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ORIGINAL PAPER

Making room for neutral affect: Evidence indicating that neutral affect is independent of and co-occurs with eight affective states

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Abstract

This project investigates four central issues concerning the nature of neutral affect. Specifically, whether neutral affect is (a) a common experience, (b) dependent on positive and negative affect, (c) occurs at all levels of activation, and (d) is discriminable from other, seemingly similar, affective states. In three studies, participants rated their neutral affect (e.g., feeling indifferent) and affective states that occupy major regions of the affective circumplex. First, neutral affect was a commonly reported experience. Second, neutral affect was independent of and co-occurred with both positive and negative affect, as well as all the other affective states. Third, the activation measures were problematic. The tentative data indicated that neutral affect occurred across the activation dimension, but it was more reflective of a deactivated than activated state. Finally, neutral affect was discriminable from both negative and positive deactivated states. The paper concludes by providing some methodological and theoretical recommendations regarding the conceptualization of neutral affect.

Keywords Neutral affect · Emotion · Valence · Activation · Affective circumplex

Neutral affective states play a central theoretical and methodological role within affective research. Many theories about affect posit that neutral affect arises when affective reactions are minimal. Because neutral affect reflects minimal affective reactions, researchers view neutral affect as an ideal control condition in their work (Gasper 2018). Interestingly, even though neutral affect plays a vital role in affect research, researchers know very little about it. The purpose of this project is to investigate four key research questions concerning the nature of neutral affect: whether neutral affect (a) is a common experience? (b) depends or not on the presence of positive and negative affect? (c) occurs across all levels of the activation dimension? and (d) is discriminable from seemingly similar affective states, such as feeling tired, bored, or calm? By examining these questions, the goal is to provide researchers with a framework for defining, measuring, and thinking about the nature and function of neutral affective states.

Theory: defining and understanding assumptions about neutral affect

Affective states are felt experiences that arise either with or without conscious awareness (Slovic et al. 2005). Valence and activation are often identified as the two primary dimensions of affective experience (for reviews, e.g., see Daly et al. 1983; Posner et al. 2005; Reisenzein 1994; Remington et al. 2000; Russell 2003). *Valence* refers to whether the state is experienced as pleasant or unpleasant; whereas *activation* or arousal refers to whether the state is experienced as providing a sense of urgency or need for action (Storbeck and Clore 2008). Thus, when thinking about neutral affect, at the very minimum, it is helpful to think about it with regards to these two dimensions.

In this paper, neutral affect is defined as a felt experience in which one feels indifferent, nothing in particular, and lacks a strong preference (for more information see: Gasper et al. 2019). It indicates that there is nothing in the

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environment that demands attention or action (for discussion of possible appraisal dimensions, see Yih et al. 2019). Note that the term "indifference" is not meant to imply disdain or apathy, which are negative states, but rather that the environment/situation makes no difference. Notably, neutral affect is defined by the presence of neutral feelings rather than the absence of other feelings (Gasper et al. 2019). Neutral affect also contains valence- and arousal-relevant cues. Specifically, it indicates that nothing noteworthy in the environment (valence) and that there is no urgent need for action (arousal).

Below, we review how this conceptualization of neutral affect aligns with and diverges from other views on the nature of affect. In the process, we discuss 4 key questions that need to be addressed to fully understand how to best conceptualize neutral states. Specifically, (a) Is neutral affect a common experience or one that rarely occurs? (b) Is neutral affect dependent or not on positive and negative affect? (c) Does neutrality arise across all levels of activation or does it reflect a deactivated state? (d) Is neutral affect discriminable from seemingly related states like feeling bored, tired, relaxed, or calm?

Is neutral affect a common experience?

Some researchers doubt that people can ever feel neutral. This doubt might stem from the assumption that neutral affect reflects the literal absence of any affective reaction. The absence of any feeling is a state that might be difficult, if not impossible, to experience (Helson 1964). For instance, Damasio (2003) wrote, "… all of your experiences occur in an emotion-full world. The point is, we do not live in a neutral world. Our experiences are always emotionally loaded and we make use of the experience" ("What happens then?" para. 1). Izard (2007, p. 270) noted "…there is no such thing as an affectless mind; affect or emotion is always present." If one assumes that feelings are always present and defines neutral affect as reflecting the literal absence of affect, then neutral affect might rarely, if ever, occur.

In this paper, neutral affect is not defined as the literal absence of affect. It is as a felt experience in which one feels indifferent (Gasper et al. 2019). Consistent with the view that people do feel neutral, the few studies in which researchers have directly assessed neutral affect indicate that people not only report neutral feelings but do so with some intensity (Gallegos and Gasper 2018). For instance, Tay (2011) found that 63% of the respondents reported feeling neutral, which was a similar percentage to people's reports of feeling a little happy (68%), slightly happy (67%) and moderately happy (65%), and their "usual" feelings (75%). Fordyce (1988) reported that, on average, people report feeling neutral 25.43% of the time. Samson et al. (2015) found that after viewing films designed to induce neutral feelings, people reported feeling more neutral affect ($M = 5.03$, $SD = 0.20$, on a 1 = *not very* to 6 = *very strong* scale) than those who viewed films designed to induce positive ($M = 2.85$, $SD = 0.27$) or negative affect ($M = 2.29$, $SD = 0.31$). Thus, people report experiencing neutral affect. These studies, however, were not designed to understand to what extent the experience of neutrality was dependent on the presence or absence of other affective states.

Is neutral affect dependent on positive and negative affect?

Many theories of affect argue that neutrality arises when positive and negative affect are minimal or absent. For instance, in the core affect perspective, valence and arousal form the axes of the affective circumplex (Barrett and Russell 1999; Russell 2003; Yik et al. 2011). The horizontal axis indicates valence (positive/negative or pleasure/displeasure) and vertical axis indicates activation (activation/deactivation). Neutral affect resides at the center of the circumplex, indicating minimal pleasure/displeasure and being neither high nor low in activation. States closest to the center of the circumplex are less intense, perhaps even unconscious (Russell 2003). The center point reflects one's adaptation level (Russell 2003), indicating that it arises when one has become accustomed to one's environment. This neutral point is described as feeling "normal" (Widen and Russell 2016, p. 197) or an "… average, everyday feeling" that is "neither positive nor negative" (Russell et al. 1989, p. 501). Thus, neutrality arises when positive and negative affect are low. In the evaluative space model (ESM, Cacioppo and Berntson 1994; Cacioppo et al. 1999), neutral affect is also viewed as a state in which positive and negative affect are minimal. In the model, positive and negative affect form two independent dimensions (whereas in the core affect perspective they form a single bipolar dimension). Neutral affect arises when both positive and negative affect are minimal or absent and reflects indifference. Lastly, in Carver and Scheier's (1998) theory of self-regulation, affect provides feedback about one's rate of progress toward one's goal. Positive affect signals that one is ahead of schedule, negative affect signals that one is behind schedule, and neutral affect signals that one is progressing at the appropriate speed to achieve one's goals (Carver 2006; Carver and Scheier 1990). Neutral affect is described as "affect free" (Carver 2006, p. 106) in that it arises when both positive and negative affect are minimal.

All these views align with our definition with regards to the idea that neutral affect signals indifference, in that there is nothing noteworthy needing attention. They, however, have a key difference in that neutral affect arises when positive and negative affect are absent or minimal. Neutral affect is either linearly dependent on positive and negative affect (as positive and negative affect increase, neutral affect

decreases) or it is mutually exclusive of them (if one feels positive or negative, then one cannot feel neutral). In contrast, neutrality defined as the presence of neutral feelings does not assume dependency on positive or negative affect. Theoretically, neutrality could arise if positive and negative are present.

A key question is whether the assumption that neutrality only occurs when positive and negative affect are minimal is appropriate. To examine this issue, researchers must assess neutrality independently of other affective states. This measurement strategy, however, is rarely used. Researchers often assess neutrality by measuring neutrality relative to positive/negative affect. For instance, the affect grid instructs people who feel neutral to select the center of the grid (Russell et al. 1989), therefore defining neutral affect as a particular region relative to valence and arousal. In the Evaluative Space Grid (Larsen et al. 2009), if people feel neutral, they are to mark a spot that indicates low positive and negative affect. Neutrality, by definition, occurs when valenced states are minimal. To determine if neutral affect really reflects minimal affect, one needs to assess it independently of positive and negative affect, allowing for the possibility that people can report experiencing neutral, positive, and negative affect at the same time.

The few studies that have directly assessed neutral affect support the hypothesis that neutral affect might be independent of positive and negative affect. For instance, when neutral emotional terms were included in a factor analysis, neutral terms did not load with positive or negative affective terms, but rather formed a separate mood dimension (Gasper and Danube 2016; Sonneville et al. 1981, as cited by Frijda 1986). Storm and Storm's (1987) work on developing a taxonomy of emotion terms found that rather than clustering with positive and negative words, the word "neutral" was part of a third cluster and associated with feeling indifferent, so-so, uncaring, unconcerned, alienated, cold, detached, and apathetic. Daly et al. (1983) used a single item to measure neutral reactions to various stimuli and found that it reflected a third affective dimension akin to intensity. Gallegos and Gasper (2018) found that neutrality was moderately negatively correlated with the positive activation (PA) scale of the Positive and Negative Affective Schedule, r's = − 0.25, − 0.37 (PANAS; Watson et al. 1988), but not significantly correlated with the negative activation (NA) scale of the PANAS, r's = − 0.04, − 0.01. Lastly, Tay (2011) found that neutrality did not lie on the positive–negative affective continuum, indicating that neutral affect might be better construed as separate from the unidimensional, bipolar continuum. Even though these studies were not designed to fully address the link between neutrality and valence, together they suggest a fascinating pattern: neutrality might be somewhat independent of positive and negative affect.

How is neutral affect associated with activation?

In addition to valence, affective states also differ in terms of activation or arousal—a dimension which signals urgency (Storbeck and Clore 2008). It is unclear how neutral affect might be linked to activation. One view is that neutral affect might occur across all levels of activation. According to the core affect perspective, activation ranges from high (aroused) to low (quiet and still) and the whole dimension is neutral because it lacks valence (Barrett et al. 2007; Yik et al. 1999). The activation dimension forms a "neutral corridor" (Yik et al. 1999, p. 616), resulting in neutral/low arousal and neutral/high arousal states (e.g., see Barrett et al. 2007; Kuppens et al. 2013).

This hypothesis, however, might not be correct because some research indicates that activation might not be completely independent of valence. First, Watson et al. (1999) noted that one of the biggest problems with research looking at the structure of affect is finding completely neutral terms. Words that are thought to reflect the activation dimension, such as aroused, often possess valence suggesting that they might not be neutral. Second, some work indicates that valence and arousal are not completely independent. Kuppens et al. (2013) pointed out that there is a weak, but consistent, association between valence and arousal, such that affect terms that are extremely valenced (e.g., elated, anxious) tend to be high in arousal, whereas terms are less strongly valence (e.g., still) tend to be low in arousal (for another view, see Reisenzein 1994). If neutral terms are not high in valence, then neutral affect might occupy the low, rather than the high, end of the activation dimension. Also, if one views activation as akin to urgency toward action (Storbeck and Clore 2008), then from a definitional standpoint, it seems hard to view neutral affect as a highly activated state. If one feels neutral, it should signal that there is little urgency to act given that there is nothing particularly noteworthy in the environment. Neutrality then would be more akin to a deactivated state. Indeed, Samson et al. (2015) found that manipulations designed to elicit neutral affect produced less arousal than did those designed to elicit positive or negative affect. This project examines these two competing views to determine whether neutral affect is reported at all levels or at predominately low levels of activation.

Is neutral affect a distinct state that is discriminable from other similar affects?

If neutral affect exists and signals indifference, then it should be discriminable from seemingly similar affects, such as deactivated negative states, like feeling tired or bored, and deactivated positive states, like feeling calm or serene. Distinguishing neutral affect from these deactivated states is critical because research suggests that they might be akin to one another. For instance, Russell and Bullock (1985) asked respondents to rate neutral faces and found that the ratings of these neutral faces fell into the displeasure/deactivation region of the affective circumplex. Reisenzein (1994) also found that the term indifference occupied this region.[1] Frijda (1986) found that indifference and boredom have similar appraisals for valence and action readiness (Frijda et al. 1989). The Geneva Affect Label Coder, a means to classify and identify emotion words, even classifies indifference with boredom and weariness (Scherer 2005).

Despite these associations, theoretically, neutral affect should be discriminable from deactivated affects because these states differ in the information they provide. Feeling tired indicates that one's psychic resources are depleted (Gaylin 1979). Boredom can signal that the situation lacks meaning (van Tilburg and Igou 2012), which suggests that not only it is not worth paying attention to, but that one should actively avoid attending to it. In terms of positive deactivated states, feeling calm, serene, or at ease, provides information indicating that all is safe (Labroo and Rucker 2010). Neutral affect, however, signals a lack of preference, which should make it discriminable from these other signals.

Overview

Three studies were conducted to examine these four critical issues. The project focused on participants' self-reported, in-the-moment affective reactions, because the goal was to understand how conscious experiences of neutrality map onto research regarding self-reported affective experiences. Study 1 sought to replicate prior work by examining whether terms associated with neutral affect would load onto one unique factor separate from terms that described positive and negative affective states. It also examined the average frequency and intensity with which neutrality was experienced relative to other affective reactions. Study 2 investigated whether neutrality was discriminable from related constructs and the extent to which it was mutually exclusive of them. Study 3 extended Study 2 by investigating the link between neutral affect and activation.

Study 1

Study 1 investigated whether terms that assess neutrality form a unique factor and to what extent neutrality was frequently and intensely experienced. To do so, participants reported the extent to which they were currently experiencing emotions that assess positive, negative, and neutral affective states.

Method

Participants

We recruited 435 people from Amazon's Mechanical Turk (MTurk) to participate in this study. The four people who failed the attention check (not marking D in response to the statement "Just to make sure that you are still paying attention, please select option D as your answer to this question") and the 20 people who took either less than 1 min or more than 30 min to complete the task were dropped (results did not change leaving these people in the analyses). The timing was selected to allow minimal time to quickly answer the questions and to not allow too much time to pass between rating various mood states. The final dataset contained 411 participants (166 men, 243 women, 2 transgendered, $M_{age} = 31.51$, $SD = 10.12$, range 18 to 73 years; 78.1% Caucasian, 7% Asian/Pacific Islander, 5.6% African American, 7% Latino/a, 2.4% other).

Materials and procedure

All respondents read: "We are interested in what you are feeling *right now, at this moment.* Please use the scale below to rate the extent to which the following emotion terms describe your current feelings." The scale ranged from 0 = *Not at all* to 10 = *Extremely*. The emotion terms were presented randomly and measured positive (happy, glad, joyous, delighted, proud, pleased, and satisfied), negative (upset, distressed, sad, unhappy, discouraged, anxious, and blue), and neutral affect (neutral, indifferent, so-so, nothing, emotionless, okay, and don't feel strongly one way or the other). For the neutral words, we selected terms that reflect the idea that neutral affect signaled a lack of a strong preference. Similar terms have been used by Gasper and her colleagues (Gasper and Danube 2016; Gasper and Gallegos 2018), but it should be noted that the words selected

[1] Reisenzein (1994) also had participants rate how neutral they felt, which was defined as "a state characterized by the absence of emotion" (p. 533). These ratings fell close to the center of the circumplex; however, because neutral affect was defined as the absence of emotion, it is unclear to what extent this finding reflects people's natural placement of neutral affect or placement in accordance with the author's definition.

in these published papers were based on the data presented in this paper.

Results

First, we used exploratory factor analyses (EFA) to investigate the factor structure of the affect ratings. We conducted an EFA rather than a confirmatory factor analysis (CFA) because the goal was more exploratory rather than confirmatory—in that we wanted to determine if the neutral items formed a third factor or not. A principal axis factor analysis was conducted using the psych package in R (Revelle 2020). Because it was more reasonable to assume that the factors would covary than be orthogonal, we used an Oblimin rotation. There were no missing data.

Multiple indices for identifying the number of factors to extract (i.e., Velicer's Minimum Average Partial Test, Very Simple Structure, and parallel analysis scree plots) all indicated that a 3-factor solution was desirable. The 3-factor model had the lowest BIC scores (3-factor = − 556.28 vs 2-factor = 982.90, 4-factor = − 517.33) and was the most interpretable. Consistent with prior work (Daly et al. 1983), the 3 factors reflected positive, negative, or neutral states (see Table 1, RMSEA = 0.058, TLI = 0.96).[2] It should be noted that the factor loadings for the items "okay" were a bit problematic. "Okay" only loaded 0.46 on the neutral factor and had a 0.28 loading on the positive affect factor. Because the term "okay" could indicate a positive feeling, we decided to drop it from the neutral measure.

Next, we computed separate, average, composite scores for positive, negative, and neutral scales. As Table 2 indicates, positive affect was felt more than both neutral affect, $t(410) = 2.10$, $p = 0.037$, and negative affect, $t(420) = 8.05$, $p < 0.001$; and neutral affect was felt more than negative affect, $t(410) = 7.79$, $p < 0.001$. The correlations in Table 2 reveal that neutral affect was moderately negative associated with positive affect and slightly positively associated with negative affect. Figure 1 depicts a plot of what percentage of people reported each type of affect across the 10-point scale (reports were round to the nearest integer). In contrast to the idea that people rarely feel neutral, the zero point of the scale clearly indicates that around 22.1% of the sample reported no negative affect, whereas only 6.0% and 6.2% reported no neutral and positive affect, respectively. That is, 94% of the sample reported some neutral feelings. These data indicate that people report neutrality affect in their daily experiences with both intensity and frequency.

Table 1 The pattern matrix from the factor analysis conducted in Study 1

	Factor		
Affect	Positive affect	Neutral affect	Negative affect
Glad	**0.91**	− 0.04	0.01
Joyous	**0.90**	− 0.04	0.04
Delighted	**0.88**	− 0.05	0.04
Pleased	**0.86**	0.02	− 0.02
Proud	**0.82**	− 0.05	0.15
Happy	**0.82**	− 0.05	− 0.17
Satisfied	**0.76**	0.06	− 0.17
Neutral	− 0.07	**0.76**	− 0.22
Indifferent	− 0.08	**0.74**	0.10
Emotionless	− 0.06	**0.74**	0.13
Nothing	− 0.04	**0.72**	0.12
Don't feel strongly	− 0.04	**0.70**	− 0.13
So-so	− 0.07	**0.61**	0.24
Okay	0.28	0.46	− 0.14
Upset	0.02	0.00	**0.86**
Sad	− 0.03	0.06	**0.84**
Unhappy	− 0.12	− 0.06	**0.84**
Blue	− 0.01	0.07	**0.83**
Distressed	0.05	− 0.05	**0.83**
Discouraged	− 0.05	0.03	**0.80**
Anxious	0.04	0.06	**0.69**
Eigenvalues	7.87	3.91	2.89
% Variance	37.48%	18.63%	13.74%

Factor loadings higher than 0.60 are in bold. Eigenvalues based on the reduced matrix. The full item for "don't feel strongly" is "don't feel strongly one way or the other"

Table 2 Descriptive data and correlations among variables in Study 1

	Affective measure		
Affective measure	Positive	Negative	Neutral
Positive	*0.95*		
Negative	− 0.39***	*0.93*	
Neutral	− 0.28***	0.11*	*0.87*
Descriptives			
Mean (SD)	4.46 (2.50) a	2.83 (2.44) c	4.06 (2.37) b
95%CI for the Mean	[4.22, 4.71]	[2.59, 3.06]	[3.83, 4.29]

Italicized numbers on the diagonal are the Cronbach alphas for each scale. All means that do not share a letter significantly differ from each other, $N = 411$

[2] When we examined a 4-factor solution, the results were the same as the 3-factor solution, except that two neutral items (so-so = .50 and okay = .36) now comprised the 4th factor, with rather low loadings. Given these low loadings, it seemed that a 3-factor solution better captured the data. We also examined a 2-factor solution. Here neutral items loaded negatively on the positive affect factor, but all the loadings on this factor were rather modest (0.55 to 0.70). Taken together, we deemed that the 3-factor solution made the most sense.

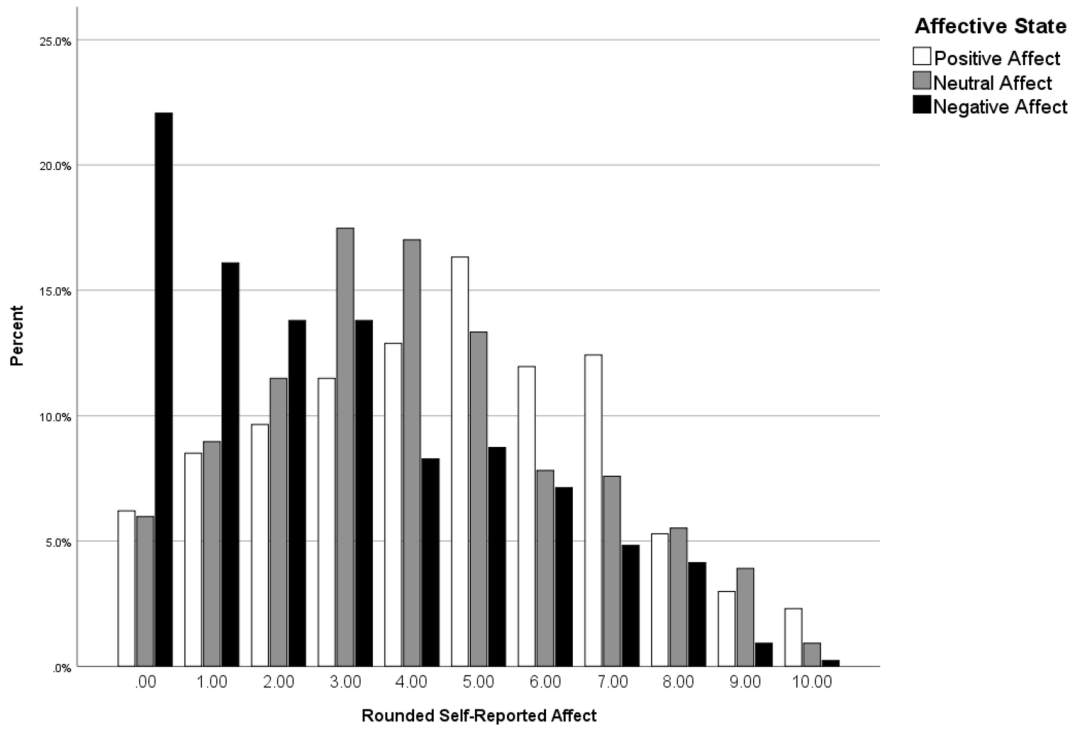

Fig. 1 Distributions of positive, negative and neutral affect in Study 1

Discussion

Study 1 provides initial evidence relevant to two key issues: whether neutral affect is (1) a common experience and (2) independent of positive/negative affect. First, neutral affect was a common, rather than rare, experience, with 94% of the respondents reporting neutral feelings. Second, consistent with prior work, factor analysis revealed that neutral affect formed a third factor. This analysis suggests that neutrality is capturing unique variance and is not necessarily akin to these other affective states.

Study 1 has some limitations. First, it did not adequately address whether neutral affect co-occurs with positive and negative affect. This is because the methodology used in the study might, inadvertently, overestimate their co-occurrence. When using a scale that goes from "*not at all*" to "*extremely*" (as we did in Study 1), participants might misinterpret the scale by viewing the endpoints as reflecting a bipolar scale (Russell and Carroll 1999). For instance, a participant who felt neutral and rated how happy they felt might have viewed the "not at all" option as indicating that they felt sadness rather than as indicating a lack of happiness. Consequently, they might have selected a number closer to midpoint of the scale, rather than the "not at all" option, to reflect neutral feelings (see Russell and Carroll 1999). If this occurred, then people with neutral feelings might be reporting moderate levels of positive or negative affect, suggesting co-occurrence, rather than a minimal amount of it. To address this issue, in Studies 2 and 3, we used the two-step procedure recommended by Russell and Carroll (1999). Respondents first rated whether a state was present and then rated the intensity of the state. This procedure reduces the likelihood that the intensity ratings reflect a misunderstanding of the scale.

A second limitation is that the Pearson correlation coefficient does not address whether neutral affect is mutually exclusive of positive and negative affect (Russell and Carroll 1999; Schimmack 2001; see Larsen and McGraw 2011 for a detailed discussion about correlation and co-occurrence). If mutual exclusivity exists, then when positive or negative affect is present, neutral affect should not be; and when neutral affect is present, positive or negative affect should not be. To examine mutual exclusivity between two constructs, one should graph the data on a coordinate plane and look at the distribution (Larsen and McGraw 2011; Larsen et al. 2017). Mutual exclusivity would result in most of the data points falling along each axis (an L-shaped pattern, reflecting the fact that if a person is positive, they are not neutral, and vice a versa), rather than falling in the middle of the graph, indicating co-occurrence. To examine mutual exclusivity, in Studies 2 and 3, we graphed the data (e.g., neutral vs. positive/negative affect) to look for an L-shaped pattern.

To test for co-occurrence, Schimmack (2001) advocated using MIN scores. If one wants to know if positive and

negative affect co-occur, then I[MF] = MIN[I[PA],I[NA]]. This formula indicates that the intensity of mixed/co-occurring feelings (represented by: I[MF]) is equal to the minimum value for both the intensity of positive affect (I[PA]) and negative affect (I[NA]). If the presence of positive affect means the absence of negative affect, then the MIN value for negative affect should be zero and vice versa. Higher MIN values indicate co-occurrence. For instance, if positive affect is 5 and negative affect is 3, then MIN = 3, but if they do not co-occur, such as when positive affect is 5 and negative affect is 0, then MIN = 0. A similar argument can be applied to examine whether neutral affect is mutually exclusive from positive and negative affect. Thus, in Studies 2 and 3, we calculated MIN scores for neutral and positive/negative affect.[3]

In addition, we provided two additional pieces of information relevant to MIN scores. First, to place the MIN scores in context, we calculated the percentage of people who did not conform to the L-shaped pattern. That is, the percentage of people who reported simultaneously experiencing two states at levels greater than zero at the same time. Second, one issue with MIN scores is that if a state is not commonly experienced, the MIN value will be low. For example, because people tend to experience negative affect less than other affects, MIN scores involving negative states might be zero merely because that state is not experienced rather than because that state cannot be experienced in conjunction with the other state. To take this issue into account, we conducted additional analyses in which we examined the question: If a particular affect is felt (ratings greater than 0 indicate the presence of the respective affect), what is the MIN value? For example, if people reported some negative affect (negative ratings > 0), what is the MIN[I[PA],I[NA]]? If they are mutually exclusive, then if negative affect is 2, positive affect should be zero, and MIN is zero. This analysis eliminates the possibility that MIN values of zero arise purely because the state tends not be experienced in general.

Study 2

Study 2 sought to replicate and extend Study 1 by further examining the association between neutral affect and other affective dimensions within the affective circumplex. We employed the two-step procedure to measure neutral affect and 6 other states reflecting various dimensions of the affective circumplex: positive/negative affect, positive/negative activated states, and positive/negative deactivates states. We investigated whether neutral affect would be discriminable from and co-occur with these different types of positive and negative affect, particularly those similar, deactivated positive (e.g., calm) and negative (e.g., tired) states.

Method

Participants

Participants were 239 MTurk workers. Seven people were dropped because they completed less than 50% of the measures, 3 people were dropped for not passing the attention check (for this response pick option D), and 3 were dropped for taking too little or too much time, leaving 226 people for the final sample (99 men, 124 women, 3 transgendered, $M_{age} = 34.89$ years, $SD = 13.58$, race and ethnicity data were not collected). The results were similar if participants who failed the attention check and took too much or too little time were kept in the analyses.

Materials and procedure

Respondents read that the study investigated what people may feel during any one moment in time. To do so, respondents answered the following: (1) "Are you feeling (insert word)?" and responded by selecting "Yes", "No", or "I don't know what this word means" (2) If they selected "yes," then they rated the intensity of their state by answering "How (insert word) are you feeling? On a 1 = *Very little*, 2 = *A little*, 3 = *Moderately*, 4 = *Quite a bit*, 5 = *Extremely* scale. If they selected "No" or "I don't know what this word means," the response was coded as a zero and they did not rate the intensity of their state. We assessed seven affective dimensions using five items per dimension. The dimensions and items were: positive: happy, pleased, satisfied, joy, cheerful; Negative: sad, depressed, unhappy, blue, down; Positive activation: alert, attentive, energetic, full-of-pep, wide-awake; Negative deactivation: tired, drowsy, dull, inactive, sluggish; Negative activation: anxious, fearful, nervous, tense, scared; Positive deactivation: calm, at-ease, at-rest, relaxed, serene, and Neutral: neutral, indifferent, nothing, emotionless, not strongly one way or the other.

Results

Confirmatory factor analysis

To examine whether neutral affect was discriminable from positive and negative states that varied in activation, we conducted a CFA with each of the 5 affect words loading on each of the hypothesized seven factors (positive, negative, positive activation, positive deactivation, negative activation, negative deactivation, and neutral). We used mean

[3] We did not conduct MIN analyses for Study 1, because this study did not use a two-step procedure to measure affect. As a result, Study 1 could be over-estimating co-occurrence amongst affective states and potentially leading to misleading results.

Table 3 Confirmatory factor analysis from Study 2

	Factor and loadings				
Positive		Positive activated		Positive deactivated	
Happy	0.84	Alert	0.83	At ease	0.85
Pleased	0.82	Wide Awake	0.76	Relaxed	0.84
Cheerful	0.78	Attentive	0.63	Calm	0.74
Satisfied	0.76	Energetic	0.58	At rest	0.70
Joy	0.69	Full of Pep	0.49	Serene	0.60
Negative		Negative activated		Negative deactivated	
Blue	0.94	Anxious	0.89	Sluggish	0.82
Down	0.92	Tense	0.80	Tired	0.71
Sad	0.87	Nervous	0.71	Inactive	0.70
Unhappy	0.86	Fearful	0.54	Drowsy	0.63
Depressed	0.84	Scared	0.47	Dull	0.52
Neutral					
Indifferent	0.63				
Neutral	0.64				
NotOneWay	0.62				
Emotionless	0.51				
Nothing	0.47				
Fit indices					
Chi Square df = 535	871.82, $p < 0.001$				
CMIN/DF	1.63				
CFI	0.93				
RMSEA (90%)	0.053 (0.046, 0.059)				
SRMR	0.078				

All factor loadings are significant

replacement for the 0.15% of missing data. The analyses turned out similar when missing data were dropped. The fit was not ideal: χ^2 (539) = 1172.63, $p < 0.001$, CFI = 0.87, SRMR = 0.081, RMSEA = 0.072, 90% CI [0.067, 0.078]. The modification indices indicated that the following errors should be allowed to covary, perhaps because the items reflect highly similar constructs: tired with drowsy ($r = 0.44$), fearful with scared ($r = 0.76$), energetic with full of pep ($r = 0.54$), emotionless and nothing ($r = 0.26$). When the analyses were rerun covarying the error for the similar terms, the fit improved to be more acceptable (see Table 3, χ^2 (535) = 871.82, $p < 0.001$, CMIN/DF = 1.63, CFI = 0.93, SRMR = 0.08, RMSEA = 0.05, 90% CI [0.046, 0.059]). All items loaded significantly and appropriately on the designated factor. To further examine discriminant validity issues, we conducted 3 additional analyses (AVE, HTMT$^{.85}$, and examined if neutrality should be combined with each of the 6 dimensions, see the Supplemental Materials for these analyses and results). All these analyses clearly supported the hypothesis that neutral affect was discriminable from all the other affects and should be its own dimension.

Descriptives

Table 4 displays the correlations, descriptives, and reliabilities for each of the factors. As before, neutral affect was not highly correlated with other affects. The intensity ratings suggest that neutral affect was reported at less intense levels than positive affects, but at more intense levels than negative affects (except for negative deactivated affect, which occurred around the same level as neutral affect).

MIN

To examine the extent to which neutral affect co-occurred with positive and negative affect, we calculated various MIN values. First, to have a standard of comparison, we examined MIN for positive and negative affect, MIN[I(positive), I(negative)]. The closer the MIN value is to zero, the more likely it is that positive and negative affect do not co-occur. As seen in Table 5, the MIN value for positive and negative affect was 0.08, indicating that positive and negative affect exhibited a low level of co-occurrence. The "% Both"

Table 4 Descriptive data and correlations among variables in Study 2

	Factor						
	Positive	Pos. Act	Neg. Act	Negative	Neg. Deact	Pos. Deact	Neutral
Positive	*0.88*						
Pos. Act	0.56***	*0.81*					
Neg. Act	− 0.36***	− 0.24***	*0.84*				
Negative	− 0.50***	− 0.32***	0.62***	*0.95*			
Neg. Deact	− 0.47***	− 0.58***	0.26***	0.46***	*0.82*		
Pos. Deact	0.63***	0.49***	− 0.58***	− 0.54***	− 0.34***	*0.86*	
Neutral	− 0.36***	− 0.28***	− 0.06	0.08	0.34***	− 0.08	*0.73*
Descriptives							
Mean	1.55c	1.71 b	0.40 f	0.62 e	1.01 d	2.23 a	1.10 d
SD	1.36	1.21	0.80	1.01	1.14	1.37	1.00
95%CI	±0.18	±0.16	±0.11	±0.15	±0.15	±0.18	±0.13

Values in italics on the diagonal are the Cronbach alphas for each scale. Note the following abbrevations: Pos = Positive, Neg = Negative, Act = Activated, Deact = Deactivated

To compute the 95%CIs, add/subtract the number in the 95%CI row from the mean. Means that do not share letters significantly differ from each other $p < 0.05$, *** $p < 0.001$, $N = 226$

column in Table 5 reports the percentage of participants who reported any MIN value greater than zero. Here, the data indicate that only 11.5% of the participants reported feeling both positive and negative affect at the same time. Indeed, as Fig. 2 reveals, when positive and negative affect were graphed together, an L-Shaped pattern emerges revealing a lack of co-occurrence. Together, these two results support prior work indicating that positive and negative affect typically do not co-occur (Russell and Carroll 1999), at least in daily life.

In contrast, the data for the MIN[I(neutral), I(positive)] and MIN[I(neutral), I(negative)] indicate greater co-occurrence. Neutral affect co-occurred with positive affect 54.0% of the time and with negative affect 25.2% of the time. Plots of these neutral vs. positive/negative appear in Figs. 3 and 4 and do not reveal an L-shaped pattern. Neutral affect clearly co-occurred with both positive and negative affect. In terms of the other affective states, the data also reveal co-occurrence: neutral affect co-occurred with negative activated (22.1%), negative deactivated (51.8%), positive deactivated (66.4%), and positive activated (65.9%) states (see the Supplemental Materials for these co-occurrence plots).

Lastly, because uncommon affective states are likely to produce MIN values of zero, we conducted additional analyses to examine the MIN values of two affective states when at least one of them is present (see the second to fourth sections in Table 5). When positive affect was felt ($n = 169$), negative affect was only reported 15.4% of the time whereas neutral affect was reported 72.2% of the time. In terms of negative affect ($n = 68$), 38.2% reported some positive affect whereas 80.9% reported some neutral affect. Lastly, when some neutral affect was reported ($n = 172$), positive affect was reported 70.9% and negative affect was reported 33.1% of the time. Overall, these data clearly indicate that neutral affect often co-occurred with both positive and negative affect.

Discussion

Study 2 provides information relevant to the discriminability of neutral affect from other affective states and its co-occurrence with other affective states. Results indicate that neutral affect is discriminable from positive and negative affect, as well as positive and negative activated and deactivated affective states. The MIN analyses indicate that, replicating Russell and Carroll (1999), positive and negative affect do not often co-occur in daily life[4]. Yet, they also reveal that neutral affect does co-occur with positive and negative affect. Moreover, the highest MIN value appeared between neutral and positive affect and positive deactivated affect, revealing that neutrality is often experienced with both happiness and calmness. Yet, neutral affect is discriminable from both activated and deactivated positive and negative affect, as evidenced by the discriminant analyses and the moderate to low correlations between neutrality and these dimensions. Thus, the data indicate that neutral affect is a distinct state, which can and does co-occur with other affective states.

A key question that remains is the extent to which neutral affect is linked to activation. Neutral states might occur across the activation continuum or they might be more prevalent among deactivated than activated states. The MIN

[4] Keep in mind, when states of ambivalence are induced, positive and negative affect can and do co-occur. These data merely indicate that on a day-to-day basis, ambivalence is not a state that people report with great frequency.

Table 5 MIN values for Studies 2 and 3

	Study 2				Study 3			
	MIN	SD	% Both	95%CI	MIN	SD	% Both	95%CI
Entire sample	N = 226				N = 449			
Positive/Negative	0.08	0.27	11.5	[0.04, 0.11]	0.09	0.29	10.9	[0.07, 0.12]
Neutral/Positive	0.50	0.59	54.0	[0.43, 0.58]	0.91	0.99	57.7	[0.81, 1.00]
Neutral/Negative	0.27	0.58	25.2	[0.20, 0.35]	0.25	0.59	20.0	[0.20, 0.31]
Neutral/Pos. Act	0.66	0.63	65.9	[0.58, 0.75]	0.39	0.63	34.3	[0.33, 0.45]
Neutral/Neg. Act	0.19	0.46	22.1	[0.13, 0.25]	0.22	0.53	19.2	[0.17, 0.27]
Neutral/Pos. Deact	0.80	0.79	66.4	[0.69, 0.90]	1.22	1.16	66.4	[1.11, 1.32]
Neutral/Neg. Deact	0.58	0.83	51.8	[0.48, 0.69]	0.59	0.88	41.2	[0.51, 0.67]
Positive is present	N = 169				N = 348			
Positive/Negative	0.11	0.30	15.4	[0.06, 0.15]	0.12	0.32	14.1	[0.09, 0.15]
Positive/Neutral	0.68	0.59	72.2	[0.59, 0.77]	1.17	0.98	74.4	[1.06, 1.28]
Negative is present	N = 68				N = 119			
Negative/Positive	0.26	0.44	38.2%	[0.16, 0.37]	0.35	0.47	41.2	[0.26, 0.43]
Negative/Neutral	0.90	0.75	80.9%	[0.72, 1.09]	0.96	0.79	75.6	[0.81, 1.10]
Neutral is present	N = 172				N = 331			
Neutral/Positive	0.66	0.59	70.9	[0.57, 0.75]	1.23	0.97	78.2	[1.12, 1.33]
Neutral/Negative	0.36	0.65	33.1	[0.26, 0.45]	0.34	0.66	27.2	[0.27, 0.41]
Activation					N = 449			
Activation/ Deactivation					0.73	0.64	61.0	[0.67, 0.79]
Neutral/Activation					0.56	0.59	52.1	[0.51, 0.60]
Neutral/Deactivation					1.19	1.15	63.5	[1.07, 1.29]
Activation is present					N = 327			
Activation/ Deactivation					1.00	0.54	83.2	[0.94, 1.06]
Activation/ Neutral					0.77	0.56	71.6	[0.71, 0.83]
Deactivation is present					N = 362			
Deactivation/ Activation					0.90	0.60	75.7	[0.84, 0.96]
Deactivation/ Neutral					1.50	1.10	78.7	[1.36, 1.58]
Neutral is present					N = 331			
Neutral/Activation					0.76	0.56	70.7	[0.69, 0.81]
Neutral/Deactivation					1.61	1.05	86.1	[1.49, 1.72]

The "% Both" column indicates the percentage of participants who reported any MIN value greater than zero

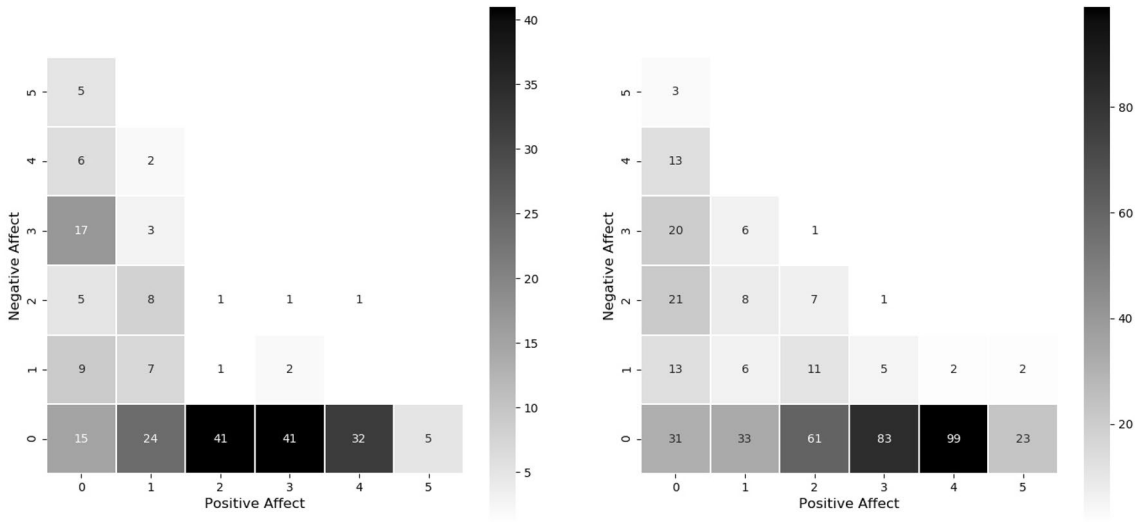

Fig. 2 Co-occurrence of positive and negative affect in Studies 2 (left panel) and 3 (right panel). Note. In both studies, the data fall along the axes to form an L-shaped pattern

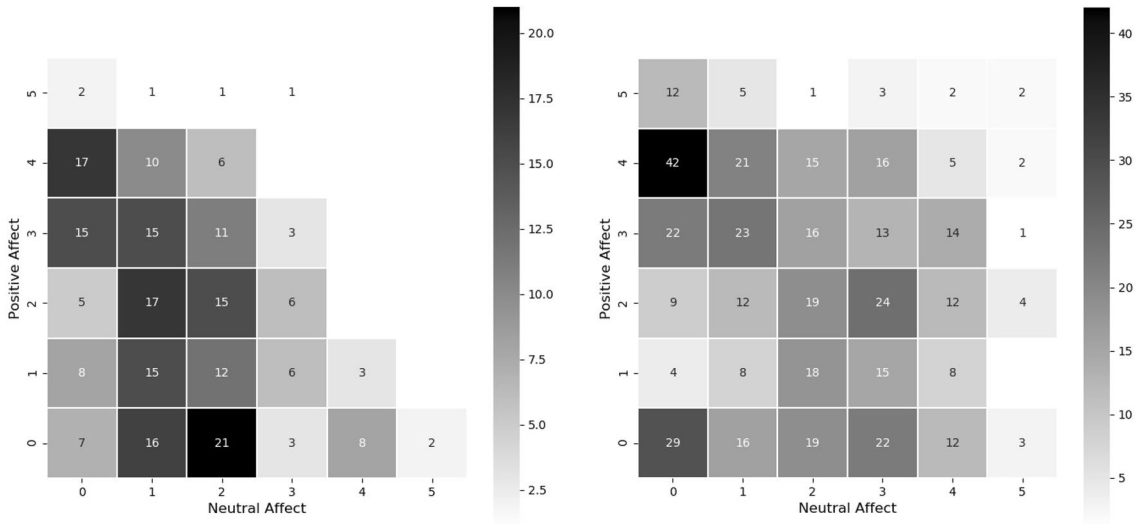

Fig. 3 Co-occurrence of neutral and positive affect in Studies 2 (left panel) and 3 (right panel). Note. In both studies, the neutral affect arises across all levels of positive affect

analyses from Study 2 suggest that neutral affect might occur across the activation continuum, in that neutral affect co-occurred with both activated and deactivated positive/negative affective states. Watson et al. (1999) argue that the key axis of the circumplex are not valence and activation, but rather positive activation and negative activation. Positive activation is the dimension that extends from highly activated positive affect to deactivated negative affect; whereas negative activation is the dimension that extends from activated negative affect to deactivated positive affect. Neutral affect appears to be linearly associated with the positive activation ($r = -0.29$)/negative deactivation ($r = 0.36$) dimension, but not with the negative activation ($r = -0.04$)/positive deactivation dimension ($r = -0.08$, see also Gasper and Gallegos 2018). These results suggest that neutral affect might be more linked to the positive-activation dimension. Unfortunately, because the study did not include a direct measure of activation, it is unclear what the link is between neutrality and activation. Study 3 rectifies this issue by measuring this dimension and trying to replicate the finding that neutrality is more strongly associated with positive activation/negative deactivation dimension than the negative activation/positive deactivation dimension.

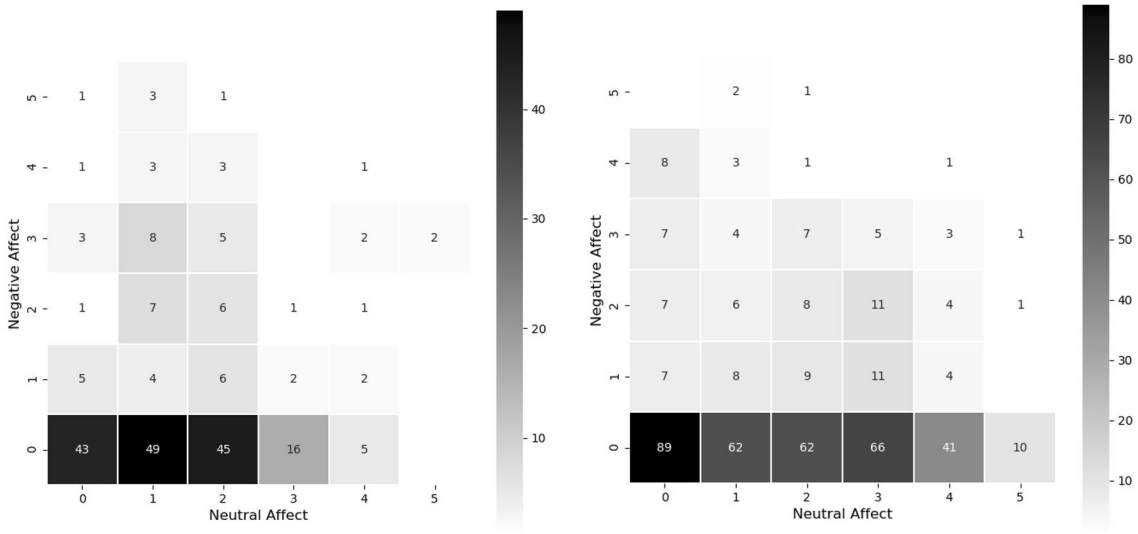

Fig. 4 Co-occurrence of neutral and negative affect in Studies 2 (left panel) and 3 (right panel). Note. In both studies, negative affect was not often reported, but when it arose, neutrality occurred across all levels

Study 3

Study 3 sought to replicate previous findings and investigate if neutral affect occurs at all levels of activation. To this end, we directly measured activated/deactivated states (i.e., arousal), in addition to the 7 affective states assessed in Study 2.

Method

Participants

Respondents ($N = 463$) were recruited via MTurk and paid for their participation. Participants were dropped due to providing no responses on the affect measures (n = 3), spending less than 1 min or more than 30 min (n = 8), not passing the attention check (asked to select answer C for a question, n = 3), leaving 449 people (260 men, 185 women, 4 transgendered; $M_{age} = 32.10$ years, $SD = 10.56$, Caucasian = 76.6%, Asian/Pacific Islander = 7.3%, African American = 7.3%, Latino/a = 5.8%, other = 1.8%). The results were similar when these dropped participants were left in the analyses.

Materials and procedure

The procedure and measures in Study 3 were identical to those of Study 2 with two exceptions. First, in addition to the seven affective dimensions assessed in Study 2, we measured activation and deactivation. Second, to keep the study short, we selected three words to assess each of the affective dimensions, which were selected from Barrett and Russell (1998) and Yik et al. (2011). The dimensions and words to assess them were: (1) positive: happy, pleased, content; (2) positive/activation: excited, strong, enthusiastic; (3) activation: aroused, alert, hyperactivated; (4) negative/activation: jittery, nervous, distressed; (5) negative: miserable, troubled, unhappy; (6) negative/deactivation: tired, dull, sluggish; (7) deactivation: quiet, still, sleepy; (8) positive/deactivation: calm, relaxed, at-rest. The neutral words were the words with the three highest CFA loadings in Study 2: neutral, indifferent, and not strongly one way or the other.

Results

Confirmatory factor analyses

To examine whether neutral affect was discriminable from the other affects, we conducted a CFA with each of the 3 items loading their respective hypothesized factor: positive, negative, activation, deactivation, positive activation, positive deactivation, negative activation, negative deactivation, and neutral. No data were missing. Unfortunately, the covariance matrix was not positive definite. An examination of the data revealed that term "sleepy" correlated 0.77 with the term "tired", 0.63 with "sluggish", and 0.40 with "dull", but not with "still" (0.01) and moderately with "quiet" (0.16) could account for the nonpositive definite matrix[5]. When the analyses were conducted without the term "sleepy", the matrix was no longer not positive definite.

[5] We included "sleepy" on the deactivation factor because Barrett and Russell (1998) did so. In hindsight, it makes sense that sleepy would be associated more strongly with feeling tired than with deactivation.

Table 6 Confirmatory factor analysis in Study 3

	Factor and loadings					
Positive		Positive activation		Activation		Negative activation	
Happy	0.84	Enthusiastic	0.74	Alert	0.67	Distressed	0.85
Pleased	0.77	Strong	0.64	Hyperactivated	0.13	Nervous	0.69
Content	0.75	Excited	0.53	Aroused	0.10	Jittery	0.44
Negative		Negative deactivation		Deactivation		Positive deactivation	
Unhappy	0.82	Sluggish	0.81	Still	0.67	Relaxed	0.83
Troubled	0.81	Tired	0.71	Quiet	0.43	Calm	0.81
Miserable	0.70	Dull	0.58			At rest	0.67
Neutral							
Neutral	0.71						
Indifferent	0.62						
Not Strongly on way or the other	0.61						
Fit Indices							
Chi Square df = 263	679.53, $p < 0.001$						
CMIN/DF	2.58						
CFI	0.91						
RMSEA (90%)	0.059 (0.054, 0.065)						
SRMR	0.069						

All loadings are significant, except for aroused on the activation dimension, $p = 0.08$

The activation factor also was problematic: in hindsight, we noticed that the term "alert", which was hypothesized in Study 2 to reflect *positive activation* based on Yik et al. (2011), was hypothesized in Study 3 to reflect *activation* based on the work of Barrett and Russel (1998). Thus, we examined the model with "alert" both on the activation factor and removed from it[6]. Overall, both models were not ideal solutions. To fully present the data, we decided to report the results for our originally planned model in the paper (alert on the activation factor) and report the results with "alert" removed from the activation factor in the Supplemental Materials. It should be noted that overall, the results were similar with regards to conclusions about the nature of neutrality.

When alert was included on the activation factor, the overall model fit was acceptable, see Table 6. Once again, the CFA analyses supported the conclusion that neutral affect is discriminable from the other affective dimensions. Looking at the factors reported in Table 6, the term "aroused" was problematic in that it did not significantly load on the activation factor. Additionally, both the activation and deactivation factors had low reliabilities (see Table 7). The Supplemental Materials contain information on the analyses for discriminant validity. All analyses indicate that neutral affect is discriminable from the other 8 measured affects. Because of the issues with the activation dimension, we view any conclusions relevant to the activation dimension, especially the activated side, as tentative at best.

Descriptives

Table 7 contains information on the means, standard deviations, reliabilities, and correlations amongst the variables. The pattern of findings is very similar to the results of Studies 1 and 2, with neutral affect not strongly correlating with the other affects and occurring at a lesser extent than positive affects, but greater than most negative affects. The strongest correlation appears between neutral affect and positive activation. With respect to deactivated states, unlike Study 2 in which neutral affect correlated with negative, but not positive deactivation, here neutral affect correlated with both ($r = 0.15$, 0.12, respectively).

[6] We also re-ran the model with alert on the positive activation measure. This model did not have better fit than our original model, χ^2 (263) = 697.10, CMIN/DF = 2.65, CFI = .90, RMSEA = .06 95%CI [.055, .066], SRMR = .07. Because of this lack of better fit, we decided not to include alert on the positive activation factor.

Table 7 Descriptive data and correlations among variables in Study 3

	Factors								
	Positive	Pos.Act	Act	Neg.Act	Negative	Neg.Deact	Deact	Pos.Deact	Neutral
Positive	*0.82*								
Pos.Act	0.59***	*0.67*							
Act	0.38***	0.44***	*0.19*						
Neg.Act	− 0.40***	− 0.16*	− 0.03	*0.71*					
Negative	− 0.54***	− 0.25***	− 0.10*	0.66***	*0.83*				
Neg.Deact	− 0.49***	− 0.37***	− 0.40***	0.31***	0.45***	*0.73*			
Deact	0.13**	− 0.06	0.02	− 0.18*	− 0.07	0.10**	*0.45*		
Pos.Deact	0.62***	0.28***	0.23***	− 0.53***	− 0.51***	− 0.40***	0.36***	*0.81*	
Neutral	− 0.18**	− 0.32***	− 0.19***	− 0.10*	− 0.07	0.15*	0.27***	0.12**	*0.69*
Descriptives									
Mean	1.99 b	0.92 d	0.93 d	0.41 f	0.49 e	0.90 d	2.10 b	2.46 a	1.61 c
(SD)	(1.47)	(1.13)	(0.70)	(0.82)	(0.98)	(1.15)	(1.41)	(1.43)	(1.34)
95%CI	±0.14	±0.11	±0.06	±0.08	±0.09	±0.11	±0.13	±0.13	±0.12

Values in italics on the diagonal are the Cronbach alphas for each scale. Note the following abbrevations: Pos = Positive, Neg = Negative, Act = Activated, Deact = Deactivated

To compute the 95% CIs, add/subtract the number in the 95%CI row from the mean. Means that do not share letters are significantly differ from each other $p < .05$, ***$p < .001$, $N = 449$

MIN

Overall, these results replicated Study 2 (see Table 5). Positive and negative affect once again had low MIN values, only co-occurred in 10.9% of the sample, and displayed an L-shaped pattern (see Fig. 2). The MIN values revealed that neutral affect co-occurred with positive affect, 57.7% of the sample, and with negative affect, 20.0% of the sample. Once again, if positive or negative affect were present, neutral affect was present, 74.4% and 75.6% of the sample, respectively. Moreover, the distribution of neutral and positive/negative affect failed to form an L-shaped pattern (see Figs. 3 and 4), indicating that neutral affect co-occurs with positive and negative affect.

The MIN values between neutral affect and the other states mirrored those found in Study 2. Neutral affect was highly likely to be present when people reported positive affect and positive deactivated affect (for both, more than 50% of the sample reported co-occurrence). Similarly, it co-occurred with negative deactivated states (41.2%) and to a lesser extent with negative and negative activated states (20.0%). However, with respect to the association between neutral affect and positive activation, the two co-occurred 65.9% of the time in Study 2, but only 34.3% of the time in Study 3. This difference might have arisen because the words used to measure positive activation in Study 2 reflected more energy (energetic and wide awake), whereas those used in Study 3 reflected more positivity (enthusiastic and excited). Perhaps, neutrality is more likely to co-occur with having energy than with being enthusiastic.

We also looked at the MIN values for activation (see the bottom part of Table 5). Given the limitations of these measures, we view these data as exploratory at best. First, there was no evidence that activation and deactivation were mutually exclusive, for they co-occurred 61.0% of the time. Moreover, neutral affect co-occurred with activation and deactivation 52.1% and 63.5% of the time, respectively. The MIN values for neutral/deactivation, however, were higher than those for neutral/activation, $t(448) = 8.03$, $p < 0.001$. Overall, these tentative data indicate that neutral affect occurs at all levels of activation, but its highest co-occurrence is with deactivated states.

Discussion

Study 3 mostly replicated the findings of Study 2. Neutral affect was discriminable from, yet co-occurred with, other affective states. It co-occurred with positive and negative affect and arouse at all levels of activation. Because the activation/deactivation construct was not reliably measured, the conclusion regarding this dimension should be viewed as tentative. Nonetheless, the data from Studies 2 and 3 together suggest that neutral affect is a common state, is discriminable from other affective reactions, yet co-occurs with them, especially those reflect deactivated states.

General Discussion

This project directly measured neutral affect and examined the extent to which the data supported 4 untested theoretical assumptions about it. Below is a summary of the key findings and a discussion of their limitations and implications for theory.

Existence of neutral affect

The data indicate that people can and do report feeling neutral. Study 1 revealed that 94% of respondents reported some neutral feelings as a spontaneous, daily experience. Studies 2 and 3, using a more conservative measure, found that approximately 76.1% and 73.7% of the participants, respectively, reported experiencing neutral affect. Neutral feelings were generally reported less often than positive experiences, but significantly more than negative feelings. Thus, in contrast to the idea that neutral affect rarely occurs, these data suggest that not only do people experience neutral affect, but they also experience it on a regular basis.

Neutral affect is independent of positive and negative affect

Exploratory and confirmatory factor analyses, as well as tests of discriminability, revealed that neutral affect was discriminable from positive and negative affect. Neutral affect regularly formed its own factor, one that accounted for unique variance, and was not redundant with other affective measures. Even though it was discriminable from other states, the MIN data and the bivariate plots reveal that neutral affect can and does co-occur with positive and negative affect. Therefore, it is insufficient to define neutral affect as the absence of other affects, because people report feeling neutral affect in combination with them.

Even though correlational data are inadequate to address issues concerning mutual exclusivity, they can provide information concerning the extent to which neutral affective states are linearly associated with other states. Because we obtained multiple correlations measures across the studies, we used meta-analysis to compute an overall effect size. According to Cohen (1988), correlations of 0.10 reflects a small association, 0.30 a moderate association, and 0.50 a large association. In Studies 1 to 3, neutral affect was moderately negatively correlated with positive affect (r = -0.28, -0.36,—0.18, fixed effect model, $r = -0.26$, 95% CI [− 0.31, − 0.20], $z = -8.61$, $p < 0.001$) and not significantly correlated with negative affect ($r = 0.11, 0.08, -0.07$, fixed effect model, $r = 0.03$, 95% CI [− 0.03, 0.09], $z = 0.97$, $p = 0.33$).

The co-occurrence data reveal that across the entire sample, neutrality co-occurred with positive affect (54.0%, 57.7%) at a higher percentage than negative affect (25.2%, 20.0%). The lower co-occurrence rates with negative affect might stem from the fact that negative affect is a less common experience than positive affect. However, the likelihood of neutrality co-occurring with either of them is high. Indeed, when one examines the co-occurrence rates when positive or negative affect were reported, the co-occurrence rates with neutrality were always above 70% (positive is present 72.2%, 74.4%, negative affect is present: 80.9%, 75.6%). These data further underscore that the presence of positive or negative affect does not indicate the absence of neutral affect.

Overall, the data do not support the hypothesis that neutral is only felt when positive and negative affect are minimal or absent. Instead, people reported feeling neutral in conjunction with both positive and negative affect. A key methodological implication of this finding is that to determine whether neutral affect is present, researchers need to directly assess it rather than infer its presence by the absence of or low levels of positive and negative affect.

Association with activation

The project sought to examine whether neutral affect arose at all levels of activation or whether it predominately arose at the deactivated end of the continuum. Unfortunately, the measures of de/activation exhibited poor reliability and validity, reflecting Watson et al.'s (1999) observation that it is difficult to identify terms that solely assess activation. This lack of reliability and validity associated with the activation dimension limits this project's ability to make conclusions about neutral affect and activation.

Keeping these issues in mind, the data *tentatively* support the idea that neutral affect appears to occur when people feel activated or deactivated, but particularly when people feel deactivated, as evidenced by the MIN value and the correlational data. Specifically, neutrality negatively correlated with the activated dimension and positively correlated with the deactivated dimension. Even though neutral affect was reported along all levels of de/activation, it was discriminable from this dimension as reflected by the confirmatory factor analyses and discriminant analyses. The fact that neutrality appeared at both low and high levels of activation might at first seem to suggest that activation reflects a neutral corridor. However, neutral affect also co-occurred at similarly high rates with other affects, which are not part of the activation corridor, suggesting that the activation dimensions does not seem to be the predominate space where neutrality arises. Thus, neutrality appears to be distinct from the activation dimension, yet co-occurs with it.

Because the activation dimension was problematic, it might be worthwhile to examine the extent to which

neutrality co-occurred with positive and negative activated states. Neutral affect was moderately negatively correlated with positive activated states ($r = -0.28, -0.32$, fixed effect model, $r = -0.31$, 95% CI [− 0.37, − 0.24], $z = -0.8.20$, $p < 0.001$) and weakly negatively associated with negative activated states ($r = -0.06, -0.10$, fixed effect model, $r = -0.09$, 95% CI [− 0.16, − 0.11], $z = -2.25$, $p = 0.02$). It also was more likely to co-occur with positive activated states (65.9%, 34.3%) than negative activated states (22.1%, 19.22%). Together, these data suggest that neutrality still arouse on the activated end of the continuum, but was moderately negatively associated with positive activation and weakly associated with negative activation.

Discriminable from deactivated affects

Lastly, the data indicate that neutral affect is discriminable from both positive and negative deactivated states. In terms of deactivated states, the correlational data reveal an opposite pattern of what appeared for activated states. Now, neutral was weakly to moderately associated with a negative deactivated state ($r = 0.34, 0.15$, fixed effect model, $r = 0.22$, 95% CI [0.14, 0.29], $z = 5.66$, $p < 0.001$), but not significantly associated with a positive deactivated state ($r = -0.08, 0.12$, fixed effect model, $r = 0.05$, 95% CI [− 0.02, 0.13], $z = 1.39$, $p = 0.17$). If one used Watson et al.'s (1999) view that the key circumplex dimensions are positive and negative activation, these results suggest that neutral affect might be associated with the positive activation dimensions (high positive activation to low negative deactivation, meta-analytic r's $= -0.31, 0.34$), rather than the negative activation dimension (high negative activation to low positive deactivation, meta-analytic r's $= -0.09, 0.05$).

Correlational data, however, only provide evidence concerning the extent to which two variables are linearly associated. The data for co-occurrence revealed that even though neutrality was not highly correlated with positive deactivated states, it was likely to co-occur with them (approximately 66% co-occurrence in Studies 2 and 3). Neutrality also was likely to co-occur with deactivation (63.5%) and with negative deactivated states, 51.8% and 41.2% in Studies 2 and 3, respectively. Thus, clearly, neutrality co-occurs with deactivated states.

Limitations and implications

It is important to keep in mind that this research is descriptive and correlational in nature. However, research in which neutral affect was manipulated has found results that were consistent with these. For example, Gasper and Hackenbracht (2015) manipulated different types of affect by exposing participants to negative, neutral, or positive pictures. Results indicated that neutral affect was not strongly correlated with positive and negative affect. In addition, neutral affect accounted for unique variance in participants' affective states when controlling for positive and negative affect (see also Gallegos and Gasper 2018; Gasper and Danube 2016). Thus, these findings provide supportive evidence that neutral affect arises somewhat independently of positive and negative affect.

Second, we assessed affect by using self-report measure because this methodology provides information about intrapsychic information (e.g., emotional experiences in the moment), which is otherwise hard to obtain (Paulhus and Vazire 2007). It is important to collect self-report data on affect to understand individuals' subjectively experienced feelings that do not necessarily turn into observable outcomes. Nonetheless, self-reports can be inaccurate (Paulhus and Vazire 2007). Therefore, future research should investigate alternative ways to assess neutral affective experiences.

Third, these data might overestimate the experience of neutrality and deactivated positive and negative affect. Participants might have completed these studies when they felt like going on-line to do something. It seems likely that many of these people were probably in a deactivated rather than an activated state. Even so, the people who did report affect at the extremes of the scale, often reported neutral feelings. Nevertheless, future research should examine the presence of neutrality with more intense levels of activated states.

Fourth, additional factors associated with this sample should be kept in mind. The samples consisted of people living in the United States, who were mostly White, had internet access, and were willing to do surveys for money. In other cultures, neutrality might arise to a greater or lesser degree (for discussion, see Gasper et al. 2019). We suspect people might be more willing to profess to neutral feelings if their culture places greater emphasis on not having extreme reactions and being open to a middle-ground.

In terms of implications, this work suggests that some assumptions in the core affect perspective, the ESM, and work on self-regulation might need clarification or refinement. In terms of the core-affect perspective, rather than lie in the center of the circumplex, neutral affect appears to arise across all circumplex dimensions. In terms of linear associations, the strongest correlations are along the 45-degree diagonal, reflecting a negative association with positive activation, and a positive association with negative deactivation. In terms of valence, neutrality is negatively associated with positive affect, but not associated with negative affect. Lastly, because of the measurement problems we encountered, it is unclear to what extent neutrality is associated with the activation dimension, but it did arise across all level of it. The failure to find terms that measure this dimension echoes Watson et al.'s, (1999) concerns about this construct. In

terms of the ESM, the data indicate that neutrality should not be thought of as a state that only arises when positive and negative affect are minimal or absent. Instead, neutral affect might reflect another dimension, independent of positive and negative affect, in which indifferent feelings are present. By defining neutrality as the lack of positive and negative affect, the ESM may fail to fully capture neutrality as an affective experience. In terms of self-regulation, co-occurrence of multiple affective states suggests that the signal that affect provides concerning one's rate of progress towards their goals might sometimes be difficult to read given that more than one state might be felt at the same time. These are just some of the potential possibilities for how this work might shape theorizing, but clearly more data are needed.

One reason why more data are needed is that this project focused on people who were mostly experiencing mild affective reactions, not extreme reactions. A researcher could argue that the data in this paper reflect what happens if one were to focus on only a small region of the affective landscape, such as if one were to zoom in on the center of the affective circumplex. The co-occurrence might merely indicate that within this small region overlap arises. We do not think that this is the case, in part because neutral affect did co-occur when people reported more extreme states. Looking at Figs. 3 and 4, when people reported more intense affective reactions, neutrality still arouse. In addition, when researchers experimentally manipulated affective reactions, thus instilling more intense states in their participants, people still reported neutral affect (Gallegos and Gasper 2018; Gasper and Hackenbracht 2015). We do think that in some instances, more intense affective reactions might be associated with less neutrality (Hu and Gasper, in prep), but the presence of an affective reaction need not imply the absence of a neutral reaction.

In addition to contributing to theory, this work provides a methodological contribution, in that is delineates a method that people can use to assess neutral affect. Specifically, the data reveal that the items we used to assess neutrality, such as feeling indifferent or not strongly one way or the other, not only coalesced to form a reliable single construct, but also formed a construct was distinct from other types of affect. If researchers are interested in neutrality, then this work underscores not only the fact that neutral affect should not be inferred from the lack of other affects, but also provides a means to directly measure it.

It is important to recognize that we view neutrality as the presence of an affective reaction. This view might seem odd, given that we measured neutral affect with terms such as "emotionless" and "nothing," which seem to reflect the absence of an emotional state. We included these terms because colloquially, in English, people with no strong preference might say they feel emotionless or nothing in particular. But, it is important to point out that neutrality is not the same as literally having no feeling. For instance, the literal absence of affect might be experienced as feeling emotionally numb, which is different from feeling neutral. Indeed, Gallegos and Gasper (2018) measured neutrality (indifferent, nothing, emotionless, so-so, nod feelings strongly one way or the other, and meh) and numbness (numb, unfeeling, detached, insensitive, and emotionally dead). These two constructs were correlated ($r = 0.60$), but numbness was strongly associated with negative affect ($r = 0.44$), whereas neutrality was not ($r = -0.01$). Feeling numb is more of a negative experience, whereas feeling neutral is more of an everyday experience.

Conclusions

This project examined four central issues concerning the nature of neutral affect. First, in contrast to the assumption that neutral affect does not exist, people can and do feel neutral. In fact, after positive states, neutral affect was the next highest in terms of prevalence and intensity. Second, neutral affect was largely independent of positive and negative affective states. Analyses revealed that neutral affect formed its own factor that was discriminable from these states and co-occurred with them. Third, keeping in mind the limits of the activation measures, neutral affect arose at all levels of activation, but tended to be reported more at the deactivated end of the continuum. Finally, neutral affect was distinct from both positive and negative deactivated states. With these findings in mind, we encourage researchers to re-examine their empirical, methodological, and theoretical views about the nature of neutral affect. By making room for neutral affect, researchers can better understand not only neutrality but also the broader landscape of affective experience.

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Data availability The data are currently deposited at OSF. To see the data go here: https://osf.io/3s65w/?view_only=23558920d6564beba8faf60cb9903537. The data will be made public and assigned a doi upon acceptance.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval Approval was obtained from the Office of Research Protections at The Pennsylvania State University. The procedures used in this study adhere to the tenets of the Declaration of Helsinki.

Informed consent Informed consent was obtained from all individual participants included in these studies.

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