Single Experience and Self-Implicit Association Test (SES-IAT)

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Abstract

Buddhist thought and contemporary psychological science suggest that an important mechanism through which mindfulness contributes to well-being is by reducing self-referential processing of experience and cultivating selfless processing of experience. Self-referential processing of experience is implicated in prevalent forms of suffering and mental health problems. In contrast, selfless processing of experience is considered to be fundamental for the cultivation of attitudinal qualities of mindfulness (e.g., non-judging) and of a metacognitive process subserving decentering (e.g., disidentification from internal experience). Critically, study of these processes has been limited by the absence of behavioral measurement methods of self-referential and selfless processing of experience. Accordingly, the Single Experience & Self-Implicit Association Test (SES-IAT) was developed to behaviorally measure these processes. It involves the experimental elicitation of a subjective experience (e.g., elicitation of fear using videos and audio), while concurrently measuring the cognitive association between self and the elicited experience (e.g., fear) by means of a Single Category-Implicit Association Test. Based on this method, the fear SES-IAT was designed to measure self-referential and selfless processing of fear. Experimental and correlational findings indicate that the fear SES-IAT measures selfless processing of fear, identification with fear, and negative self-referential evaluation of fear. Importantly, findings also support the fear SES-IAT as a measure of key attitudinal qualities of mindfulness and of a metacognitive process subserving decentering (i.e. disidentification from internal experience). This chapter describes the theoretical foundations of the SES-IAT, findings supporting its reliability and validity, its methodology and score computation, and possible future directions for the SES-IAT.

Key Words: Behavioral Assessment of Mindfulness, Behavioral Measurement of Mindfulness, Decentering, Disidentification, Implicit Association Test, Mindfulness Mechanisms, Attitudinal Qualities of Mindfulness, Self-Reference

Theoretical Foundations

Mindfulness entails the practice of sustained non-reactive attention and awareness of present-moment subjective experience such as sights, sounds, bodily sensations, emotions, and thoughts (Anālayo, 2003; Bishop et al., 2004; Kabat-Zinn, 2013; Segal et al., 2013). In the Buddhist *Pāli* canon, this form of non-reactive awareness has been described as in the following way: “In reference to the seen, there will be only the seen; In reference to the heard, only the heard; In reference to the sensed, only the sensed; In reference to the cognized, only the cognized” (Thanissaro, 2021). Importantly, in Buddhist thought, this form of awareness practiced in mindfulness meditation, is thought to alleviate suffering by reducing self-referential processing of present-moment subjective experience (Anālayo, 2003; Olendzki, 2006). In the Buddhist *Pāli* canon, this mechanism of mindful awareness has been described as follows: “when for you there will be... only the sensed in reference to the sensed... then... there is no you in connection with that. When there is no you in connection with that, there is no you there... This, just this, is the end of stress” (Thanissaro, 2021).

Likewise, in contemporary psychology, among other salutary functions, mindful awareness is described as reducing negative self-referential evaluation of experience (non-judging; Kabat-Zinn, 2013; Linehan, 1993) and producing a decentered experience of internal states as separate from one’s self (i.e., disidentification from internal experience; Bernstein et al., 2015; Hölzel et al., 2011). Yet, and important for research on mindfulness, decentering, and mental health, study of these processes has been limited by the absence of behavioral measurement methods of these phenomena. Accordingly, in this chapter we focus on a novel behavioral method to measure experiential self-referential processing (ESRP) – the cognitive association of present-moment subjective experience with the self; and the inverse process of experiential selfless processing (ESLP) – the processing of present-moment subjective experience without self-referentiality (Hadash et al., 2016). The following paragraphs

describe these processes and their functions based on what we refer to here as the Cognitive Self-Construction Model (CSCM; Figure 1). The CSCM is a working model elucidating how different forms of self-referential processing subserve the phenomenology of self, and its relation to present-moment subjective experience.

Figure 1. The Cognitive Self-Construction Model (CSCM). The middle circle reflects present-moment subjective experience. When people engage in experiential selfless processing (ESLP), their experience is reflected by the middle circle alone – present-moment subjective experience devoid of a minimal or a narrative sense of self. The minimal self ring reflects a phenomenological sense of being the immediate subject of experience subserved by experiential self-referential processing (ESRP) – cognitive association of self with present-moment subjective experience (e.g., identification with, or self-referential evaluation of, subjective experience). The narrative self ring reflects a sense of self extended in time and self-focused thought subserved by Narrative Self-Referential Processing (NSRP) – cognitive association of self with experience and

attributes across time. The CSCM model figure is based on Dor-Ziderman et al. (2013, Figure 1), Farb et al. (2007), Gallagher (2000), and Tagini and Raffone (2010).

Sensory subjective experience such as sights, sounds, bodily sensations, and subjective experience of emotions and thoughts are basic elements of consciousness (Block, 1995; Damasio, 1999). ESRP is the cognitive association of these exteroceptive, interoceptive and mental experiences with the self and is thought to lead to a minimal sense of self – a phenomenological sense of being the immediate subject of experience (Hadash et al., 2016; Northoff et al., 2006). ESRP reflects several kinds of cognitive associations between present-moment subjective experience and self (see Hadash et al., 2016 for a summary of key forms of ESRP). One form of ESRP is *identification with experience* – relating to experience such as thoughts, emotions and sensations as parts of the self (Bernstein et al., 2015). For example, when a person is identified with his or her experience of fear, he or she may verbally relate to it by noting “I am afraid”; when disidentified from fear, he or she may relate to it by simply noting “a feeling of fear.” A second form of ESRP is *self-referential evaluation of experience* – assignment of a self-referential value/interpretation to an experience, such as: ‘I love this feeling’ and ‘I shouldn’t think this way’ (Hadash et al., 2016).

A related important form of self-referentiality has been referred to as narrative self-referential processing (NSRP; Hadash et al., 2016). NSRP refers to the cognitive association between self and experiences and attributes *across time* and is thought to lead to a narrative sense of self (Dor-Ziderman et al., 2013; Farb et al., 2007). The narrative self is self as an object of thought (cf. subject of experience). It is extended in time and creates a phenomenological sense of identity and continuity across time (Gallagher, 2000; Tagini & Raffone, 2010). It is characterized by self-focused thinking, and has been suggested to take many forms such as self-reflection, rumination, worry, and self-criticism (Mennin & Fresco, 2013).

ESLP is the processing of present-moment subjective experience without self-referentiality (Figure 1) and leads to a phenomenological experience devoid of a minimal or narrative sense of self (Dor-Ziderman et al., 2013; Hadash et al., 2016; Tagini & Raffone, 2010). For example, when a person is engaging in ESLP of fear, he or she may relate to it in a decentered manner, by simply noting “a feeling of fear” (instead of “I am afraid”, “I shouldn't be afraid” or “I am an anxious person”). Therefore, while engaging in ESLP, present-moment subjective experience is processed in a decentered manner, as simply experience in consciousness – “In reference to the seen, there will be only the seen; In reference to the sensed, only the sensed” (Thanissaro, 2021).

In the Buddhist tradition, ESRP is conceptualized as a cause of suffering; in turn, ESLP is a key pathway through which mindfulness alleviates suffering (Olendzki, 2006). Contemporary psychological research has advanced similar ideas. Excessive identification with fear and anxiety, and negative self-referential evaluation of fear and anxiety are implicated in the development and maintenance of anxiety psychopathology (anxiety sensitivity; Bernstein & Zvolensky, 2007; Taylor et al., 1992; Taylor, 1999). In turn, the capacity to relate to unpleasant thoughts and other internal states without self-referentiality in mindfulness practice (e.g., ‘this is just a thought/feeling’ vs. ‘I think that...’ or ‘I hate it when I’m so upset’) is considered to be fundamental for the cultivation of key attitudinal qualities of mindfulness (e.g., non-judging; Hadash & Bernstein, 2019; Hölzel et al., 2011). Importantly, it may reduce a person’s cognitive, affective, and behavioral reactivity to those internal states, such as reactions of avoidance or negative repetitive thought (Shapiro et al., 2006; Teasdale et al., 2002). Furthermore, selfless processing of experience is conceptualized to be fundamental for the cultivation of decentering – a central mechanism of action of mindfulness practice (Bernstein et al., 2015; Bernstein et al., 2019). For example, the capacity to separate one’s self and disidentify from unpleasant internal states (a

metacognitive process subserving decentering) has been theorized to promote greater tolerance of these states (Bernstein et al., 2015; Hayes et al., 2012; Shapiro et al., 2006). Thus, according to Buddhist and contemporary psychological science, ESRP is a source of suffering and mental health problems; and ESLP may be fundamental for the cultivation of attitudinal qualities of mindfulness and decentering, and a key salutary mechanism through which mindfulness alleviates suffering.

Measure Development and Overview

In line with calls regarding the importance of behavioral (Baumeister et al., 2007; Furr & Funder, 2007) and implicit (Fazio & Olson, 2003; Greenwald et al., 2009) measurement methods broadly, and for mindfulness-related processes more specifically (Davidson & Kaszniak, 2015; Garland & Gaylord, 2009; Sauer et al., 2013), Hadash et al. (2016) developed and tested a novel implicit behavioral method to measure ESRP and ESLP. Implicit behavioral measurement methods are important to advance the science of mindfulness and self-referential processing in a number of ways. First, such methods could facilitate measurement of these processes, which are not typically verbally accessed and reported, yet behaviorally expressed (Baumeister et al., 2007). Second, such methods are less susceptible to biases of retrospective self-report scales (Shadish et al., 2002). Third, the accuracy of implicit behavioral measurement methods is less likely dependent on changes in introspective abilities or meta-awareness that may result from mindfulness practice (Grossman, 2008; Sauer et al., 2013). Finally, such methods facilitate measurement of ESRP and ESLP without interfering with the expression of these phenomena via meta-awareness or introspection that may be elicited by self-report (Hadash et al., 2016).

The novel implicit behavioral method involves an experimental elicitation of a specific subjective experience (e.g., via video and audio stimuli), while concurrently measuring participant's cognitive association between self and the elicited subjective

experience. Measurement of this cognitive association is conducted via the Single Category-Implicit Association Test (SC-IAT; Karpinski & Steinman, 2006). Because Hadash et al. (2016) aimed to measure the association between a single experience and the self, they named this modified SC-IAT the Single Experience & Self-Implicit Association Test (SES-IAT; all reported methods and findings in this section are based on Hadash et al., 2016).

In the first study of the SES-IAT, they focused on one variant of this method designed to measure ESRP and ESLP of fear – the *fear SES-IAT*. Fear was selected due to its importance in multiple forms of maladaptation and psychopathology (Barlow, 2004; Olatunji & Wolitzky-Taylor, 2009; Taylor, 1999) and because fear is relatively well understood and may be experimentally elicited with sufficient and reliable intensity (Gross & Levenson, 1995; Kreibig et al., 2007). The fear SES-IAT included an experimental fear elicitation via short frightening videos played before SC-IAT test blocks and scary background audio played during SC-IAT test blocks (Figure 2; see *Experimental fear elicitation* subsection below for more details). ESRP and ESLP of fear were measured by means of a SC-IAT measuring participant's cognitive association between fear and self. During the task participants were instructed to sort target words presented on a computer screen into categories by pressing one of two keys on every trial (see Table 1 for target words in each category). The fear SES-IAT categorization task included three categories: *me*, *fear*, and *office equipment* (neutral category). As in other IATs, the fear SES-IAT consists of a *congruent stage* and an *incongruent stage*. In the congruent stage, the categories *me* and *fear* are assigned the same response key, such that participants use the same key to correctly respond to *me* and *fear* target words. In the incongruent stage the *me* and *fear* categories are assigned different response keys, such that participants use different keys to correctly respond to *me* and *fear* target words (Figure 2; see “Single Category-Implicit Association Test (SC-IAT)” subsection below for more details).

Figure 2. Fear SES-IAT congruent and incongruent test blocks

Table 1

Categories and target words for the Fear Single Experience & Self-Implicit Association Test (fear SES-IAT).

Category	Words
Me	I, me, myself
Fear	fear, fright, anxiety, horror, panic, terror
Office equipment	notebook, folder, paper

In line with IAT and SC-IAT scoring algorithms (Greenwald et al., 2003; Karpinski & Steinman, 2006), the outcome of the SES-IAT is a D-score (Difference score) based on the difference in the mean response time (RT) between *congruent* and *incongruent stages* (Figure 3; also refer to *D-score computation* subsection below for more details). This results in a D-score that can be either positive, negative or around 0. Higher positive D-scores, reflecting faster RTs in the congruent stage than the incongruent stage, were expected to represent identification with fear (e.g., “I am afraid”). This is because identification with fear is hypothesized to facilitate RT in the congruent stage (*me* and *fear* share the same key) and inhibit RT in the incongruent stage (*me* and *fear* have different keys). Lower negative D-scores, reflecting slower RTs in the congruent stage than the incongruent stage, were expected to represent negative self-referential evaluation of fear (e.g., “I don’t want to be afraid”). This is because negative self-referential evaluation of fear is hypothesized to inhibit RT in the congruent stage and facilitate RT in the incongruent stage. Finally, D-scores around 0, reflecting no meaningful difference between RTs in congruent and incongruent stages, were expected to represent ESLP of fear or reduced ESRP of fear (e.g., “a feeling of fear”; see Figure 3). This is because participants engaging in ESLP of fear or in reduced ESRP of fear should not be affected by the assignments of response keys to *me* and *fear* and therefore will demonstrate similar RTs in both stages.

Figure 3. Outline of the fear SES-IAT D-score computation and forms of ESRP and ESLP reflected by D-scores. For a detailed computation see Table 3. $\overline{RT}$: mean response time; SD_{RT} : standard deviation of response times; $D-score$ = difference score. Figure adapted with permission from Hadash et al. (2016).

Detailed Measure Methodology

Single Category-Implicit Association Test (SC-IAT). To measure participants' cognitive association between self and a present-moment experience of fear, the fear SES-IAT utilizes the SC-IAT methodology (Karpinski & Steinman, 2006) combined with an experimental fear elicitation via short frightening videos played before SC-IAT test blocks and scary background audio played during SC-IAT test blocks. In the fear SES-IAT participants are instructed to sort target words into the following three categories: *me*, *fear*, and *office equipment* (see Table 1 for target words in each category). To encourage a construal of the *me* category as a minimal non-narrative self the SES-IAT includes first person personal pronouns (I, me, myself) as target words for the *me* category (in line with methodology used in Esslen et al., 2008). *Office equipment* functioned as a neutral category,

unrelated to *me* or *fear*, to permit the task to measure only the cognitive association between *me* and *fear* (for a similar use of a neutral category in an IAT see Czopp et al., 2004).

On each trial, a target word is presented in lowercase letters in the center of the screen until the participant responds by pressing one of two keys. Following each response, an inter-trial interval of 1,500ms with a blank screen appears if the response is correct, or with a red X if the response is incorrect. To decrease the overall duration of the task, we are currently testing whether the inter-trial intervals may be reduced to 500ms without harming the task's psychometrics.

The SES-IAT consists of two stages, each containing a practice block and three test blocks (Table 2). In the congruent stage the categories *me* and *fear* are assigned the same response key; whereas in the incongruent stage they are assigned different response keys (Figure 2). In line with previous SC-IAT studies (Karpinski & Steinman, 2006), each block (except for the second practice block) includes 24 randomly selected trials comprised of 7 trials presenting target words for each of the two categories assigned the same response key and 10 trials presenting target words for the other category. The presentation order of the two stages is randomized or counter-balanced between participants in order to test for possible IAT presentation/pairing order effects – differences in D-scores depending on presentation order of congruent and incongruent stages (see *Testing for IAT presentation/pairing order effects* subsection below for more details). As suggested in previous IAT methodological research, the second practice block in the SES-IAT contains 40 trials in order to reduce the presentation/pairing order effect (Nosek et al., 2005). Findings indicated that when using this methodology, the presentation/pairing order effect was eliminated from the SES-IAT (Hadash et al., 2016).

Table 2

Procedure of the Fear Single Experience & Self-Implicit Association Test (fear SES-IAT).

Stage	Block	Trials	Response key A	Response key B
Congruent	Practice	24/40	Me + Fear	Office equipment
	Test 1	24	Me + Fear	Office equipment
	Test 2	24	Me + Fear	Office equipment
	Test 3	24	Me + Fear	Office equipment
Incongruent	Practice	24/40	Me	Office equipment + Fear
	Test 1	24	Me	Office equipment + Fear
	Test 2	24	Me	Office equipment + Fear
	Test 3	24	Me	Office equipment + Fear

Note. The first test block in each stage is preceded by two frightening videos and a reminder of the task instructions. All other test blocks are preceded by one frightening video. Monotonic scary background audio is played during the test blocks. The first practice block includes 24 trials and detailed description of the task instructions and the second practice block includes 40 trials and a shorter description of the task instructions. Table reprinted with permission from Hadash et al. (2016).

The following task instructions are presented at the beginning of the task, before the first practice block:

“In this task words will be presented on the screen one after the other. You will need to sort these words into categories according to their literal meaning. The categories and the words that fit into them are as follows [show Table 1]. Place the index finger of each hand on the right and left response buttons. In this task you are asked to sort words that will be presented in the center of the screen into categories. The labels of the categories are presented at the bottom of the screen [labels are presented at the bottom of the screen like

in Figure 2 according to the allocated response keys]. If the word in the center of the screen fits the category [or one of the categories] at the bottom-*left side* of the screen press the *left button*. If the word in the center of the screen fits the category [or one of the categories] at the bottom-*right side* of the screen press the *right button*. During the task the categories that fit each button will remain at the bottom of the screen. Each word fits into one category only. If you make a mistake an X will appear on the screen. Try to sort the words as quickly as you can while making as few mistakes as possible.”

A brief version of these instructions referring to the button allocations and reminding participants to sort the words as quickly as they can while making as few mistakes as possible is presented before the second practice block and before the first test block at each stage (Table 2). Instructions before the second practice block emphasize that the *fear* category switched sides.

Experimental fear elicitation. As in extant emotion elicitation studies (Gross & Levenson, 1995; Kreibig et al., 2007), fear is elicited via eight short frightening videos (< 1 min each) presented before each test block (see Hadash et al., 2016 supplemental materials for selection process). To provide a strong initial fear manipulation, the first test block in each stage is preceded by two frightening videos. All frightening videos are randomly selected and presented without replacement during the task. Before the first presentation of the videos participants are presented with instructions stating:

“Now, and during the experiment, you are going to watch short videos that might be unpleasant. You should watch each video to the end without looking away from the screen. There’s no need to press anything or react while watching the videos. You should just watch them.”

Five of the short frightening videos are excerpts taken from the following horror movies: Texas Chainsaw (Luessenhop, 2013), The Grudge 2 (Shimizu, 2006), Boogeyman

(Kay, 2005), The Ring (Verbinski, 2002), and A Nightmare on Elm Street (Bayer, 2010). The other three videos are excerpts taken from the following YouTube videos: Amy's torch (Leacock, 2012), scary Japanese tire commercial (Andrea, 2013), and shocking ghost caught on tape! (ChrissCassOfficial, 2011).

During the test blocks, the experience of fear is maintained via three tracks of monotonic scary background audio played as the participant completes the IAT test blocks (see Hadash et al., 2016 supplemental materials for selection process). All scary background audio tracks are randomly selected and presented without replacement. All audio tracks are presented at both stages to prevent their influence on inter-stage differences. The scary background audio tracks are excerpts taken from the following YouTube videos: The prestige - scariest music ever (one track; Roll The Credits, 2011), and lull - lull not null (two tracks; B3P, 2013).

Instructions on Administration

The fear SES-IAT should be administered in an experimental setting using E-Prime or another experimental software to run the task. The fear SES-IAT is ideally conducted in a private experimental room but can also be conducted in a group setting if each participant has a single computer with headphones and is unable to see other participants or their monitors. We recommend to not deliver the SES-IAT online to prevent the possibility of participants choosing to mute or reduce the sound volume during the movies and test blocks, unless there is full remote control and digital monitoring of such method parameters.

Sound should be played using high-quality headphones or speakers with volume set to a high level to ensure the videos and background audio elicit strong emotional reactivity (e.g., startle). Participants should have no way to control the volume (e.g., block the volume control buttons on headphone cord). It is recommended to conduct the fear SES-IAT in a dark room to enhance the experience of fear during the task.

The SES-IAT should not directly follow another IAT to prevent task set interference, nor should it follow an emotion elicitation targeting an emotional state different from fear (via pictures, music or videos). It is not recommended to use the SES-IAT with other IATs in the same study as findings indicate that D-scores might be affected by previous experience with IATs (Greenwald & Nosek, 2001; Greenwald et al., 2003).

How to Score and Analyze the Data

Data screening. In line with standard guidelines for data screening in IATs (Greenwald et al., 2003) and findings from the SES-IAT validation study (Hadash et al., 2016) the following trials should be removed from data analysis and computation: trials with RTs > 10,000ms and the first trial in every test block (immediately following frightening video/s). Participants demonstrating RT < 300ms on > 10% of trials (Greenwald et al., 2003) and participants demonstrating errors on > 20% trials (Karpinski & Steinman, 2006) should be removed from data analysis and computation.

D-score computation. The SES-IAT D-scores computation is based on the IAT improved D-score algorithm (Greenwald et al., 2003) adapted for the SC-IAT (Karpinski & Steinman, 2006). First, RTs in all error trials are replaced with the block mean RT of correct trials + an error penalty of 400ms (see Table 3 for formulas for all D-score computation stages). Second, the resulting RTs of all test trials (correct trials and replaced error trials, excluding practice trials) are averaged to create a mean RT for all test trials in each stage (i.e., congruent stage and incongruent stage). Finally, a D-score is computed by subtracting the mean RT in the congruent stage from the mean RT in the incongruent stage and dividing this difference by the standard deviation of RT in all correct test trials.

Table 3

Single Experience & Self Implicit-Association Test (SES-IAT) D-score computation.

Stage	Formula
1. Replace RT in all error trials	$RT_{error\ trials} = \overline{RT}_{correct\ trials\ in\ block} + 400ms$
2. Compute mean RTs in each stage	$\overline{RT}_{incongruent\ stage} = \frac{1}{N_{incongruent\ test\ trials}} \sum RT_{incongruent\ test\ trials}$ $\overline{RT}_{congruent\ stage} = \frac{1}{N_{congruent\ test\ trials}} \sum RT_{congruent\ test\ trials}$
3. Compute D-scores	$D-score = \frac{\overline{RT}_{incongruent\ stage} - \overline{RT}_{congruent\ stage}}{SD_{RT\ correct\ test\ trials}}$

Note. RT = response time; $\overline{RT}$ = mean response time; N = number of trials not removed during data screening; SD = standard deviation; $D-score$ = difference score.

This computation procedure is based on the Single Category-Implicit Association Test (SC-IAT) D-score computation procedure presented in Karpinski and Steinman (2006).

Internal reliability computation. The SES-IAT internal reliability is computed according to the method used in the SC-IAT (Karpinski & Steinman, 2006). First, a block difference score is computed for each of the three pairs of congruent and incongruent test blocks (test 1, test 2, test 3 in each stage) by subtracting the mean RT in the congruent block from the mean RT in the incongruent block (see Table 4 for formulas of all internal reliability computation stages). Second, zero-order correlations between these three block difference scores are computed and a mean difference scores correlation is computed. Finally, the mean difference scores is corrected using the Spearman-Brown prophecy correction formula to compensate for the underestimation of the task's reliability caused by dividing the task into thirds (Nunnally, 1978).

Table 4

Single Experience & Self Implicit-Association Test (SES-IAT) internal reliability computation.

Stage	Formula
1. Compute three block difference scores ($n = 1, 2, 3$)	$dif_n = \overline{RT}_{incongruent\ block\ n} - \overline{RT}_{congruent\ block\ n}$
2. Compute mean difference scores correlation	$\bar{r}_{dif} = \frac{1}{3} \sum (r_{dif1, dif2} + r_{dif2, dif3} + r_{dif1, dif3})$
3. Spearman-Brown prophecy correction	$r_{corrected} = \frac{3 \times \bar{r}_{dif}}{1 + 2 \times \bar{r}_{dif}}$

Note. $\overline{RT}$ = mean response time; dif = block difference score; n = block number; $r_{difa, difb}$

= zero-order correlation between $difa$ and $difb$; $\bar{r}_{dif}$ = mean difference scores correlation; $r_{corrected}$ = Spearman–Brown prophecy corrected internal reliability. This computation procedure is identical to the Single Category-Implicit Association Test (SC-IAT) internal reliability computation procedure presented in Karpinski and Steinman (2006).

Testing for IAT presentation/pairing order effects. The presentation/pairing order effect is a common methodological IAT artifact – the influence of presentation order of the *congruent* and *incongruent* stages (i.e., *congruent first* vs. *incongruent first*) on D-scores (Nosek et al., 2005). Importantly, findings from the fear SES-IAT validation study indicate that presentation order of the two stages did not significantly influence D-scores (Hadash et al., 2016). This might be due to the prolonged second practice block (40 trials) used in the SES-IAT in order to reduce the presentation/pairing order effect (in line with previous IAT methodological research: Nosek et al., 2005). However, such effects could be observed in

future studies and must be tested by comparing D-scores between the two presentation orders (e.g., using independent-samples *t*-tests).

Reliability and Validity of the Measure

Hadash et al. (2016) tested the reliability and construct validity of the SES-IAT D-scores in an experimental and correlational study. Before participants performed the fear SES-IAT they were randomized to a meta-awareness with disidentification condition (i.e., mindful awareness meditation with instructions that promote disidentification from experience), a meta-awareness with identification condition (i.e., “mindful awareness” meditation with paradoxical instructions that promote identification with experience), and a no-intervention control condition. Because they theorized that high positive SES-IAT scores reflect identification with experience, they predicted mean D-scores to be significantly higher in the meta-awareness with identification condition compared to the two other conditions. Hadash et al. (2016) also tested the correlations between SES-IAT D-scores and self-report scales among participants in the no-intervention control condition. Specifically, they expected that SES-IAT D-scores would be associated with self-reported: (1) identification with internal experience (i.e., experiencing internal states as the self); (2) negative self-referential evaluation of internal experience (i.e., not wanting an experience: judging experience, anxiety sensitivity); (3) and other constructs closely related to ESRP and ESLP of fear such as meta-awareness, reactivity to thought content, anxiety symptoms, and tolerance of distress and fear. Hypotheses were thus formulated to test two key objectives. First, to help validate the fear SES-IAT as a measure of ESRP and ESLP of fear. Second, to test key theoretical propositions regarding the relations of ESRP and ESLP of fear with mindfulness, decentering, and key processes important to mental health.

Descriptive statistics. The majority of participants (71%) demonstrated negative D-scores ranging between -1.10 and 0 (i.e., reflecting negative self-referential evaluation of

fear). The remaining participants demonstrated positive D-scores ranging between 0 and 0.69 (i.e., reflecting identification with fear). The mean D-score was -0.24, and the distribution of the D-scores was approximately normal (skew = 0.04 and kurtosis = -0.39). Procedural variables including presentation order of the two stages in the task and the keys (left/right) assigned to the categories did not significantly influence the D-scores (see Hadash et al., 2016 supplemental materials for details).

Reliability. To assess the internal consistency of the SES-IAT, Hadash et al. (2016) used the SC-IAT internal reliability analysis method (Karpinski & Steinman, 2006; see "Internal reliability computation" subsection below for more details). Internal reliability was acceptable ($r = .74$; Hadash et al., 2016), in line with moderate to high levels of reliability reported in other IATs (.69-.85; Greenwald et al., 2003) and SC-IATs (.55-.85; Karpinski & Steinman, 2006).

Validity. First, fear, measured via an experience sample, was successfully elicited (mean = 3.57, mode = 5 on a scale of 1 to 5; see Hadash et al., 2016 Supplemental Materials for experience sample item) – permitting measurement of participants' cognitive association between fear and self, concurrent with their experience of fear. Second, findings supported the prediction that higher positive D-scores reflect identification with fear. As predicted, among participants predisposed to ESRP of fear (i.e., high in anxiety sensitivity), the meta-awareness with identification condition had significantly higher D-scores compared to the other two conditions (high positive scores are theorized to reflect increased identification with fear). Moreover, as predicted, among control condition participants positive D-scores were related to an index of decentering and disidentification with internal experience (Drexel Defusion Scale; Forman et al., 2012). Third, findings supported the prediction that lower negative D-scores reflect negative self-referential evaluation of fear as demonstrated by relations between negative D-scores and indices of non-judging and negative self-referential

evaluation of internal experience among control condition participants (Five Facet Mindfulness Questionnaire-Non-Judging subscale; Baer et al., 2006; Anxiety Sensitivity Index-3; Taylor et al., 2007). Fourth, findings supported the prediction that D-scores around 0 reflect ESRP of fear as demonstrated by relations of D-scores around 0 with higher levels of disidentification from internal experience and with reduced negative self-referential evaluation of internal experience. Finally, additional support that the task measures ESRP and ESRP was provided by significant and moderate to strong associations between D-scores and multiple other constructs closely related to ESRP and ESRP: meta-awareness (Five Facet Mindfulness Questionnaire-Describing subscale; Baer et al., 2006), reactivity to thought content (a metacognitive process of decentering; Cognitive Fusion Questionnaire; Gillanders et al., 2014), anxiety symptoms (Beck Anxiety Inventory; Beck & Steer, 1990), and tolerance of distress and fear (Tolerance of Negative Affective States Scale-fear-distress subscale; Bernstein & Brantz, 2013; Distress Tolerance Scale; Simons & Gaher, 2005). Therefore, collectively, preliminary findings indicate that high positive D-scores reflect identification with fear, low negative D-scores reflect negative self-referential evaluation of fear, and D-scores around 0 reflect ESRP of fear (Hadash et al., 2016). Importantly, these findings support the fear SES-IAT as a measure of key attitudinal qualities of mindfulness (e.g., non-judging; Hadash & Bernstein, 2019) and of a metacognitive process subserving decentering (e.g., disidentification from internal experience; Bernstein et al., 2019).

Limitations

The SES-IAT is a novel behavioral method that has only been used and psychometrically tested in a single published study (Hadash et al., 2016). Findings from this first study support the SES-IAT internal reliability and construct validity. More studies are needed to replicate these findings and test other psychometric features of the task. For example, studies comparing SES-IAT D-scores of advanced mindfulness meditators and

novices are needed to test the SES-IAT known-groups validity and gain a better understanding of ESRP and ESLP in advanced practitioners. As another example, future studies examining the test-retest reliability of the SES-IAT are needed to test the degree of trait-specific variance captured by this measure (an individual difference that is stable across time). Importantly, findings suggest that IATs across content domains display moderate test-retest reliabilities (median $r = .56$) indicating that this measurement methodology captures substantial state-specific variance as well as trait-specific variance (Nosek et al., 2007). Future studies could test these and other psychometric properties of the SES-IAT.

Variants of the Method

First, the Fear SES-IAT is only one variant of the SES-IAT methodology. The SES-IAT may be used to measure ESRP and ESLP of experiences other than fear. We have recently developed a pleasure SES-IAT in which single experience category is *pleasure*, and in which pleasure is elicited using short cute/funny videos and happy background music played during the test blocks. Other variants of the SES-IAT could be developed and used to measure ESRP of other emotions (e.g., sadness) or bodily sensations (e.g., pain). Such variants are essential for a more comprehensive understanding of the functions of ESRP and ESLP of different experiences. In such studies it is important that psychometric properties such as internal reliability and construct validity are rigorously examined.

Second, IATs are measures of cognitive associations but do not directly measure the propositional nature of these associations (i.e., the specific way concepts are associated; De Houwer et al., 2015). Existing empirical findings suggest that fear SES-IAT D-scores reflect identification with fear and negative self-referential evaluation of fear (Hadash et al., 2016). However, these forms of ESRP are, technically speaking, propositions – they contain information about how fear and self are related (“I am afraid” or “I don’t want to be afraid”; De Houwer, 2014). The SES-IAT does not directly measure such propositions, but only the

cognitive associations between self and the experience of fear. Accordingly, in addition to reflecting identification with fear, high positive D-scores may also reflect ownership of fear (“This is my fear”) and agency of fear (“I choose to be afraid”; Hadash et al., 2016). Future research is needed to explore such propositional possibilities, and might utilize implicit tasks measuring specific propositional beliefs about fear (or a different experience) with a concurrent elicitation of fear (or a different experience) to provide a measurement of specific forms of ESRP (Relational Responding Task: De Houwer et al., 2015; Questionnaire-based IAT: Yovel & Friedman, 2013). Such methods may be important to better understand the nature and function(s) of different forms of ESRP.

Summary

In this chapter we reviewed Buddhist and contemporary psychological contemplative approaches related to self-referential and selfless processing of experience, and their importance in the study of mindfulness, decentering, and mental health. We described the SES-IAT, an implicit behavioral method designed to measure self-referential and selfless processing of experience. We reviewed preliminary experimental and correlational findings indicating that the fear SES-IAT measures selfless processing of fear, identification with fear, and negative self-referential evaluation of fear. Importantly, findings also support the fear SES-IAT as a measure of key attitudinal qualities of mindfulness (e.g., non-judging) and of a metacognitive process subserving decentering (i.e. disidentification from internal experience). To date, the role of self-referential and selfless processing of experience has received limited scientific study. We hope that the SES-IAT will contribute to the integration of intriguing Buddhist ideas on these processes into contemporary scientific study of mindfulness, decentering, and mental health.

Information on How to Cite the Measure

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References

- Anālayo, B. (2003). *Satipaṭṭhāna: The direct path to realization*. Cambridge, UK: Windhorse Publications.
- Andrea, A. (2013). Scary japanese tire commercial [video file]. Retrieved from <https://youtu.be/54U6BgYuJMY>
- B3P. (2013). Lull - lull not null [video file]. Retrieved from <https://youtu.be/s2Y4VP3z1rY>
- Baer, R. A., Smith, G. T., Hopkins, J., Krietemeyer, J., & Toney, L. (2006). Using self-report assessment methods to explore facets of mindfulness. *Assessment*, 13(1), 27-45.
10.1177/1073191105283504
- Barlow, D. H. (2004). *Anxiety and its disorders: The nature and treatment of anxiety and panic*. New York, NY: Guilford press.
- Baumeister, R. F., Vohs, K. D., & Funder, D. C. (2007). Psychology as the science of self-reports and finger movements: Whatever happened to actual behavior? *Perspectives on Psychological Science*, 2(4), 396-403. 10.1111/j.1745-6916.2007.00051.x
- Bay, M., Form, A., & Fuller, B. (Producers), & Bayer, S. (Director). (2010). *A nightmare on elm street*. [Video/DVD] United States: New Line Cinema.
- Beck, A. T., & Steer, R. A. (1990). *Beck anxiety inventory: Manual*. San Antonio, TX: Psychological Corporation.
- Bernstein, A., & Brantz, H. (2013). Tolerance of negative affective states (TNAS): Development and evaluation of a novel construct and measure. *Cognitive Therapy and Research*, 37(3), 421-433. 10.1007/s10608-012-9471-6
- Bernstein, A., Hadash, Y., Fresco, D. M. (2019). Metacognitive processes model of decentering: Emerging methods and insights. *Current Opinion in Psychology*, 28, 245-251. 10.1016/j.copsyc.2019.01.019

Bernstein, A., Hadash, Y., Lichtash, Y., Tanay, G., Shepherd, K., & Fresco, D. M. (2015).

Decentering and related constructs: A critical review and metacognitive processes model. *Perspectives on Psychological Science*, 10(5), 599-617.

10.1177/1745691615594577

Bernstein, A., & Zvolensky, M. J. (2007). Anxiety sensitivity: Selective review of promising research and future directions. *Expert Review of Neurotherapeutics*, 7(2), 97-101.

10.1586/14737175.7.2.97

Bishop, S. R., Lau, M., Shapiro, S., Carlson, L., Anderson, N. D., Carmody, J., . . . Devins, G. (2004). Mindfulness: A proposed operational definition. *Clinical Psychology: Science and Practice*, 11(3), 230-241. 10.1093/clipsy.bph077

Block, N. (1995). On a confusion about a function of consciousness. *Behavioral and Brain Sciences*, 18(2), 227-247. 10.1017/S0140525X00038188

ChrissCassOfficial. (2011). Shocking ghost caught on tape! [video file]. Retrieved from <https://youtu.be/rIxwuYmXlw8>

Czopp, A. M., Monteith, M. J., Zimmerman, R. S., & Lynam, D. R. (2004). Implicit attitudes as potential protection from risky sex: Predicting condom use with the IAT. *Basic and Applied Social Psychology*, 26(2-3), 227-236. 10.1080/01973533.2004.9646407

Damasio, A. R. (1999). *The feeling of what happens: Body and emotion in the making of consciousness*. New York: Harcourt Brace.

Davidson, R. J., & Kaszniak, A. W. (2015). Conceptual and methodological issues in research on mindfulness and meditation. *American Psychologist*, 70(7), 581-592. 10.1037/a0039512

De Houwer, J., Heider, N., Spruyt, A., Roets, A., & Hughes, S. (2015). The relational responding task: Toward a new implicit measure of beliefs. *Frontiers in Psychology*, 6(319), 1-9. 10.3389/fpsyg.2015.00319

- De Houwer, J. (2014). A propositional perspective on context effects in human associative learning. *Behavioural Processes*, 104, 20-25. 10.1016/j.beproc.2014.02.002
- Dor-Ziderman, Y., Berkovich-Ohana, A., Glicksohn, J., & Goldstein, A. (2013). Mindfulness-induced selflessness: A MEG neurophenomenological study. *Frontiers in Human Neuroscience*, 710.3389/fnhum.2013.00582
- Esslen, M., Metzler, S., Pascual-Marqui, R., & Jancke, L. (2008). Pre-reflective and reflective self-reference: A spatiotemporal EEG analysis. *NeuroImage*, 42(1), 437-449. 10.1016/j.neuroimage.2008.01.060
- Farb, N. A. S., Segal, Z. V., Mayberg, H., Bean, J., McKeon, D., Fatima, Z., & Anderson, A. K. (2007). Attending to the present: Mindfulness meditation reveals distinct neural modes of self-reference. *Social Cognitive and Affective Neuroscience*, 2(4), 313-322. 10.1093/scan/nsm030
- Fazio, R. H., & Olson, M. A. (2003). Implicit measures in social cognition research: Their meaning and use. *Annual Review of Psychology*, 54(1), 297-327. 10.1146/annurev.psych.54.101601.145225
- Forman, E. M., Herbert, J. D., Juarascio, A. S., Yeomans, P. D., Zebell, J. A., Goetter, E. M., & Moitra, E. (2012). The drexel defusion scale: A new measure of experiential distancing. *Journal of Contextual Behavioral Science*, 1(1-2), 55-65. 10.1016/j.jcbs.2012.09.001
- Furr, R. M., & Funder, D. C. (2007). Behavioral observation. In R. W. Robins, R. C. Fraley & R. F. Krueger (Eds.), *Handbook of research methods in personality psychology* (pp. 273-291). New York, NY: Guilford Press.
- Gallagher, S. (2000). Philosophical conceptions of the self: Implications for cognitive science. *Trends in Cognitive Sciences*, 4(1), 14-21. 10.1016/S1364-6613(99)01417-5

- Garland, E., & Gaylord, S. (2009). Envisioning a future contemplative science of mindfulness: Fruitful methods and new content for the next wave of research. *Complementary Health Practice Review*, 14(1), 3-9. 10.1177/1533210109333718
- Gillanders, D. T., Bolderston, H., Bond, F. W., Dempster, M., Flaxman, P. E., Campbell, L., . . . Remington, B. (2014). The development and initial validation of the cognitive fusion questionnaire. *Behavior Therapy*, 45(1), 83-101. 10.1016/j.beth.2013.09.001
- Greenwald, A. G., & Nosek, B. A. (2001). Health of the implicit association test at age 3. *Zeitschrift Für Experimentelle Psychologie*, 48(2), 85-93.
- Greenwald, A. G., Nosek, B. A., & Banaji, M. R. (2003). Understanding and using the implicit association test: I. an improved scoring algorithm. *Journal of Personality and Social Psychology*, 85(2), 197-216. 10.1037/0022-3514.85.2.197
- Greenwald, A. G., Poehlman, T. A., Uhlmann, E. L., & Banaji, M. R. (2009). Understanding and using the implicit association test: III. meta-analysis of predictive validity. *Journal of Personality and Social Psychology*, 97(1), 17-41. 10.1037/a0015575
- Gross, J. J., & Levenson, R. W. (1995). Emotion elicitation using films. *Cognition and Emotion*, 9(1), 87-108. 10.1080/02699939508408966
- Grossman, P. (2008). On measuring mindfulness in psychosomatic and psychological research. *Journal of Psychosomatic Research*, 64(4), 405-408. 10.1016/j.jpsychores.2008.02.001
- Hadash, Y., & Bernstein, A. (2019). Behavioral assessment of mindfulness: Defining features, organizing framework, and review of emerging methods. *Current Opinion in Psychology*, 28, 229-237. 10.1016/j.copsyc.2019.01.008
- Hadash, Y., Plonsker, R., Vago, D. R., & Bernstein, A. (2016). Experiential self-referential and selfless processing in mindfulness and mental health: Conceptual model and implicit

measurement methodology. *Psychological Assessment*, 28(7), 856-869.

10.1037/pas0000300

Hayes, S. C., Strosahl, K. D., & Wilson, K. G. (2012). *Acceptance and commitment therapy:*

The process and practice of mindful change (2nd ed.). New York, NY: Guilford Press.

Hölzel, B. K., Lazar, S. W., Gard, T., Schuman-Olivier, Z., Vago, D. R., & Ott, U. (2011).

How does mindfulness meditation work? proposing mechanisms of action from a conceptual and neural perspective. *Perspectives on Psychological Science*, 6(6), 537-559. 10.1177/1745691611419671

Kabat-Zinn, J. (2013). *Full catastrophe living: Using the wisdom of your body and mind to*

face stress, pain, and illness. NY: New-York: Bantam Books.

Karpinski, A., & Steinman, R. B. (2006). The single category implicit association test as a

measure of implicit social cognition. *Journal of Personality and Social Psychology*, 91(1), 16-32. 10.1037/0022-3514.91.1.16

Raimi, S., Tapert, R., Drake, J., Hein, S., & Bryman, G. (Producers), & Kay, S. T. (Director).

(2005). *Boogeyman*. [Video/DVD] United States & New Zealand: Screen Gems.

Kreibig, S. D., Wilhelm, F. H., Roth, W. T., & Gross, J. J. (2007). Cardiovascular,

electrodermal, and respiratory response patterns to fear- and sadness-inducing films.

Psychophysiology, 44(5), 787-806. 10.1111/j.1469-8986.2007.00550.x

Leacock, M. (2012). Short scary horror film - amy's torch [video file]. Retrieved from

https://youtu.be/01AI0IAq_uY

Linehan, M. M. (1993). *Cognitive-behavioral treatment of borderline personality disorder*.

NY: New-York: Guilford Press.

Mazzocone, C. (Producer), & Luessenhop, J. (Director). (2013). *Texas chainsaw*.

[Video/DVD] United States: Millennium Films & Mainline Pictures.

- Mennin, D. S., & Fresco, D. M. (2013). What, me worry and ruminate about DSM-5 and RDoC? the importance of targeting negative self-referential processing. *Clinical Psychology: Science and Practice*, 20(3), 258-267. 10.1111/cpsp.12038
- Northoff, G., Heinzel, A., de Greck, M., Bermpohl, F., Dobrowolny, H., & Panksepp, J. (2006). Self-referential processing in our brain—A meta-analysis of imaging studies on the self. *NeuroImage*, 31(1), 440-457. 10.1016/j.neuroimage.2005.12.002
- Nosek, B. A., Greenwald, A. G., & Banaji, M. R. (2007). The implicit association test at age 7: A methodological and conceptual review. In J. A. Bargh (Ed.), *Social psychology and the unconscious: The automaticity of higher mental processes* (pp. 265–292). New York: Psychology Press.
- Nosek, B. A., Greenwald, A. G., & Banaji, M. R. (2005). Understanding and using the implicit association test: II. method variables and construct validity. *Personality and Social Psychology Bulletin*, 31(2), 166-180. 10.1177/0146167204271418
- Nunnally, J. C. (1978). *Psychometric theory*. New York: McGraw-Hill.
- Olatunji, B. O., & Wolitzky-Taylor, K. (2009). Anxiety sensitivity and the anxiety disorders: A meta-analytic review and synthesis. *Psychological Bulletin*, 135(6), 974-999. 10.1037/a0017428
- Olendzki, A. (2006). The transformative impact of non-self. In D. K. Nauriyal, M. S. Drummond & Y. B. Lal (Eds.), *Buddhist thought and applied psychological research: Transcending the boundaries* (pp. 250-261). Abingdon, UK: Routledge.
- Roll The Credits. (2011). The prestige - scariest music ever [video file]. Retrieved from https://youtu.be/p9XMd2eAy_4
- Sauer, S., Walach, H., Schmidt, S., Hinterberger, T., Lynch, S., Büssing, A., & Kohls, N. (2013). Assessment of mindfulness: Review on state of the art. *Mindfulness*, 4(1), 3-17. 10.1007/s12671-012-0122-5

- Segal, Z. V., Williams, J. M., & Teasdale, J. D. (2013). *Mindfulness-based cognitive therapy for depression (2nd ed.)*. New York, NY: Guilford Press.
- Shadish, W. R., Cook, T. D., & Campbell, D. T. (2002). *Experimental and quasi-experimental designs for generalized causal inference*. Boston, MA: Houghton, Mifflin and Company.
- Shapiro, S. L., Carlson, L. E., Astin, J. A., & Freedman, B. (2006). Mechanisms of mindfulness. *Journal of Clinical Psychology*, 62(3), 373-386. 10.1002/jclp.20237
- Raimi, S., Tapert, R., & Ichise, T. (Producers), & Shimizu, T. (Director). (2006). *The grudge 2*. [Video/DVD] United States & Japan: Columbia Pictures.
- Simons, J., & Gaher, R. (2005). The distress tolerance scale: Development and validation of a self-report measure. *Motivation and Emotion*, 29(2), 83-102. 10.1007/s11031-005-7955-3
- Tagini, A., & Raffone, A. (2010). The 'I' and the 'Me' in self-referential awareness: A neurocognitive hypothesis. *Cognitive Processing*, 11(1), 9-20. 10.1007/s10339-009-0336-1
- Taylor, S. (Ed.). (1999). *Anxiety sensitivity: Theory, research, and treatment of the fear of anxiety*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Taylor, S., Koch, W. J., & McNally, R. J. (1992). How does anxiety sensitivity vary across the anxiety disorders? *Journal of Anxiety Disorders*, 6(3), 249-259. 10.1016/0887-6185(92)90037-8
- Taylor, S., Zvolensky, M. J., Cox, B. J., Deacon, B., Heimberg, R. G., Ledley, D. R., . . . Cardenas, S. J. (2007). Robust dimensions of anxiety sensitivity: Development and initial validation of the anxiety sensitivity index-3. *Psychological Assessment*, 19(2), 176-188. 10.1037/1040-3590.19.2.176

Teasdale, J. D., Moore, R. G., Hayhurst, H., Pope, M., Williams, S., & Segal, Z. V. (2002).

Metacognitive awareness and prevention of relapse in depression: Empirical evidence.

Journal of Consulting and Clinical Psychology, 70(2), 275-287. 10.1037/0022-

006X.70.2.275

Thanissaro, B. (2021, September 20). Bāhiya sutta: Bāhiya. Retrieved from

<http://www.accesstoinight.org/tipitaka/kn/ud/ud.1.10.than.html>

Parkes, W. F., & MacDonald, L. (Producers), & Verbinski, G. (Director). (2002). *The ring*.

[Video/DVD] United States: DreamWorks Pictures.

Yovel, I., & Friedman, A. (2013). Bridging the gap between explicit and implicit

measurement of personality: The questionnaire-based implicit association test.

Personality and Individual Differences, 54(1), 76-80. 10.1016/j.paid.2012.08.015