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## Examining the Cognitive and Physiological Processes Underlying Traumatic Disclosure

Anna Carlson '02  
Illinois Wesleyan University

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DISCLOSURE

Examining the Cognitive and Physiological Processes

Underlying Traumatic Disclosure

Anna Carlson

Illinois Wesleyan University

Committee Members:

Dr. John Ernst 

Dr. Jim Dougan

Dr. Carl Gillett

Dr. Vicki Magee

## Abstract

The aims of this research were to examine the cognitive and physiological reactions associated with the disclosure of a traumatic event. Cognitive-Experiential Self-Theory (Epstein, 1991; 1998) suggests that there are two separate modes of information processing. One is the rational mode that is based on logic and the other is the experiential mode that is based on emotions and heuristics. The way these two modes of processing may be related to disclosure was examined using 60 undergraduate students at Illinois Wesleyan University.

Participants engaged in one of four writing conditions; a trivial topic, the emotions surrounding a traumatic experience, the facts surrounding a traumatic experience, or both the facts and emotions surrounding a traumatic experience. Immediately after completing the writing task, participants engaged in a modified ratio-bias task. The ratio-bias task consisted of 56 presentations of choices the participant had to make. The amount of optimal choices in this task is thought to be related to the mode of cognitive processing the participant is in. Following this task, participants listed the thoughts they were having during the modified ratio-bias task. They then filled out a demographics questionnaire and the Rational-Experiential Inventory. Continuous cardiovascular measures were taken during all periods of the experiment including a rest period prior to the writing task.

Writing condition did not have a significant effect on autonomic activation, the thought-listing task, or decisions across all 56 trials of the modified ratio-bias task. However, writing condition did have a significant effect on the first 14 trials of the

modified ratio-bias task. These results should be seen as promising rather than definitive.

## Examining the Cognitive and Physiological Processes

### Underlying Traumatic Disclosure

Life can be interrupted by unexpected, negative events that range in intensity from a fight with a friend to the death of a loved one. These events can sometimes lead to negative thoughts and emotions. Extensive research by Pennebaker has shown that inhibiting these negative thoughts and emotions can be stressful on the body, which leaves it more open to illness (Pennebaker, Kiecolt-Glaser, & Glaser, 1988). While inhibiting thoughts and emotions may be harmful, research also suggests that disclosure of the thoughts and emotions that accompany negative experiences can be helpful, not only psychologically but also physiologically (Pennebaker & Beall, 1986; Pennebaker, Hughes, & O'Herron, 1987; Pennebaker, Kiecolt-Glaser, & Glaser, 1988; Wegner, Shortt, Blake, & Page, 1990; Petrie, Booth, Pennebaker, Davison, & Thomas, 1995). For example, when people disclose a traumatic event it has been shown that they experience better immune functioning as a long-term benefit (Pennebaker et. al, 1988; Petrie et. al, 1995)

Because disclosure has been shown to be such an important factor in reducing the negative consequences of inhibition, it is important to understand disclosure more thoroughly. One way to further our understanding is to make a connection between disclosure and the cognitive processes that underlie it. A majority of ideas about disclosure describe how putting our emotional experience into language allows people to organize and structure their experiences (Pennebaker, 1995). Stiles (1995) suggests that talking about a traumatic experience promotes assimilation of the traumatic event. This assimilation is thought to lead to some of the benefits of disclosure. A related theory

(Bucci, 1995) views the link between emotions and the verbal system as the key to the benefits of disclosure. All of these theories focus on the emotions that surround a traumatic event. A cognitive model that relates not only emotions but also the facts involved in cognitive activities is the Cognitive-Experiential Self-Theory (CEST) that suggests two separate modes of information processing (Epstein 1991; 1998). One is the rational mode that is based on logic (Epstein 1991). The other is the experiential mode that is based on emotions and heuristics (1991). The experiential and rational systems can work with or against one another. The present study will attempt to reveal whether emotional disclosure of a traumatic event promotes the experiential system of information processing and whether both disclosure of facts and disclosure involving a combination of emotions and facts promote the rational system. This was done by measuring optimal choices in a decision making task and physiological responses of the autonomic nervous system during disclosure.

### *Effects of Disclosure*

One type of research on disclosure compares participants who have disclosed a trauma to participants who have disclosed a trivial event. A study by Pennebaker and Beall (1986) illustrates the basic parameters of these types of disclosure studies. Forty-six undergraduate students were randomly assigned to one of 4 conditions, trauma-emotion (TE), trauma-fact (TF), trauma-combination (TC), and a control group (C). All participants were instructed to write about their assigned topic for 15 minutes a day for 4 consecutive days. The participants in the TE condition were instructed to write about only the emotions surrounding a previously experienced traumatic event, being sure to avoid describing the facts surrounding the actual event. The participants in the TF condition

were instructed to write about a trauma in a narrative fashion, avoiding all discussion of emotions. Participants in the TC condition were told to write about both the emotions and the facts surrounding a traumatic experience. The C participants were told to write about a different trivial topic each evening.

Following each session participants completed a survey that included their own opinions about the content of their essays. Participants in the TE and TC conditions told experimenters that they had revealed more emotions in their essays compared to participants in the TF and C conditions. Four months after the experiment a questionnaire with health related items was sent to all the participants. Participants in the TE and TC conditions self-reported improved health and through independent verification they were also found to have had fewer visits to the health care center compared to TF and C participants (1986).

*Short-term Effects of Disclosure.* Short-term physiological changes have been found to occur during disclosure and its opposite, inhibition (Pennebaker, Hughes, & O'Heeron, 1987; Wegner, Shortt, Blake, & Page, 1990). For example, Pennebaker, Hughes, O'Heeron (1987) asked twenty-four undergraduates to talk into a tape recorder about a traumatic event and about their plans for the day for six-minutes each. During each session skin conductance levels (SCL), systolic blood pressure (SBP), diastolic blood pressure (DBP), and heart rate (HR) were continuously measured. It was found that participants who were high disclosers, determined by four blind-to-condition judges, had decreased SCL during the session where they disclosed a traumatic event compared to the session where they discussed their plans for the day. A significant increase in SBP, DBP,

and HR was also found among high disclosers during the disclosure of a traumatic event (Pennebaker et al, 1987).

When people actively inhibit something emotional, even if it is not traumatic, it has a noticeable effect on the body (Wegner et al., 1990). Trying not to think about an exciting thought (sex) made participants' SCL increase compared to participants who tried not to think about more neutral topics (dancing). These results suggest that the level of emotional content involved in what an individual inhibits effects physiological responses.

*Long-term Effects of Disclosure.* Long-term physiological changes have also been found to coincide with disclosure (Pennebaker, Kiecolt-Glaser, & Glaser, 1988; Petrie, Booth, Pennebaker, Davison, & Thomas, 1995). A representative study asked fifty subjects to write about a traumatic event or a control topic for 4 consecutive days. Six-weeks following the study the participants in the trauma group had decreased visits to the health center and higher immune functioning as measured by lymphocyte response to phytohemagglutinin and concanavalin (Pennebaker et al, 1988).

In a related study, Petrie et al. (1995) had forty medical students who tested negative for Hepatitis B write about a trivial topic or a traumatic experience for 4 consecutive days. The day after the fourth writing session all participants were given a vaccination for Hepatitis B. Participants in the trauma group had more Hepatitis B antibodies at 4 and 6 month check-ups compared to the trivial topic group (Petrie et al, 1995). This suggests better immune functioning by those participants who disclosed a trauma.



*Theories of Disclosure*

In an attempt to decipher how these benefits can occur from disclosure, previous theories have been used to explain the cognitive processes that underlie disclosure (Stiles, 1995; Pennebaker, 1995; Bucci, 1995). One of these theories is called the multiple code theory (Bucci, 1995). In this theory, disclosure is the link between emotions and the verbal system. Throughout the process of disclosure concrete descriptions turn into abstract narratives of a traumatic event. There are three stages of disclosure in the multiple code theory. In the first stage it is difficult for an individual to express their emotions verbally. Instead they start with sensory statements such as “I feel cold.” These statements are in what is called the subsymbolic processing system. This system is rapid, creative, and has no discrete categories. The next stage of disclosure moves from the subsymbolic to the symbolic processing system. In this symbolic system concrete images and episodes that represent emotions are connected with language. Following this stage emotional insight is reached. In this stage emotions have been processed into language and new categories have been made. This helps the traumatic experience be assimilated and the benefits of disclosure begin to take place.

While it is important that Bucci’s theory focuses on integrating the emotional experience with language it has nothing to say about the integration of the emotions of a trauma with the facts surrounding the trauma. A theory that could explore how this fits into disclosure is Epstein’s Cognitive-Experiential Self-Theory (1991; 1998). Epstein (1998) believes that every person constructs his or her own model of reality. This model includes two separate but occasionally interactive modes of thought, the experiential

mode and the rational mode. All behaviors are a product of the actions of these two systems.

The experiential system operates automatically, rapidly, effortlessly, and efficiently (Epstein, 1991). It encodes reality into concrete images and is based on heuristics and emotions. An example of the way this system is thought to work is that when a person responds to an emotionally significant event, the experiential system automatically searches in its memory for related events and their emotional accompaniments. If the feelings that are recalled are positive and pleasant, they motivate actions and thoughts that will reproduce those feelings. If the recalled feelings are negative and unpleasant, they motivate actions and thoughts that will avoid reproducing those feelings (Epstein, 1998). What goes on in the experiential system is experienced passively and preconsciously. This system is resistant to changes in the beliefs it holds. It is also thought to be older evolutionarily compared to the rational system.

The rational system on the other hand is based on logic and is reason oriented (Epstein, 1991). It encodes reality in abstract symbols, words, and numbers. The rational system is experienced actively and consciously and requires the justification of evidence. It is a slower moving system and therefore is inefficient for dealing with trivial everyday events like choosing which socks to wear.

In order to examine behavior as it relates to rational and experiential modes, Kirkpatrick and Epstein (1992) have utilized the ratio-bias phenomenon. The ratio-bias phenomenon can be demonstrated using the ratio-bias (RB) paradigm as adapted from Miller, Turnbull, and McFarland (1989, as cited in Kirkpatrick & Epstein, 1992). The original task involved asking participants to respond to a vignette where a child draws a

preferred cookie out of a jar with 1 preferred cookie and 19 non-preferred cookies compared to a jar that has 10 preferred cookies and 190 non-preferred cookies. It was found that participants were more likely to be suspicious that cheating had resulted in drawing the preferred cookie in the condition where smaller numbers represented the probabilities. This paradigm puts a person in a situation where their experiential and rational modes are in conflict with one another.

Kirkpatrick and Epstein (1992) believed that the results found by Miller, Turnbull, and McFarland (1989) could be explained by the principles of CEST. Two attributes of the experiential system could explain the results, the concrete principle and the experiential learning principle. The concrete principle says that while in the experiential system, people encode information in the form of concrete representations, not abstract principles. Ratios are a more abstract principle than absolute numbers. Since in the experiential system people will pay attention to the absolute numbers and not the ratios, they will see the choice with the larger absolute number of preferred objects as having a better chance of winning.

According to the experiential learning principle, generalizations from past emotionally significant experiences are incorporated into the experiential system. People are likely to have learned that in situations where the likelihood of an event is one out of any high number, it is unlikely to occur. This would cause people to choose the bowl with a higher absolute number over a bowl with a “1 out of higher number” chance. In order to test their theory, Kirkpatrick and Epstein (1992) conducted an experiment with 52 undergraduates where they had them choose which bowl they wanted to pick from. They could pick from a small bowl with 1 red and 9 white jellybeans or they could

pick from a large bowl with 10 red and 90 white jellybeans. If participants drew a red jellybean from the bowl while it was hidden from their sight, they won a dollar. The results showed that 76.9% of the participants chose to draw from the large bowl. When the participants were asked what bowl they thought other people would choose from, 94.2% of participants said others would pick from the large bowl. When given the opportunity to pay a dime for having a choice between bowls, roughly half of the participants paid to pick from the larger bowl. Participants reported that they “knew” their behavior was irrational because both bowls had an equal chance of winning, but regardless of that fact, they “felt” they had a better chance when they chose from the large bowl (1992).

These types of statements demonstrate the disagreement that sometimes occurs between the rational system that “knows” there is no difference between the bowls, and the experiential system that “felt” the larger bowl had a better chance. Since the experiential system won this battle more often than the rational mode it also provides support for the idea that in most situations the experiential mode is dominant. It is believed to be dominant because it is less effortful and in most circumstances, more efficient (Epstein, 1998).

Denes-Raj and Epstein (1994) devised a more severe test of the RB phenomenon. They continued to use the two bowls of red and white jellybeans but varied the ratio of red to white jellybeans in the large tray from 5-9% red. The small bowl always contained 1 out of 10 red so it always had a better chance of winning. The optimal choice on each trial would always be the small bowl. The bowls were labeled with index cards so the participants were well informed of the ratios and the percentages of red to white

jellybeans in the bowls. Seventy-nine undergraduates participated in this study and it was found that 82% made one or more non-optimal choices. This provides further support that there are two competing systems, and that the experiential system usually wins.

Vignette studies and decision-making paradigms provide powerful tools for exploring cognitive processing. One important compliment to such tools that has not been utilized in studying the CEST is measures of the nervous system. Measuring the autonomic nervous system may provide an additional lens for viewing the experiential and rational modes of cognitive processing.

### *Physiological Components of Disclosure*

The autonomic nervous system (ANS) is divided into two parts, the parasympathetic nervous system (PNS) and the sympathetic nervous system (SNS). The SNS responds to increased demands for action in the body whereas the PNS responds to decreased demands (Ohman, Hamm, & Hugdahl, 2000). The classic view of the two branches in the ANS was formed by Walter Cannon (1915 as cited in Ohman, et al, 2000). He believed that the two branches worked as opposing reciprocal forces and this maintained the energy balance of the body. Berntson, Cacciopo, and Quigley formed an alternative idea they termed autonomic space (1991). Based on this idea, the PNS and SNS can fit the classical depiction where they move in opposite directions (reciprocal coupling), or can deviate from the classical idea and both move in the same direction or one can go up or down while the other remains where it is (uncoupling). An example of uncoupling where SNS and PNS both increased is found in strong fear reactions where increasing heart rate and blood pressure showed SNS arousal and at the same emptying of the participant's bladder showed PNS arousal (1991).

Research has found that higher level thinking tasks, such as mental arithmetic tasks, have demonstrated an uncoupling of the SNS and PNS. Lower level thinking tasks have shown coupling of the SNS and PNS (Tomaka, Blascovich, Kelsey, & Leitten, 1993). It follows that an individual in the experiential mode (lower level thinking) would be more likely to show a reciprocal coupling of SNS and PNS whereas an individual in the rational mode (higher level thinking) would be more likely to show uncoupling of the SNS and PNS.

Pre-ejection period (PEP) is the time between the start of the electrical signal to the ventricles initiating contraction and ejection of the blood from the left ventricle to the aorta (Stern, Ray, Quigley, 2001). PEP is negatively correlated with sympathetic influence on the heart. Respiratory sinus arrhythmia (RSA) is an oscillation in the heart period due to the respiratory cycle (Stern et al., 2001). RSA is positively correlated with increases in the parasympathetic control of the heart. These two measurements can be used to show reciprocal coupling or uncoupling of the ANS.

#### *Previous Research on CEST and Disclosure*

In the initial test of CEST and its relation to disclosure Setork (2001) used the method of Pennebaker and Beall (1986) in which 60 participants were randomly assigned to C, TF, TE, and TC writing conditions. After written disclosure they participated in the ratio-bias (RB) decision making task (Denes-Raj & Epstein, 1994). For the first trial of the RB task, participants in the C condition were more likely to make an optimal choice on the first trial compared to the participants in the trauma conditions. Out of the participants in the trauma conditions, individuals in the TC condition were more likely to make an optimal choice (85%) compared to individuals in the TE and TF conditions

(41% and 40% respectively). The later trials showed no significant differences in optimal choices between writing conditions.

Physiological data were also collected before and during the writing task and also during the decision making task. During the first minute of writing participants in the TE condition showed strong reciprocal coupling of the ANS whereas participants in all other conditions showed a weak reciprocal coupling of the ANS. These results suggest that the participants in the TC and C conditions were in the rational mode of thinking and that participants in the TE condition were in the experiential mode of thinking. Even though the results of the ratio-bias task suggest that the participants in the TF condition were in the experiential mode of thinking, the physiological data suggests there is a difference between what is happening with the participants in the TF condition and the participants in the TE condition.

One possible explanation for why the participants in the TF were more likely to make non-optimal choices in the ratio-bias task is that they were cognitively busy. Gilbert and Hixon (1991) found that when individuals participated in a cognitive busyness task after their stereotypes were activated, they were more likely to apply stereotypical judgements of Asian confederates. Stereotypes can be seen as mental shortcuts (Allport, 1954). Thus, the study by Gilbert and Hixon (1991) shows that when individuals were under a cognitive load, they resorted to mental shortcuts.

Other mental shortcuts might be used under cognitive load depending on the demands of the task at hand. If participants in the TF and TE conditions are under cognitive load during the RB paradigm because they have not been able to integrate both the facts and emotions from the trauma they have just disclosed, the mental shortcut

might be to rely on the concrete principle (Kirkpatrick & Epstein, 1992) and therefore pay attention to absolute numbers rather than ratios. This would lead to fewer optimal choices in the RB paradigm.

In addition to testing whether the basic effects of the Setork (2001) study will replicate, there are two problems the current study will try to disentangle. The first problem is that the participant's in the TF condition had the same likelihood of making optimal choices in the first trial of the RB paradigm as the participants in the TE condition, but during the disclosure task the two conditions elicited different patterns of ANS control suggesting the two conditions are not identical. As mentioned above, it is suggested this has to do with the participants in the TF condition being cognitively busy. To test this a thought-listing task followed the RB task. The second problem with Setork's (2001) results is the outcomes of the RB paradigm were significant only in the first trial. I suggest this has to do with the original RB paradigm allowing participants to take unlimited time to make decisions. This could cause individuals to no longer be in the cognitive mode they were in during disclosure because too much time has passed. By modifying the RB paradigm and forcing participants to make quicker decisions, I attempt to get rid of this problem.

Based on previous research it was hypothesized that participants in C, TC, and TF conditions are all in the rational mode of thinking and participants in the TE condition are in the experiential mode. In order to show this the writing paradigm from Pennebaker & Beall (1986), the ratio-bias paradigm (Denes-Raj & Epstein, 1994), a thought-listing task to measure cognitive busyness (Cacioppo, von Hippel, & Ernst, 1997), and measurements of the autonomic nervous system (Berntson et. al 1991) will be used.



It was hypothesized that in the RB decision-making task the participants in the C condition would make more optimal choices compared to the participants in all of the trauma conditions. Out of the trauma conditions, participants in the TC condition were hypothesized to make significantly more optimal choices than participants in both TE and TF conditions. It was also hypothesized that there would be no significant differences between optimal choices made by the participants in the TE and TF conditions. In the thought-listing task, it was hypothesized that participants in the TF and TE conditions would have more thoughts related to their recently disclosed trauma compared to the other two conditions. Physiologically it was hypothesized that participants in the TE condition would show strong reciprocal coupling of the ANS while participants in the other three conditions would not.

## Method

### *Participants*

Sixty-five undergraduates were recruited from the students enrolled in General Psychology 100 at Illinois Wesleyan University as an opportunity for them to earn partial credit. The RB task was modified after the first five participants and their data was not used as part of the analysis leaving a final sample size of sixty.

### *Materials*

*Rational-Experiential Inventory (REI)*. This 40-item inventory was devised by Epstein and measures rational and experiential thinking styles. Items on the scale include questions such as, “I try to avoid situations that require thinking in depth about something,” and “I like to rely on my intuitive impressions.” Participants respond to statements on a 4-point scale ranging from “Never” to “Often”.

*Modified Ratio-bias Paradigm (RB Paradigm).* Participants were presented with a picture on a computer screen of two rectangular trays containing different mixtures of red and white jellybeans. One tray consisted of either ten jellybeans, one of which is red (10% red), or twenty jellybeans, two of which are red (10% red). The other tray consisted of 100 jellybeans, and the number of red jellybeans will vary among trials from five, six, seven, eight, nine, and ten (5%, 6%, 7%, 8%, 9%, and 10% red respectively). The percentages and ratios of the red jellybeans in each tray were stated under the appropriate tray. The goal of this task is to blindly draw a red jellybean. The participants must choose from which tray they want to blindly pick from.

The participants were presented with a series of 56 slides, each of which was presented for 2.5 seconds. During this time participants were asked to indicate (via clicking the mouse) from which tray they would prefer to draw a jellybean from if given the opportunity.

After the participant completes the computer task the research assistant selected three pre-selected trials for them to make real life choices from. The participants were then presented with a tray with a predetermined ratio of red and white jellybeans based on decisions they made during the computer task. They were blindfolded and told to pick a jellybean. If they drew a red jellybean they received a dollar. If they drew a white jellybean they received nothing. They did this for all three of the pre-selected trials.

*Thought -Listing Task.* Participants were asked to write out a list of the thoughts they were experiencing during the RB paradigm (Cacioppo et al, 1997). Research assistants, who are blind to condition, coded these thoughts for thoughts about the previously disclosed trauma, thoughts about the RB paradigm, and neutral thoughts.

*Physiological.* ZCG, a non-invasive measure of blood flow through the heart, and electrocardiography (ECG), a measure of the electromechanical action of the heart, was obtained using a Minnesota Impedance Cardiograph (model 304B) employing the standard tetra polar aluminum/mylar tape electrode system. The electrodes were adhesive bands that encircled the body. The second band was placed at the base of the neck; the first band was placed at least 3 cm above the second band; the third band was placed at the level of the xiphisternal junction (or just below the bra line for female participants); the fourth band was placed 3 cm below the third band. The front and back distances between the inner edges of the second and third bands were recorded. The impedance signals of primary interest were  $Z_0$ , a measure of basal thoracic impedance, and  $dZ/dt$ , a measure of changes in thoracic impedance. ECG was recorded using standard lead II configuration with Ag/AgCl disposable electrodes (Protrace 9113).

Blood pressure, a measure of pressure within the arteries was obtained from a Colin Model 7000 continuous, non-invasive blood pressure monitor. It used a self-inflating blood pressure cuff along with a tonometric sensor that was placed against the skin and tissue above the artery in the wrist.

#### *Procedure*

Upon arrival at the laboratory participants were informed of the general nature of the study and completed an informed consent form. Next, participants were hooked up to the sensors and the blood pressure cuff and rested for 5 minutes while physiological signals were checked and calibrated. Once this was done, 5 minutes of baseline data was recorded.

Next, the participants were given a pen and a notepad and were introduced to one of four writing topics depending on which condition they were randomly assigned to before they arrived. Those randomly assigned to the control condition were asked to write about their dorm room for 10 minutes. Those assigned to the fact-based condition were asked to write about a personally traumatic experience from a strictly factual perspective for 10 minutes, omitting any discussion of emotions. Participants in the emotion-based condition were asked to write about a personally traumatic experience from a strictly emotional perspective for 10 minutes, omitting any discussion of facts. The participants in the combination condition were asked to write about both the emotions and facts surrounding a personally traumatic experience. During this time cardiovascular measures were recorded.

Next the participants completed the RB paradigm. They were read a script explaining how the task works and how to use the mouse. After they completed the computer RB paradigm, they participated in the real life RB paradigm (described above). For every red jellybean the participant drew they received a fake dollar bill. They were told this fake dollar could be exchanged for real money at the end of the study. They were then unhooked from the sensors and the blood pressure cuff.

The participants completed the REI and a demographics questionnaire. After they are done, they were thanked, given any money they have won, and debriefed. At this time the participants were free to ask any questions concerning the purpose of the study. In addition, they were asked not to discuss the purpose of the study with other students.

## Results

### *Manipulation Checks*

To examine whether results were consistent with previous literature three manipulation checks were performed. First heart rate (HR) and mean arterial pressure (MAP) were examined. Previous research (Pennebaker & Beall, 1987) reported a significant increase in both HR and blood pressure from the last minute of resting to the first minute of writing in disclosure tasks. A within subjects analysis of variance (ANOVA) was used and significant increases in both HR,  $F(1, 57) = 91.95, p < .001$ , and MAP,  $F(1, 58) = 6.78, p < .05$ , were found across participants. Pennebaker and Beall (1987) found significantly greater increases in HR and MAP for trauma writing conditions compared to control conditions. However, no significant differences were found by writing condition in HR,  $F(3, 53) = 1.62, p > .1$ , and MAP,  $F(3, 55) = .329, p > .1$ .

The second manipulation check was done to see if results matched with previous research concerning the amount of optimal versus non-optimal choices made in the RB task. Pacini and Epstein (1999) found that participants make more optimal choices compared to non-optimal choices when performing the RB task. The results of this study were consistent with these findings and the participants made more optimal decisions ( $M=25.33, SD=10.36$ ) as compared to non-optimal decisions ( $M=18.67, SD=10.36$ ).

The third manipulation check was to see if the scores on the REI were significantly related to choices on the modified RB task as previous research had found correlations between the REI and choices on the RB task (Pacini & Epstein, 1999). There are two sub scores in the REI, total rationality and total experientiality. No significant

correlations were found between the total rationality score on the REI and optimal choices in the modified RB task,  $r = .164$ , or between total experientiality score on the REI and optimal choices on the modified RB task,  $r = -.001$ .

*Writing condition effect on choices in the modified RB task*

To examine the effects writing condition had on optimal choices in the modified RB task, three a priori contrasts were tested in an ANOVA model. The first contrast compared the total number of optimal choices in the control writing condition to the total number of optimal choices in the other three trauma conditions (TE, TF, and TC). The second contrast compared the total number of optimal choices in the TE and TF conditions to the total number of optimal choices in the TC condition. The third contrast compared the total number of optimal choices in the TE condition to the total number of optimal choices in the TF condition. Results revealed no significant differences between groups in all of the contrasts ( $p > .1$  in all contrasts). Although no significant differences were found among all 56 trials, the trend of optimal choices was the same as found in previous research (Setork, 2001) where participants in the C writing condition made the most optimal choices followed by the participants in the TC writing condition (see Table 1). The participants in the TE and TF writing conditions made the fewest amount of optimal choices. In this study participants in the C condition made 64% optimal choices, participants in the TC condition made 58% optimal choices, and participants in the TE and TF conditions both made 54% optimal choices.

Since in previous research (Setork, 2001) the potential effects of writing condition on choices in the RB task appeared to be short lived we decided to examine the first 14 trials of the modified RB task. Three a priori contrasts were tested in an ANOVA model.

As before the first contrast compared the total number of optimal choices in the control writing condition to the total number of optimal choices in TE, TF, and TC combined ( $p < .05$ ). The second contrast compared the total number of optimal choices in the TE and TF conditions to the total number of optimal choices in the TC condition ( $p > .1$ ). The third contrast compared the total number of optimal choices in the TE condition to the total number of optimal choices in the TF condition ( $p > .1$ ). Results in the first contrast were significant and revealed that participants in the C writing condition made more optimal choices in the modified RB task compared to the other three writing conditions (see Table 2).

*Writing condition effects on autonomic activation*

As mentioned above, autonomic space is measured by respiratory sinus arrhythmia (RSA) and pre-ejection period (PEP). RSA is correlated with parasympathetic nervous system (PNS) control of the heart. PEP is negatively correlated with sympathetic nervous system (SNS) control of the heart. The change between the last minute of rest and the first minute of writing in both PEP and RSA were correlated and plotted on a scatter graph to examine how writing condition affected both PNS and SNS control of the heart.

It was found that in comparison to previous research (Setork, 2001) the scatter plots were descriptively similar. In both cases there were a higher percentage of participants who showed reciprocal coupling of the ANS compared to those who showed uncoupling of the ANS across all writing conditions. Inspection of the graphs showed that in Setork's (2001) research for the trauma-emotion (TE) writing condition, 61% of the participants showed reciprocal coupling while 0% showed uncoupling. In this study

for the TE writing condition, 47% of participants showed reciprocal coupling while 20% showed uncoupling (see Figure 1). For the trauma-fact (TF) writing condition in Setork's (2001) research, 64% showed reciprocal coupling while 0% showed uncoupling. In this study, 44% showed reciprocal coupling while 29% showed uncoupling (see Figure 2). For the trauma-combination (TC) writing condition, Setork's (2001) results showed that 76% of participants showed reciprocal coupling while 8% showed uncoupling (see Figure 3). In this study 64% of participants showed reciprocal coupling while 14% showed uncoupling. For the control (C) writing condition 67% of participants in Setork's (2001) study showed reciprocal coupling while 13% showed uncoupling. In this study 36% of participants in the C writing condition showed reciprocal coupling while 27% showed uncoupling (see Figure 4).

Across all writing conditions, 67% of participants showed reciprocal coupling and 5.3% of participants showed uncoupling in Setork's (2001) study. In this study, across all writing conditions, 33.5% of participants showed reciprocal coupling and 17.5% showed uncoupling. Therefore in general, more instances of uncoupling were found in this study related to Setork's (2001) study. However, there did not appear to be any differences by writing condition.

### *Thought-listing*

Two research assistants who were blind to condition coded thought-listing sheets. Out of 60 participants only two of them listed thoughts pertaining to the trauma or the writing task. Therefore it can be concluded that no significant differences existed between groups.



## Discussion

The first set of hypotheses I had concerned the effects that writing condition would have on optimal choices in the RB task. I hypothesized that participants in the C, TF, and TC writing conditions were in the rational mode of thought and that participants in the TE writing condition were in the experiential mode of thought. The way this would be demonstrated is participants in the C writing condition would make the most optimal choices, participants in the TC writing condition would make the most optimal choices out of the three trauma conditions, and participants in the TE and TF would make the fewest optimal choices. For all 56 trials the results were not significant but they did follow the trend of previous research (Setork, 2001) where the participants in the C condition made the most optimal choices in the RB task, the participants in the TC condition made the most optimal choices compared to the other trauma conditions, and the participants in the TE and TF conditions made the fewest optimal choices. The results were found to be significant in the first 14 trials. These results could be examined in many different ways.

One possibility for the outcome of the results is participants in the three trauma conditions made fewer optimal choices in the first 14 trials compared to the participants in the control condition because all three trauma conditions were in the experiential mode of thought and the participants in the control condition were not.

Another possibility for the outcome of the results could have been that the initial hypothesis was correct and participants in the C, TF, and TC conditions were in different modes of thought processing but the modified RB task that was used did not correctly

measure that mode of thought. This could have occurred for 2 reasons. First, perhaps participants did not think the choices they were making on the computer made a real difference in the real RB task. Since the reward, or possibility of reward, was delayed they might have not had the proper motivation to put effort into their decisions. The second reason is there might have been too much time between writing and the RB task because of the instructions that had to be given. This time span might have taken too long and caused them to fall out of the mode of thought they had been in during writing.

A third possibility for the outcome of the results could have been that the original hypothesis on the different modes of thought was correct but the effects that writing condition had on mode of thought were short lived which would explain why the results were only significant for the first 14 trials. Finally, the theory that the participants were in different modes of thought because of writing condition could be wrong indicated by the lack of empirical support.

The second group of hypotheses I had concerned the physiological responses of the different writing conditions. I hypothesized that participants in the TE writing condition would show strong reciprocal coupling of the ANS demonstrated by a strong correlation between PEP and RSA and the other three writing conditions would not show strong reciprocal coupling of the ANS demonstrated by a weak correlation between PEP and RSA. The outcome of the data was such that a correlational analysis was not a proper measure of reciprocal coupling. The reason for this is in previous research (Setork, 2001) participants across all writing conditions showed reciprocal coupling therefore a correlational analysis was used to determine the strength of that coupling between

groups. Since in the data from this study, participants showed both reciprocal coupling and uncoupling a correlational analysis would not have been comparable.

For this reason an alternative way to compare the data was used. The percentage of the participants that were in reciprocal coupling and uncoupling quadrants of the graphs were compared to previous research (Setork, 2001). This analysis showed that in this study there were more participants who showed total uncoupling compared to reciprocal coupling of the ANS but across all writing conditions there were participants who did show uncoupling. This was inconsistent with Setork's (2001) research that showed very few participants who demonstrated uncoupling. As mentioned before, reciprocal coupling of the ANS has been previously shown to indicate lower modes of thought processes and therefore maybe linked to the experiential mode and uncoupling of the ANS has been previously shown to indicate higher modes of thought (Tomaka et al, 1993) and maybe therefore linked to the rational mode. Because of the distribution of reciprocal coupling and uncoupling across all writing conditions, it appears in this study, participants showed physiological signs of being in both the rational mode and experiential mode of thought during writing. This is inconsistent with previous research (Setork, 2001) where across writing conditions participants mostly showed physiological signs of being in one mode or the other.

My third hypothesis was that participants in both the TF and TE were cognitively busy because they had not been given a chance to disclose all parts of the trauma and this would cause them to make fewer optimal choices in the modified RB task. The results of the thought-listing task do not support this hypothesis. This could be because the instructions to the task were not clear enough and participants were not aware that they

could write down thoughts unrelated to the modified RB task. This could also be because if they had trauma related thoughts they might have not wanted to reveal them on a piece of paper that wasn't sealed in an envelope. Also it could be because the modified RB task lasted too long and they lost the mode of processing they were in. It could also mean that the hypothesis was wrong and that the participants in the TF and TE writing conditions were not cognitively busy.

These results give way to many future research possibilities. Other studies could be done on the new modified computerized RB task to see if it measures rational versus experiential mode the way that the real life RB task does. Participants could also be questioned about their motivation for the choices they made to reveal if they were really putting effort toward their decisions. The time between writing and modified RB task should try to be shortened to give the participants more of an opportunity to remain in the mode of thought they had been in during writing.

Physiological research could continue to look for a way better way to sample physiological information while the participant is performing the writing task. Optimal choices in the modified RB task should be examined based on whether the participants demonstrated reciprocal coupling or uncoupling during the writing task to see if autonomic activation has an effect on optimal choices. Also it should be examined whether reciprocal coupling or uncoupling during the modified RB task itself effects the optimal choices made. The thought-listing instructions could be changed to stronger emphasize the ability to list thoughts unrelated to the RB task. Their thought-listing sheets should also be sealed in envelopes so they have fewer qualms about revealing personal information.

The trend of optimal RB choices and the significant results of the first 14 trials reveal that there may be some difference between writing conditions. The physiological data is inconclusive. The results of the thought-listing task reveal that future research should continue to look for other possibilities why participants in the TC condition and C condition may make more optimal choices in the RB task compared to the participants in the TE and TF conditions. Previous research has demonstrated the many benefits of disclosure (Pennebaker & Beall, 1986; Pennebaker et al, 1987, Pennebaker et al, 1988, Wegner et al, 1990, Pennebaker et al, 1995). The limitations and findings of this study will hopefully be able to aid future researchers in further examining the cognitive and physiological processes behind disclosure.

## References

- Allport, G.W. (1954). *The nature of prejudice*. New York: Addison Wesley.
- Berntson, G.G., Cacioppo, J.T., & Quigley, K.S. (1991). Autonomic determinism: The modes of autonomic control, the doctrine of autonomic space, and the laws of autonomic constraint. *Psychological Review*, 98, 459-487.
- Bucci, W. (1995). The power of the narrative: A multiple code account. In J.W. Pennebaker (Ed.), *Emotion, disclosure, & health* (pp.93-122). Washington, DC: American Psychological Association.
- Cacioppo, J.T., von Hippel, W., & Ernst, J.M. (1997). Mapping cognitive structures and processes through verbal content: The thought-listing technique. *Journal of Consulting and Clinical Psychology*, 65, 928-940.
- Denes-Raj, V., & Epstein, S. (1994). Conflict between intuitive and rational processing: When people behave against their better judgment. *Journal of Personality and Social Psychology*, 66, 819-829.
- Epstein, S. (1991). Cognitive-experiential self-theory. In M.R. Gunnor & A.L. Sroufe (Eds.), *Self-processes and development* (pp.211-238). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Epstein, S. (1998). Cognitive-experiential self-theory: Implications for developmental psychology. In D.F. Barone & M. Herson (Eds.), *Advanced personality, the Plenum series in social/clinical psychology* (pp.79-122). New York: Plenum.
- Epstein, S., Lipson, A., Holstein, C., & Huh, E. (1992). Irrational reactions to negative outcomes: Evidence for two conceptual systems. *Journal of Personality and Social Psychology*, 62, 328-339.

- Gilbert, D.T., & Hixon, J.G. (1991). The trouble of thinking: Activation and application of stereotypic beliefs. *Journal of Personality and Social Psychology*, 60, 509-517.
- Kirkpatrick, L.A., & Epstein, S. (1992). Cognitive-experiential self-theory and subjective probability: Further evidence for two conceptual systems. *Journal of Personality and Social Psychology*, 63, 534-544.
- Pacini, R., & Epstein, S. (1999). The relation of rational and experiential information processing styles to personality, basic beliefs, and the ratio-bias phenomenon. *Journal of Personality and Social Psychology*, 76, 972-987.
- Pennebaker, J.W., & Beall, S.K. (1986). Confronting a traumatic event: Toward an understanding of inhibition and disease. *Journal of Abnormal Psychology*, 95, 274-281.
- Pennebaker, J.W., Kiecolt-Glaser, J.K., & Glaser, R. (1988). Disclosure of traumas and immune function: Health implications for psychotherapy. *Journal of Consulting and Clinical Psychology*, 56, 239-245.
- Pennebaker, J.W., Hughes, C.F., & O'Heeron, R.C. (1987). The psychophysiology of confession: Linking inhibitory and psychosomatic processes. *Journal of Personality and Social Psychology*, 52, 781-793.
- Petrie, K.J., Booth, R.J., Pennebaker, J.W., Davison, K.P., & Thomas, M.G. (1995). Disclosure of trauma and immune response to a hepatitis B vaccination program. *Journal of Consulting and Clinical Psychology*, 63, 787-792.
- Ohman, A., Hamm, A., & Hugdahl, K. (2000). Cognition and the autonomic nervous system: Orienting, anticipation, and conditioning. In J.T. Cacioppo, L.G. Tassinary, & G.G. Berntson (Eds.), *Handbook of Psychophysiology* (pp.533-??).

Cambridge: Cambridge University Press.

Setork, L. (2001). *Cognitive and physiological processes underlying written disclosure*.

Unpublished undergraduate thesis, Illinois Wesleyan University at Bloomington.

Stiles, W.B. (1995). Disclosure as a speech act: Is it psychotherapeutic to disclose? In

J.W. Pennebaker (Ed.), *Emotion, disclosure, & health* (pp.71-92). Washington,

DC: American Psychological Association.

Stern, R.M., Ray, W.J., & Quigley, K.S. (2001). *Psychophysiological recording*. New

York: Oxford University Press.

Wegner, D.M., Shortt, J.W., Blake, A.W., & Page, M.S. (1990). The suppression of

exciting thoughts. *Journal of Personality and Social Psychology*, 55, 409-417.



Appendix A

**Informed Consent**

We are requesting that you participate in a research study being conducted by Anna Carlson, an undergraduate psychology student here at Illinois Wesleyan University under the supervision of Dr. John Ernst. You will be asked to initial after two statements to ensure you have read the following paragraphs carefully. The purpose of this project is to better understand the cognitive and physiological processes underlying written disclosure. In order to do this, we are first going to ask you to write about a personal event for ten minutes. You may be asked to write about something traumatic or something not traumatic. While you write, you will be hooked up to sensors and a blood pressure cuff. This equipment will be used to collect your physiological responses (such as heart rate, blood pressure, etc.) throughout the study.

In order to measure your heart function, two adhesive bands, like long Band-Aids, will be placed around your neck and two will be placed around your abdomen. This will require that you raise your shirt slightly so we can place the lower bands around your stomach. These bands will be placed on you by a female research assistant. In addition, a very few individuals report that the bands leave a slight reddening of the skin. Although this causes no discomfort, the marks sometimes take up to 24 hours to completely fade.

\_\_\_\_\_ initials

You may then be asked to write about a personally traumatic experience for ten minutes

\_\_\_\_\_ initials

Afterwards, you will be asked to participate in a decision-making task. Lastly, you will be completing one survey and a brief demographics questionnaire (questions about your age, year in school, etc.), which will take approximately 15 minutes. The questions we ask you are about your thinking styles. You may find some of the questions to be personal or they may ask you about feelings that you are not comfortable with. You are free to withdraw from the session at any time and are free to answer or not answer any of the questions. There will be no penalty or loss of credit for withdrawing or omission of answers. If you withdraw during the first hour of the experiment you will still

receive one research credit. If you withdraw during the second hour of the study, you will receive two research credits. The entire process will last about two hours.

The specific information that you provide will be strictly confidential. Your questionnaire and writing samples will be identified by a random number code, and your name will not appear on any of these materials. All information will be held under lock and key. Your writing samples may be viewed only by members of the research team, and your identity will remain anonymous at all times. *Under no circumstance will your writing samples or your responses to the questionnaires be matched with your name.* The confidential responses you provide will be used by the members of the research team to better understand people's experiences. Summaries of information you and others participating in the study provide may appear in research publications in psychology.

If you have any questions regarding this project, please feel free to contact Anna Carlson at (309) 287-5003 or the supervising faculty member, Dr. John Ernst at (309) 556-3907. If you have any concerns regarding this project, please feel free to contact Dr. David Bollivar, a member of IWU's independent review board for ethics in experimentation, at (309) 556-3677.

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I have read the above information pertaining to the cognitive and physiological processes underlying disclosure.

\_\_\_\_\_ I agree to participate in this research. I understand that I may stop participation at any time or not answer any of the questions without penalty.

\_\_\_\_\_ I do not agree to participate in this research.

\_\_\_\_\_  
Participant Name (Print)

\_\_\_\_\_  
Participant Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Interviewer Signature

\_\_\_\_\_  
Date

---

Appendix B

Writing Instructions for Control Condition

(Pennebaker & Beall, 1987)

I am now going to give you a pen and a pad of paper. Once I leave the room and the door is closed, I want you to write continuously for 10 minutes about your campus bedroom. Don't worry about grammar, spelling or sentence structure. In your writing, I want you to clearly describe what your bedroom looks like at school. It may be your dorm room, an apartment bedroom, or your bedroom in a fraternity or sorority house. Describe what your bedroom looks like using the most detail possible. You can describe the furniture you have, the colors of the room, posters on the wall, and any other descriptive features of your bedroom.

Appendix C

Writing Instructions for Trauma-Emotion Condition

(Pennebaker & Beall, 1987)

I am now going to give you a pen and a pad of paper. Once I leave the room and the door is closed, I want you to write continuously for 10 minutes about the most upsetting or traumatic experience of your entire life. Don't worry about grammar, spelling, or sentence structure. In your writing, I want you to discuss your deepest feelings about the experience. You can write about anything you want. But whatever you choose, it should be about something that has affected you very deeply. Ideally, it should be about something you have not talked about with others in detail. It is critical, however, that you do not mention the trauma itself. Instead focus only upon your emotions. Let yourself go and touch the deepest emotions you have. In other words, write about how you felt at the time of the event and how you feel about it now.

Appendix D

Writing Instructions for Trauma-Fact Condition

(Pennebaker & Beall, 1987)

I am now going to give you a pen and a pad of paper. Once I leave the room and the door is closed, I want you to write continuously for 10 minutes about the most upsetting or traumatic experience of your entire life. In your writing, I want you to discuss the details of the event. You can write about anything you want. But whatever you choose, it should be about something that has affected you very deeply. Ideally, it should be about something you have not talked about with others in detail. It is critical, however, that you do not mention your feelings toward the experience. Instead focus only upon the facts of the experience. Let your self go and retell the event as clearly as possible. In other words, write about what happened, where it happened, and when it happened without referring to any of your emotions.

Appendix E

Writing Instructions for Trauma-Combination Condition

(Pennebaker & Beall, 1987)

I am now going to give you a pen and a pad of paper. Once I leave the room and the door is closed, I want you to write continuously for 10 minutes about the most upsetting or traumatic experience of your entire life. In your writing, I want you to discuss your deepest thoughts and feelings about the experience. You can write about anything you want. But whatever you choose, it should be about something that has affected you very deeply. Ideally, it should be about something you have not talked about with others in detail. It is critical, however, that you let your self go and touch the deepest emotions and thoughts that you have. In other words, write about what happened and how you felt about it, and how you feel about it now.

## Appendix F

### Computer RB Script

You will now be participating in a decision-making task in which you will have the opportunity to win and keep real money. Before the actual task begins you will have the chance to practice using the mouse on this particular computer.

\*When explaining the next part, show them the trays of jellybeans...

When the task begins, two different amounts of red and white jelly beans will appear on both sides of the screen. If picking a red jellybean meant you would win a dollar and you have a chance to pick from one of the two sides without looking, which side would you want to pick from? You will have 5 seconds to answer this question by clicking on the side of the screen you would want to pick from with the mouse. When the task begins, there will be two sets of numbers at the bottom of the screen. The first set tells you the amount of red jellybeans to the amount of total jellybeans. The second number tells you the percentage of red jellybeans on that side.

Are there any questions so far?

After you have completed this task, you will get to actually draw a jellybean from a tray with a ratio of jellybeans based on some of the decisions you made in the previous task. We will place this mask over your eyes and allow you to draw one jellybean, if you draw a red jellybean you will receive a fake dollar that will be exchanged for real money at the end of the study. If you draw a white jellybean you neither win nor lose money. You will have 3 opportunities to draw from a tray.

Do you have any questions?

You can start the computer task whenever you are ready by clicking the begin button on the screen.

## Appendix G

We would like to get an idea of the thoughts that crossed your mind **DURING** the previous computer task. This page contains space for you to use to record your thoughts and ideas. Please write down the first thought that comes to mind on the first line (A), the second thought that comes to mind on the second (B), and so on. Please put one thought per line. You do not have to use every line. Regardless of whether your thoughts were positive, negative, neutral, or completely unrelated to the previous computer task, please list all of your thoughts and list them as clearly as possible. Remember, there are no correct answers.

Please begin listing the thoughts that occurred to you during the previous computer task.

- A. \_\_\_\_\_
- B. \_\_\_\_\_
- C. \_\_\_\_\_
- D. \_\_\_\_\_
- E. \_\_\_\_\_
- F. \_\_\_\_\_
- G. \_\_\_\_\_
- H. \_\_\_\_\_
- I. \_\_\_\_\_
- J. \_\_\_\_\_
- K. \_\_\_\_\_
- L. \_\_\_\_\_
- M. \_\_\_\_\_
- N. \_\_\_\_\_



## Appendix H

**REI**

Please circle the corresponding number as you rate the following statements about your feelings, beliefs, and behaviors. Work rapidly; first impressions are as good as any.

1=definitely false

2=mostly false

3=undecided or equally true and false

4=mostly true

5=definitely true

1. I'm not that good at figuring out complicated problems.  

1	2	3	4	5
---	---	---	---	---
2. If I were to rely on my gut feelings, I would often make mistakes.  

1	2	3	4	5
---	---	---	---	---
3. I prefer complex to simple problems.  

1	2	3	4	5
---	---	---	---	---
4. I generally don't depend on my feelings to help me make decisions.  

1	2	3	4	5
---	---	---	---	---
5. I have no problem with thinking things through clearly.  

1	2	3	4	5
---	---	---	---	---
6. When it comes to trusting people, I can usually rely on my gut feelings.  

1	2	3	4	5
---	---	---	---	---
7. Thinking is not my idea of an enjoyable activity.  

1	2	3	4	5
---	---	---	---	---
8. I like to rely on my intuitive impressions.  

1	2	3	4	5
---	---	---	---	---
9. I am not a very analytical thinker.  

1	2	3	4	5
---	---	---	---	---
10. I believe in trusting my hunches.  

1	2	3	4	5
---	---	---	---	---
11. I enjoy solving problems that require hard thinking.

- |  | 1 | 2 | 3 | 4 | 5 |
|--|---|---|---|---|---|
| 12. I think it is foolish to make important decisions based on feelings.                           | 1 | 2 | 3 | 4 | 5 |
| 13. I suspect my hunches are inaccurate as often as they are accurate.                             | 1 | 2 | 3 | 4 | 5 |
| 14. I usually have clear, explainable reasons for my decisions.                                    | 1 | 2 | 3 | 4 | 5 |
| 15. Knowing the answer without having to understand the reasoning behind it is good enough for me. | 1 | 2 | 3 | 4 | 5 |
| 16. I would not want to depend on anyone who described himself or herself as intuitive.            | 1 | 2 | 3 | 4 | 5 |
| 17. Using logic usually works well for me in figuring out problems in my life.                     | 1 | 2 | 3 | 4 | 5 |
| 18. I enjoy intellectual challenges.   | 1 | 2 | 3 | 4 | 5 |
| 19. I can usually feel when a person is right or wrong, even if I can't explain how I know.        | 1 | 2 | 3 | 4 | 5 |
| 20. I often go by my instincts when deciding on a course of action.                                | 1 | 2 | 3 | 4 | 5 |
| 21. My snap judgments are probably not as good as most people's.                                   | 1 | 2 | 3 | 4 | 5 |
| 22. Reasoning things out carefully is not one of my strong points.                                 | 1 | 2 | 3 | 4 | 5 |
| 23. I don't like situations in which I have to rely on my intuition.                               | 1 | 2 | 3 | 4 | 5 |
| 24. I try to avoid situations that require thinking in depth about something.                      | 1 | 2 | 3 | 4 | 5 |
| 25. I trust my initial feelings about people.  | 1 | 2 | 3 | 4 | 5 |

26. I have a logical mind.

1                      2                      3                      4                      5

27. I don't think it's a good idea to rely on one's intuition for important decisions.

1                      2                      3                      4                      5

28. I don't like to have to do a lot of thinking.

1                      2                      3                      4                      5

29. I don't have a very good sense of intuition.

1                      2                      3                      4                      5

30. I am not very good at solving problems that require careful logical analysis.

1                      2                      3                      4                      5

31. I think there are times when one should rely on one's intuition.

1                      2                      3                      4                      5

32. I enjoy thinking in abstract terms.

1                      2                      3                      4                      5

33. Using my "gut feelings" usually works well for me in figuring out problems in my life.

1                      2                      3                      4                      5

34. I don't reason well under pressure.

1                      2                      3                      4                      5

35. I tend to use my heart as a guide for my actions.

1                      2                      3                      4                      5

36. Thinking hard and for a long time about something gives me little satisfaction.

1                      2                      3                      4                      5

37. I hardly ever go wrong when I listen to my deepest "gut feelings" to find an answer.

1                      2                      3                      4                      5

38. I am much better at figuring out things logically than most people.

1                      2                      3                      4                      5

39. Intuition can be a very useful way to solve problems.

1                      2                      3                      4                      5

40. Learning new ways to think would be very appealing to me.

1

2

3

4

5

---

Note. From "The relation of Rational and Experiential Information Processing Styles to Personality, Basic Beliefs, and the Ratio-Bias Phenomenon," by Rosemary Pacini and Seymour Epstein, 1999, Journal of Personality and Social Psychology, 76, p.976. Copyright 1999 by the American Psychological Association. Adapted with permission.

### **REI Scoring Key**

Scoring: Sum of ratings (1-5) of items in a scale. Item numbers with an “r” are reversed scored as follows: 1=5,2=4,3=3,4=2,5=1.

#### Rational Ability

- 1. I’m not that good at figuring out complicated problems.
- 5. I have no problem with thinking things through clearly.
- r9. I am not a very analytical thinker.
- 14. I usually have clear, explainable reasons for my decisions.
- 17. Using logic usually works well for me in figuring out problems in my life.
- r22. Reasoning things out carefully is not one of my strong points.
- 26. I have a logical mind.
- 30. I am not very good at solving problems that require careful logical analysis.
- r34. I don’t reason well under pressure.
- 38. I am much better at figuring out things logically than most people.

#### Rational Favorability

- 3. I prefer complex to simple problems.
- r7. Thinking is not my idea of an enjoyable activity.
- 11. I enjoy solving problems that require hard thinking.
- r15. Knowing the answer without having to understand the reasoning behind it is good enough for me.
- 18. I enjoy intellectual challenges.
- r24. I try to avoid situations that require thinking in depth about something.
- r28. I don’t like to have to do a lot of thinking.
- 32. I enjoy thinking in abstract terms.
- r36. Thinking hard and for a long time about something gives me little satisfaction.
- 40. Learning new ways to think would be very appealing to me.

Total Rationality = Sum of Rational Ability & Rational Favorability

#### Experiential Ability

- r2. If I were to rely on my gut feelings, I would often make mistakes.
- 6. When it comes to trusting people, I can usually rely on my gut feelings.
- 10. I believe in trusting my hunches.
- r13. I suspect my hunches are inaccurate as often as they are accurate.
- 19. I can usually feel when a person is right or wrong, even if I can’t explain how I know.
- r21. My snap judgments are probably not as good as most people’s.
- 25. I trust my initial feelings about people.
- r29. I don’t have a very good sense of intuition.
- 33. Using my “gut feelings” usually works well for me in figuring out problems in my life.

37. I hardly ever go wrong when I listen to my deepest “gut feelings” to find an answer.

Experiential Favorability

r4. I generally don't depend on my feelings to help me make decisions.

8. I like to rely on my intuitive impressions.

r12. I think it is foolish to make important decisions based on feelings.

r16. I would not want to depend on anyone who described himself or herself as intuitive.

20. I often go by my instincts when deciding on a course of action.

r23. I don't like situations in which I have to rely on my intuition.

r27. I don't think it's a good idea to rely on one's intuition for important decisions.

31. I think there are times when one should rely on one's intuition.

35. I tend to use my heart as a guide for my actions.

39. Intuition can be a very useful way to solve problems.

Total Experientiality = Sum Experiential Ability & Experiential Favorability

Appendix I

**Demographics**

1. Age (in years): \_\_\_\_\_
2. Gender:     M     F (Please circle one)
3. Year in school: 1 2 3 4 5 (Please circle one); 4. Major \_\_\_\_\_
5. What is your ethnicity? (Please circle all that apply)
  - a. Caucasian
  - b. African-American
  - c. Asian-American
  - d. Asian-Indian-American
  - e. Pacific Islander
  - f. Asian-Indian
  - g. Latino/Latina
  - h. Asian
  - i. Native American
  - j. International Student \_\_\_\_\_ country of origin
  - k. Other
6. What social groups do you belong to on campus? (Please circle all that apply)
  - a. volunteer organization
  - b. church group
  - c. academic club
  - d. fraternity or sorority
  - d. musical group
  - e. varsity sports team
7. How often, if at all, do you engage in personal writing (whether it be in a journal/diary, writing poetry, writing poetry/stories outside of class, etc.)
  - a. Once or more a week
  - b. A couple of times a month
  - c. A few times a year
  - d. Never
  - e. Other \_\_\_\_\_

For this study personal writing is defined as ant type of writing that you do because it is a way to reflect on your life. For this study we are not including work that you've done for schooling.

1. Would you define personal writing in another way than my definition?

Yes.....1

No.....2

2. If you would define personal writing in another way, what is your definition of personal writing?

3. At some time in your life have you ever done personal writing –any type of writing that you do as a way to reflect upon your life?

Yes.....1

If yes, answer questions # 4-7.

No.....2

If no, why have you **NEVER** done personal writing at any time in your life?

4. Have you ever kept a diary or a journal?

Yes.....1

No.....2

5. There are many reasons for personal writing. Which of these fits you. Please circle the number corresponding to the statement in the left side of the column. Circle all that apply.

To document, explore, escape from, or reflect on extremely painful memories or feelings and how separate you feel from these feelings, including anger	1
To record daily events, hold onto writing for a lifetime, and to write innocent stories	2
To access the self – to have a place where I can think about things related to me	3
To reflect social change or injustice	4
To provide temporary relief/ventilation of daily stress/smaller issues	5
To tell the truth	6
To break the isolation of feeling alone	7
To give myself a boost	8
To hide secret acts, feelings, and thoughts in writing	9
To complete creative writings or free writings at school	10
To communicate with or write about God	11
To reflect or solve problems with friends or relationships	12
To share thoughts/feelings/daily life with others in letters or gifts	13
Other reasons: please list other reasons.	14

6. Which of the above reasons is your main reason for doing personal writing?

7. Please let us know anything else related to your personal writing.



Appendix J  
**Verbal Debriefing**

*[Note to experimenter – if at any time you feel like you want help-immediately call Dr. Ernst (556-3907 or 820-1099). If he cannot be reached then call the health services at 556-3107.]*

Thank you very much for participating in this study. Your participation will help us to better understand the physiological and cognitive processes behind written disclosure. I will be giving you a debriefing form before you leave that will further explain what this study is examining.

Right now, however, I want to specifically thank you for agreeing to write about a personal experience. As previously mentioned, everything you've written will remain confidential and anonymous. Often times if we write about something upsetting we may experience feelings of sadness, anger, or pain, or we may experience new feelings that we have not previously experienced.

1. Did the writing exercise conjure up feelings for you?

*[Regardless of whether they say yes or no the experimenter is to move on to the next question.]*

2. Is there anything you would like to talk about?

*[If the answer is yes-then the experimenter is to listen to what the participant has to say.]*

*What if the participant doesn't seem hysterical:*

A. Let the participant talk.

B. At the end say something like, "Thanks for sharing those feelings me. Your participation is really appreciated and as I mentioned before, very valuable for understanding the repercussions of traumatic events." Go to question #3 below.

*Imagine that the subject seems upset:*

Let the participant talk. At the end say something like, "You seem upset to me. Would you like to have a chance to talk to my supervisor, Dr. John Ernst, or someone at health services?" If they say yes, then contact Dr. Ernst (556-3097 or 820-1099) or health services (556-3107). If they ask for Ernst and he is not available call health services. If they don't answer the phone and the participant seems truly hysterical and/or suicidal (we don't anticipate suicidal ideation-indeed the literature suggests that disclosing a traumatic event is likely to make the participant feel better) then call the PATH Crisis Center @ 827-4005. If they say no, ask them if they want a friend to come pick them up.

3. Is there someone you can talk to about this experience if you want to do so later on?

*If they say no-then refer them to the contact numbers for Dr. Ernst and the Health Services Center.*

4. If at any time upon leaving should you want to talk to someone about any feelings that this study may have evoked, please feel free to contact Dr. Ernst, social psychologist here at IWU, or IWU Counseling services, located in the basement of Magill Hall. The numbers for both places are on the debriefing form I am about to give you. Thank you again for your participation.

*[After reading this debriefing form the participant will be asked if they have any further questions, thanked for their participation, and dismissed.]*

**\*\*Don't forget to give the participant their debriefing form and informed consent form before they leave..**

## Appendix K

### Debriefing

Thank you very much for your participation! The main purpose of this study was to examine the events surrounding written disclosure of a traumatic experience. Research conducted by Epstein suggests the existence of two distinct modes of processing: rational and experiential. The rational mode of processing is driven by logic and deliberative thought involving higher brain functioning, whereas the experiential mode of processing is driven by emotions and automatic heuristics involving lower brain functioning. For example, solving math problems would more heavily invoke the rational system, whereas painting a picture would more heavily rely on the experiential system. It is possible that writing about the facts surrounding a traumatic event invokes rational processing, whereas writing about the emotions surrounding a traumatic event invokes experiential processing. We will be examining this possibly by observing the relationship between your writing sample and the decisions you made in the jellybean task.

In addition to self-report and behavioral measures, people's physiological responses have often been examined as a way to learn more about their psychological processing. Tomaka, Blascovich, Kelsey, and Leitten propose that events involving higher brain functioning involve one type of autonomic activation whereas lower brain functioning involves another. We will examine this hypothesis by looking at your physiological reactivity throughout the study.

This research is valuable because it will help us better understand the cognitive and physiological processes that underlie disclosure. Disclosure is a central aspect in many therapies and every day encounters. It is our hope that our research will shed some light on the hidden processes that accompany emotional versus factual disclosure.

It is very important that you do not talk about the specifics of this study with other students at IWU. You are doing this study with lots of students and it's important that everyone comes with the same information. We don't want some students and not others to know about specific tasks or questions. However, you can say that you participated in a study that examined the cognitive and physiological processes underlying disclosure.

If you have any questions in the future, please contact Dr. Ernst, Ph.D. at (309) 556-3907. In addition, if you would like to discuss any feelings this study may have invoked, please contact Dr. Ernst or the counseling services at IWU (free services): (309) 556-3052.

If you are interested in this study and would like further information, the following is recommended reading used in this study:

- Pacini, R., & Epstein, S. (1999). The relation of rational and experiential information processing styles to personality, basic beliefs, and the ratio-bias phenomenon. *Journal of Personality and Social Psychology*, 76, 972-987.
- Pennebaker, J.W. *Emotion, Disclosure, & Health*. Washington, DC: American Psychological Association.

Thanks again for your participation! Your help is of great service as we explore cognitive and physiological processes underlying disclosure.

Table 1

Mean and Standard Error of Optimal and Non-optimal Choices Made in All Trials of the Ratio-Bias Task by Writing Condition

<u>Writing Condition</u>	<u>Choices in the Ratio-Bias Task</u>	
	<u>Optimal</u>	<u>Non-optimal</u>
Control		
<i>M</i>	28.20	15.80
<i>SE</i>	2.70	9.09
Trauma-Emotion		
<i>M</i>	23.60	20.40
<i>SE</i>	2.70	11.48
Trauma-Fact		
<i>M</i>	23.94	20.06
<i>SE</i>	2.62	9.92
Trauma-Combination		
<i>M</i>	25.71	18.29
<i>SE</i>	2.80	11.29

Table 2

Mean and Standard Error of Optimal and Non-optimal Choices Made in the First 14 Trials of the Ratio-Bias Task by Writing Condition

<u>Writing Condition</u>	<u>Choices in the First 14 Trials</u>	
	<u>Optimal</u>	<u>Non-optimal</u>
Control		
<i>M</i>	6.13	3.87
<i>SE</i>	.64	2.39
Trauma-Emotion		
<i>M</i>	4.67	5.20
<i>SE</i>	.64	2.33
Trauma-Fact		
<i>M</i>	3.56	6.44
<i>SE</i>	.62	2.45
Trauma-Combination		
<i>M</i>	4.64	5.36
<i>SE</i>	.66	2.71

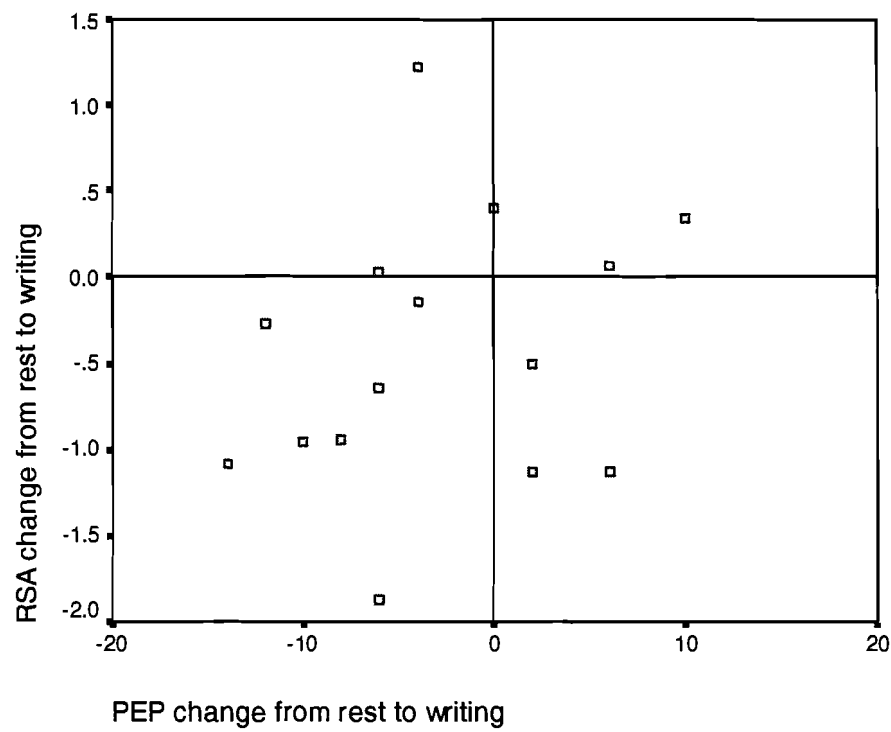


Figure 1

Autonomic Space as a Function of Change in Pre-Ejection Period (PEP) and Change in Respiratory Sinus Arrhythmia (RSA) for Participants in the Trauma-Emotion Condition

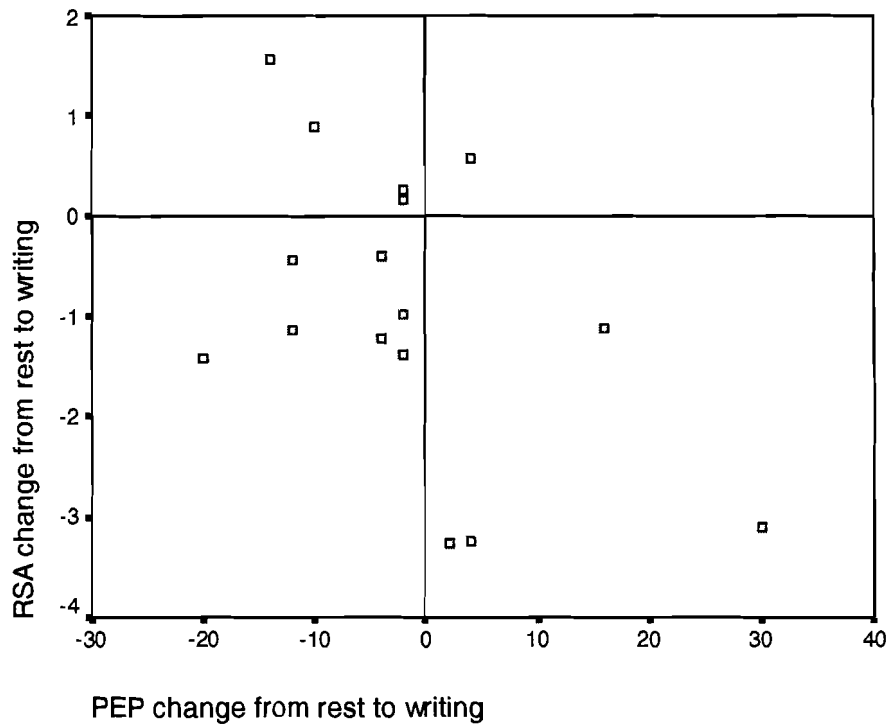


Figure 2

Autonomic Space as a Function of Change in Pre-Ejection Period (PEP) and Change in Respiratory Sinus Arrhythmia (RSA) for Participants in the Trauma-Fact Condition

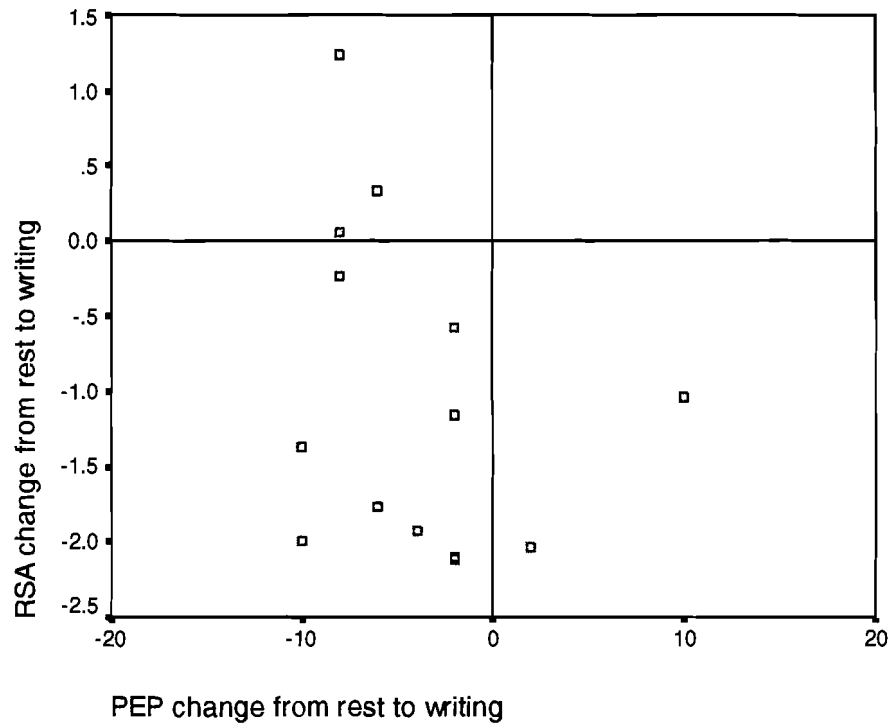


Figure 3

Autonomic Space as a Function of Change in Pre-Ejection Period (PEP) and Change in Respiratory Sinus Arrhythmia (RSA) for Participants in the Trauma-Combination Condition



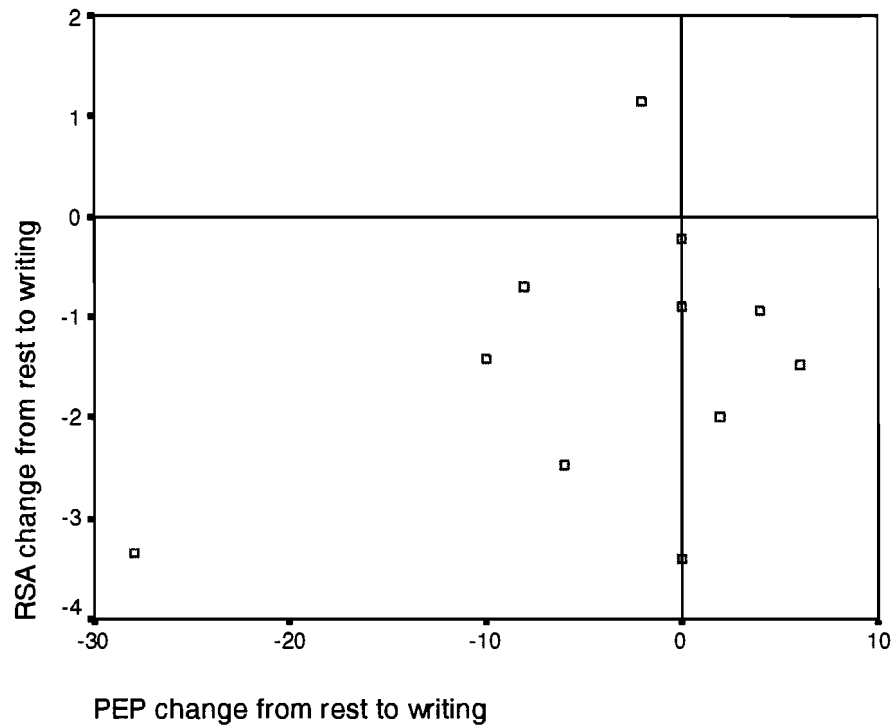


Figure 4

Autonomic Space as a Function of Change in Pre-Ejection Period (PEP) and Change in Respiratory Sinus Arrhythmia (RSA) for Participants in the Control Condition

Author Note

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