantaitė, 2020). Evidence consistent with this account was reported in Study 2, in which it was found that perceptions such as personal growth and self-acceptance were systematically higher as self-locations shifted toward the heart and away from the head.

Given these findings, it is important to resist equating heart-related processing with something like the id and head-related processing with something like the ego. Freud's view of unconscious forces emphasized problematic desires, but the desires of the experiential system – to engage with the environment and embrace that which is need-satisfying – are likely to be adaptive rather than problematic (Epstein, 2003). A similar point is being made in the self-regulation literature, which contends that the intrinsic motivations of the self are typically health-promoting (Sheldon et al., 2003) and pursuing goals because one wants to pursue them renders it more likely that goals will be achieved (Werner & Milyavskaya, 2019). In this connection, the heart-located self may have at least two important capacities that the head-located self appears to lack. The heart-located self appears to have greater hedonic capacity (Bernecker & Becker, 2021), as evident in terms greater happiness and mechanisms such as reward perception (Study 1) and savoring (Study 2). Metaphors for the heart also suggest its prosocial basis (Afreh, 2015) and the heart may operate in a manner consistent with intuitive prosociality (Robinson et al., 2023; Zaki & Mitchell, 2013). Whether there are downsides to self-locations that favor the heart is yet to be determined, but such downsides could include some tendencies toward magical thinking (King, Burton, Hicks, & Drigotas, 2007).

Although the findings are compelling in some respects, there are limitations. The self-location measure of Study 1 was not ideal and a more intuitive measure was created for Studies 2 and 3. Many of the daily measures were brief. Negative affect was assessed less reliably than positive affect in all of the studies and the alpha coefficient for negative affect in Study 1b (.55) might be considered marginal rather than adequate. Additionally, we caution that conclusions concerning particular PWB dimensions (Study 2) are, at best, preliminary, pending replication with longer scales. Relatedly, stress was assessed with a single item in Study 3 and the leisure item was not particularly informative, probably because different leisure activities need to be distinguished when considering their impact on well-being (Doerksen, Elavsky, Rebar, & Conroy, 2014). We pursued different mediators in each of the studies. This strategy allowed us to explore multiple mechanisms, but it did not allow us to replicate any of the mediational patterns, nor did it allow us to compare the different mediators to each other. We also suspect that there are unmeasured mediators, such as intrinsic motivation and perceptions of authenticity, that would be worth investigating in future studies. We should finally state that eudaimonic well-being is a complex construct (Martela & Sheldon, 2019) and further research is needed in assessing it. Some of this research might focus on the different goals that are likely to follow from variations in self-location.

Conclusions

People perceive the self to migrate throughout its body, sometimes favoring a head location and sometimes favoring a heart location. These migrations offer important clues concerning how one is interacting with the world and the heart-located self, in particular, appears to be the happier self. Incorporating the head-heart slider into future daily diary and experience-

sampling studies could provide further insights concerning the metaphoric self and its tendencies.

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Informed Consent: Informed consent was obtained from all participants.

Open Practices Statement: Datasets for all studies can be found at

https://osf.io/jxa8e/?view_only=deaa7c84a85447e0b157a4a9b5b85fd5. None of these studies was preregistered.

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Table 1

Self-Location as a Within-Person Predictor of Daily Outcomes (Multilevel Models), Study 1

Outcome and Study	<i>b</i> [95% CI]	<i>t</i>	<i>p</i>	standardized <i>b</i>
Positive Affect				
Study 1a	.128 [.074, .183]	4.60	<.001	.142
Study 1b	.088 [.044, .132]	3.90	<.001	.100
Negative Affect				
Study 1a	-.052 [-.096, -.008]	-2.30	.022	-.065
Study 1b	-.053 [-.096, -.010]	-2.44	.015	-.075
Reward Appraisal				
Study 1a	.091 [.049, .133]	4.29	<.001	.102
Study 1b	.053 [.008, .098]	2.33	.020	.060
Threat Appraisal				
Study 1a	-.014 [-.055, .027]	-0.67	.503	-.019
Study 1b	.014 [-.021, .050]	0.79	.430	.021

Note: Standardized *b* values were obtained by z-scoring the outcome variable (Lorah, 2018).

Table 2

Self-Location as a Within-Person Predictor of Daily Outcomes (Multilevel Models), Study 2

Daily Outcome	<i>b</i> [95% CI]	<i>t</i>	<i>p</i>	standardized <i>b</i>
Affective Well-Being				
Positive Affect	.182 [.130, .233]	6.93	<.001	.185
Negative Affect	-.090 [-.136, -.044]	-3.86	<.001	-.112
Psychological Well-Being				
Autonomy	.079 [.016, .142]	2.47	.014	.051
Mastery	.085 [.024, .146]	2.74	.006	.061
Growth	.144 [.061, .227]	3.41	<.001	.095
Relations	.078 [.023, .134]	2.78	.006	.055
Purpose	.154 [.081, .228]	4.13	<.001	.090
Self-Acceptance	.186 [.102, .269]	4.37	<.001	.107
Total PWB	.120 [.071, .169]	4.78	<.001	.102
Global Well-Being				
Happiness	.168 [.112, .225]	5.86	<.001	.156
Misery	-.096 [-.158, -.034]	-3.04	.002	-.096
Reactivity Indices				
Best Magnitude	.177 [.114, .239]	5.55	<.001	.135
Best Length	.213 [.154, .272]	7.07	<.001	.171
Worst Magnitude	-.105 [-.179, -.031]	-2.77	.006	-.080

Worst Length	-0.064 [-.131, .004]	-1.86	.063	-.052
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Note: Standardized b values were obtained by z-scoring the outcome variable (Lorah, 2018).

Table 3

Self-Location as a Within-Person Predictor of Daily Outcomes (Multilevel Models), Study 3

Daily Outcome	<i>b</i> [95% CI]	<i>t</i>	<i>p</i>	standardized <i>b</i>
Affective Well-Being				
Positive Affect	.252 [.209, .295]	11.55	<.001	.242
Negative Affect	-.124 [-.163, -.085]	-6.22	<.001	-.150
Global Well-Being				
Happiness	.228 [.182, .274]	9.69	<.001	.230
Success	.084 [.031, .137]	3.10	.002	.078
Activity Measures				
Socializing	.225 [.167, .282]	7.65	<.001	.173
Leisure	.161 [.099, .222]	5.13	<.001	.126

Note: Standardized *b* values were obtained by z-scoring the outcome variable (Lorah, 2018).