TESTING A PROCESS MODEL OF EMOTIONS: ASSOCIATIVE ACTIVATION OF APPRAISALS VIA PRIMING TECHNIQUES – PRELIMINARY STUDIES

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CHAPTER I

INTRODUCTION

As agents who interact daily with the world around us, we are constantly exposed to stimuli and situations of potential harm or benefit to our personal well-being. In order to ensure our own survival and maximize our growth, we need to accurately detect and adequately address these stimuli. In other words, we need to sift through the vast amount of stimuli we are confronted with, pick out those stimuli that are relevant to our well-being, attend to them, and handle them in such a way that we avert harm and/or contract benefit. For example, a pedestrian who is trying to safely cross a busy street is confronted with a potentially harmful task, yet a careful calculation of where and when to cross depending on the speed of the cars, the presence of cellular phones in the drivers' hands, and the distance between the cars and the pedestrian him or herself can result in reaching the other side safely. Smith and Lazarus (1990) claim that there are three systems that help us deal with such adaptational questions – reflexes, physiological drives, and emotions. Reflexes and drives promote survival in an elementary way via built-in stimulus-response connections (e.g., pull your hand away from a source of pain). The emotion system, which developed in response to a need for flexibility in interacting with one's surrounding stimuli and resulted from humans' growing ability to draw on intellectual functions to understand these stimuli, enhances our well-being in a more complex manner. For one, emotions allow for new connections to be formed via learning, thus moving away from simple SR connections. Secondly, the emotion system

leaves room for the interpretation of our circumstances and helps us navigate a world where the **meaning** of stimuli we encounter is often more crucial than their mere presence.

From a functional perspective, we view emotions as an "adaptational subsystem" (Smith & Lazarus, 1990, pp. 611) that serves to enhance our personal well-being and to motivate our growth. Because emotions guide our thoughts and actions, it is important to examine what feeds into them and how they are elicited. That is, we need to increase our understanding about which thoughts or appraisals lead to which emotions on the one hand, and how this process works on the other hand.

In search of an answer to the first question, we will focus here on the Structural Appraisal Model of Smith and Lazarus (1990). Like several other emotion theorists (e.g., Scherer, 2001; Roseman, 1991; Roseman & Smith, 2001; Smith & Kirby, 2000, 2001), these authors focus on the meaning or appraisal of one's circumstances. Smith and Lazarus (1990) claim that we continuously scan our environment and evaluate whether or not the stimuli we encounter are relevant for our wellbeing and whether or not they are potentially beneficial or harmful. These authors identified these two basic 'checks' (i.e. motivational relevance and motivational congruence) on incoming information as **primary appraisals**. Primary appraisals are adequate to differentiate between positive emotions (motivationally relevant + congruent) and negative emotions (motivationally relevant + incongruent) as a whole; however, they are unable to identify particular positive or negative emotions. To further specify the exact type of negative or positive emotions, these authors incorporated **secondary appraisals** in their theory. These

appraisals cover the questions of (1) who is held accountable for the perceived threat/harm or benefit, (2) how the person evaluates his or her potential to act upon the situation in order to avert the threat or attract the benefit, (3) the degree to which the person feels like s/he can deal with the situation emotionally, and (4) the expectation of any changes in the situation in the future, making it less/more threatening or beneficial.

The answers to these primary and secondary appraisal questions combine into core relational themes such as ambiguous danger, irrevocable loss, other-blame, self-blame and possibility of success. Every emotion is characterized by a core relational theme, and when a person's appraisals lead to the activation of such a theme, the emotion associated with this theme will be elicited. For example, when someone appraises a situation as motivationally relevant, incongruent, and he or she has a high future expectancy about it, the relational theme 'possibility of amelioration/success' will be triggered. The interpretation of a situation as having this possibility evokes the emotion of hope. Using these appraisal components and core relational themes, Smith and Lazarus (1990) mapped out which appraisals lead to which emotions. According to their theory, not an event itself, but its interpretation – the meaning people give it – triggers emotions. In light of these considerations it is not surprising that two individuals in the same situation can react entirely differently.

While this Structural Model of Appraisal (Smith & Lazarus, 1990) outlines which cognitions lead to which emotions and why different people react to a given situation in different ways, the mechanism of emotion elicitation is unexplained in this theory. In search of a model that addresses how emotions are triggered, Smith and Kirby (2000)

proposed a dynamic 'Process Model of Appraisals.' They stated that people's emotions are a direct result of their evaluation of what a given situation implies for their personal wellbeing, and this evaluation can be made in two different ways: automatically or deliberately. Smith and Kirby (2000, 2001) referred to quick, automatic and uncontrolled processing as 'associative processing' while labeling slow, deliberate, conscious and controlled processing as 'reasoning.' These two levels of information processing are proposed to come into play at different points in time and interact with one another.

Smith and Kirby hypothesized the existence of 'appraisal detectors' that continuously monitor a person's environment for potentially important information to his or her wellbeing, goals and needs. Once potentially relevant information is detected, the activation level of these appraisal detectors increases. At that point, even though there is some preliminary awareness of the information, a perceiver can still be entirely unaware – on a conscious level – of what is going on and feel unemotional about it. As the appraisal detectors continue to get activated, a certain threshold becomes exceeded in the appraisal detectors, which leads to the elicitation of an emotion at the associative level of processing. The information perceived in the situation triggers activation of prior memories that are similar to the current circumstances as well as the appraisals and emotional responses associated with these memories. This process is called 'spreading activation' where activation of a given node of information (e.g., the sight of a snake) activates surrounding informational nodes connected to it (e.g., poison, danger, increased muscular tension, elevated blood pressure, thoughts about running away). These nodes in turn activate the nodes they are connected to, and so on. As these appraisals and their physiological counterparts become more and more activated and strong, they force

themselves into conscious awareness at which point the observer tries to integrate these associative appraisals with his or her momentary conscious appraisals. If these associative appraisals do not immediately make sense to the observer and she does not understand why she is feeling a certain way, she will actively examine her circumstances via reasoning to give meaning to the emotion that forced itself into her awareness via associative processing. Via this combination of associative processing and reasoning, the observer can reach a clear understanding of the situation she finds herself in and address it appropriately.

While theoretically appealing, this model of appraisals has only been empirically examined to a limited degree. In 2004, Kirby, Edwards & Smith (unpublished manuscript) conducted a preliminary test of the process model of appraisal - associative processing specifically. These authors set out to experimentally activate different appraisals of problem-focused coping potential (evaluations of a person's ability to succeed at a task) on the associative level via 'priming techniques' and examined how these appraisals affect (a) individual's reported feelings towards a task and (b) their actual problem-solving behavior. In priming techniques, a given concept is activated in a person's mind through exposure to stimuli that represent this concept. For example, negative affect can be primed in a person by showing him or her pictures of sad faces, or by exposing him or her to words that reflect negative affect (e.g., war, hate, pain). Participants are typically exposed to primes in a covert fashion to prevent them from piecing together the purpose of the priming task. This type of exposure can be reached by either using a 'cover task' – a task that provides a (false) rationale for why the primes

are shown – or by presenting primes outside of conscious awareness. For example, in some studies participants are exposed to both words and non-words and asked to decide as quickly as possible whether the stimuli they see are words or non-words (i.e. lexical decision task – see Neely, 1991 for review). In this fashion participants are exposed to the primes but might not be aware of them. In other designs, primes are masked, i.e. presented so briefly that they cannot be consciously perceived (while still being registered by the brain). This method is called 'masked priming' or 'subliminal priming' as opposed to 'supraliminal priming' where primes are visible to participants (such as in a lexical decision task).

Kirby et al. (2004) successfully primed participants supraliminally with either high or low problem-focused coping potential using a scrambled sentence task. That is, participants were shown four words at a time and were asked to make a sentence with 3 out of those 4 words. This task was set up in such a way that the words that represented high or low coping potential always had to be used to make a 3-word sentence. For example, WINS HE PICTURE ALWAYS would be made into "HE ALWAYS WINS". As a control condition, some participants were exposed to neutral words (words unrelated to coping potential). After this priming phase, participants were presented with a problem-solving task (math problems). The investigators were interested to see how different levels of problem-focused coping potential would affect emotions and actions in response to a task where these appraisals were relevant. The results showed that primed appraisals of coping potential affected (1) participants' behavior – participants primed with high coping potential were more successful at solving difficult math problems than participants in the low coping and the neutral condition, and (2) participants' reported

emotions – lower feelings of resignation were reported in the high coping potential group than in the other two groups. These observations suggest that different appraisals can become activated using priming techniques, and that these appraisals elicit different emotions and emotion-related behavior.

However, since the prime words in this study were offered supraliminally (i.e., participants were consciously aware of the stimuli in the scrambled sentence task), it was possible that participants pieced together the purpose of the study or the manipulations and adjusted their emotional and behavioral responses accordingly.

In the current set of studies, we (a) examined the possibility that Kirby et al.'s (2004) findings were caused by participants' awareness of the experimental purpose and (b) avoided some caveats that limited these authors' conclusions. In particular, we set out to replicate Kirby et al.'s experiment using *subliminal* primes presented outside of conscious awareness. Furthermore, we wanted to rule out a 'valence effect' as a possible explanation for Kirby et al.'s findings. Since high coping words tend to be positive, and low coping words are typically negative, it is possible that the activation of general positive vs. negative affect, rather than high vs. low coping potential specifically was responsible for the observed effects. In order to test this, we wanted to prime participants with either high/low coping potential or pure positive/negative affect (using prime words unrelated to coping potential) and compare these groups. Finally, rather than using math problems (which are time consuming and therefore few in number, evoke strong negative reactions in some people, and are rather domain specific hence limiting the generality of

the data), we planned on asking participants to solve anagrams. Before running this main study however, we conducted three pilot studies to examine the effectiveness of our methods.

Overview of the pilot studies

In the first pilot study – the word validation study – we aimed to identify words that reliably represent high coping potential, low coping potential, positive affect (neutral on the coping potential dimension), negative affect (neutral on the coping potential dimension) and words that were neutral both with regard to coping potential and valence. The second proposed pilot study – the awareness check study – focused on ensuring that participants were not consciously aware of the primes (as we wanted to present them subliminally). In the third pilot study – the priming check study – we validate the subliminal priming procedure by examining if it actually led to the activation of primed appraisals. In short, we attempted to replicate and extend Kirby et al.'s (2004) study by using a modified version of their experimental paradigm, and thereby study associative processing more in depth.

CHAPTER II

PILOT STUDIES

Pilot Study One - Word Validation Study

METHOD

Participants

Participants were 10 graduate students (50% female) who completed the pilot study for monetary compensation.

Procedure

Each participant was given a booklet with 848 words. This booklet was composed of words from each of five categories: high coping, low coping, positive (unrelated to coping), negative (unrelated to coping), and neutral (neutral on valence and unrelated to coping). Participants were asked to rate each word with regard to valence and coping potential. To ensure that they had a solid understanding of these two concepts, we started with a short training phase in which the concepts were explained and a few examples of high coping potential and low coping potential were provided. We explained the valence of a word as "whether the word is positive (or good), neutral, or negative (or bad)". Coping potential was described in the following way: "Coping potential refers to a person's beliefs about how well he or she can handle a difficult situation -- how good a person thinks he or she can cope with a given problematic event or a challenging

situation. Coping potential thus refers to a person's assessment of his or her ability or potential to cope with a problem -- for instance, one's assessment of his or her ability to overcome challenging obstacles and succeed at a difficult task. When you consider yourself able to deal with problematic situations, when you think you will do fine, and are likely to succeed, you have high coping potential. On the other hand, when you expect that you will not be able to handle a problem or cope with a difficulty, that is, when you expect to fail at something, you are characterized by low coping potential."

After this explanation, participants were asked to rate the **valence** of each word on a 7-point Likert scale ranging from –3 (strongly negative word) to +3 (strongly positive word) and to rate the degree to which each word represented **coping potential**, ranging from –3 (strongly represents low coping potential) to +3 (strongly represents high coping potential). A zero score for valence meant that the word was neutral, a zero for coping potential indicated that the word was not related to coping potential at all. After completing two practice trials with feedback, the participants began working on the booklet. They were given two weeks to finish the ratings.

RESULTS AND DISCUSSION

A highly significant correlation, $r\ (845) = 0.812$, $p < 0.001$, was found between coping potential and valence, indicating that words that were considered strong high coping words were also considered strongly positive, and words that scored high on low coping potential were typically rated strongly negative as well. In other words, there are very few high coping words that are not positive or low coping words that are not negative. Because of this, words with a weak valence (determined by the investigators as

words with a valence rating between –1 and +1) were also words that represented coping potential weakly. So, in order to select a set of strong coping words and strong valence words, we excluded all words that were rated between –1 and +1 on the valence scale. Due to the inherently positive valence of high coping words, we selected high coping prime words and positive prime words by maximizing the difference in ratings on coping potential and minimizing the difference in ratings on the valence dimension. This provided us with words that were strongly positive and strongly represented high coping potential (high coping words), and words that were strongly positive but did not represent coping potential (positive words). Further, we selected words that were both strongly negative and strongly represented low coping potential (low coping words), and words that were strongly negative but were considered unrelated to coping potential (negative words). Neutral words for the priming study were selected from the words that were rated as not related to coping potential and considered neutral with regard to valence (rated '0' on both dimensions).

This pilot study provided us with a set of 90 reliable high coping, low coping, positive, negative and neutral words (see Appendix A.) to prime our participants with specific appraisals. Within each type of 90 words, three sets (n_1=60, n_2=15, n_3=15) were selected, equated on mean coping potential rating, mean valence rating, word frequency (according to Kucera & Francis, 1967) and word length. The first two sets combined were used as prime words ($n_1 + n_2 = 75$) and the last two sets combined were used to test, via a pronunciation task, whether our priming procedure ($n_2 + n_3 = 30$) was effective. We will talk more about these sets, tasks and the reasons behind them below.

After selecting words that reliably represent the five given categories, we needed to examine our priming paradigm and test its effectiveness. This paradigm, based on research by Bargh and Chartrand (2000), Greenwald (2003), and Eimer and Schlaghecken (2002) was a standard priming procedure with both backward and forward masks. We tested whether this priming procedure was in fact (a) subliminal and (b) effective at activating the desired constructs.

Pilot Study Two – Awareness Check Study

Our priming paradigm consisted of presenting participants with (1) a blank screen for 1000 ms, (2) a fixation point for 1500 ms, (3) another blank screen for 1000 ms, (4) a row of X's for 100 ms [= forward masking], (5) a prime word for 12 ms, (6) a row of X's for 100 ms [= backward masking] and (7) a picture of a diamond or a square. In this manner, 75 prime words – an amount identified by Bargh and Chartrand as sufficient to prime a concept subliminally – would be presented to participants on a regular computer screen. We wanted to ensure that the presentation of a forward mask of X's for 100 ms followed by a 12 ms presentation of a prime word and a 100 ms backward mask of X's was successful at presenting prime words outside of conscious awareness – meaning that the participants would only see a row of X's flash on the screen. In order to test this, we presented participants with primes for different durations (12ms, 67ms, 134ms). We hypothesized that participants would perform at chance level identifying words and non-words presented for 12 ms, above chance level but not perfectly for words and non-words presented for 67 ms, and close to perfectly when the words and non-words were shown for 134 ms.

METHOD

Participants

Participants were 50 undergraduate students (52% female) at Vanderbilt University who completed this study for course credit.

Apparatus

Stimulus materials were presented with Superlab 3.0 (beta version 4) on Macintosh OS X.

Procedure

After providing consent, participants watched a string of letters flash on a screen and indicated – by pressing the appropriate key – whether they thought they had seen an English word or a random string of letters (non-word). Per trial, a blank screen was presented for 1000 ms, followed by a fixation point for 1500 ms, another blank screen for 1000 ms, a forward mask of X's for 100 ms, a neutral word or a non-word for 12 ms, 67 ms or 134 ms, and a 100 ms backward mask of X's.

After 10 practice trials, we presented participants with 50 words and 50 non-words at each of the three different presentation times (12 ms, 67 ms, 134 ms) in random order, resulting in 300 experimental trials. We encouraged participants to give a response on each trial and told them to make their best guess when they were not sure what the right answer was.

RESULTS AND DISCUSSION

For the stimuli presented for 12 ms, participants' responses were accurate in 50.52% of cases (SD = 3.22) and this performance is not significantly different from what we would expect based on chance, $t(49) = 1.141$, $p = 0.259$. Participants' responses were accurate in 82.14% of cases when the stimuli were presented for 67 ms (SD = 8.19) and in 89.30% of cases when the stimuli were shown for 134 ms (SD = 6.34). These performances were both significantly greater than what could be expected based on chance $t(49) = 27.74$, $p < 0.001$ and $t(49) = 43.84$, $p < 0.001$, respectively.

From the results of this pilot study we can safely conclude that our presentation time of 12 ms with forward and backward masks is short enough for participants not to be aware of the fact that they were being exposed to prime words.

Pilot Study Three – Priming Check Study

Before engaging in the main study we tested whether the concepts we wanted to prime could effectively be primed with our priming procedure. One way to measure whether or not a concept has been primed is by means of a pronunciation task (Bargh & Chartrand, 2000). Given that a particular concept has been successfully primed, this concept and all words that are associated with it become more accessible in one's mind via spreading activation. This increased accessibility of the primed concept should lead to a faster start of the pronunciation of words that are related to this concept than of words that are not related to the primed concept. In this third pilot study we answered the question: "Do participants start pronouncing words related to a primed concept faster than other words?"

METHOD

Participants

Participants were 60 undergraduate students (45% female) at Vanderbilt University who completed this study for course requirements.

Apparatus

Materials for the priming task were presented with Superlab 3.0 (beta version 4) on Macintosh OS X. This software also presented the pronunciation materials and measured the latency of speech onset. In addition, a small clip-on microphone was used as well as a digital voice recorder.

Procedure

After obtaining consent, we presented participants with a 'speed detection task' in which they were first shown a masked prime word followed by a picture of a geometric shape and then asked to press one key as fast as possible if the shape was a diamond and another key if the shape was a square. We used the same stimulus presentation procedure as in the 12 ms condition of the pilot study two with the addition of a geometric shape (a diamond or a square) after the backward mask. This shape was presented at a random location on the screen and was visible until the participants pressed a response key. Participants were told that we were testing their reaction speed and were encouraged to act as quickly and accurately as possible. The rationale we gave participants for showing the fixation point and flashing row of X's was that these markers would draw their attention to the right location on the screen so that they could respond to the geometric

shapes faster. One third of participants ($N = 20$) in this study was exposed to high coping words, another third of the participants ($N = 20$) to words that represented low coping potential and the last third ($N = 20$) was presented with neutral words (= control condition).

After going through 75 trials and being subliminally exposed to 75 prime words ($n_1 + n_2$, see pilot study one), participants started their second task in which they were asked to pronounce words presented one by one on a computer screen as quickly and accurately as possible. Each participant pronounced 30 high coping words, 30 low coping words, 30 positive words, 30 negative words and 30 neutral words. These words were presented in a random order. A small microphone was placed near each participant's right collarbone at the beginning of the pronunciation task. The microphone was connected to the computer, and the experiment presentation software (Superlab 3.0, beta 4) measured the reaction time (RT) between the start of the presentation of the stimulus and the onset of speech. A digital recorder was placed next to participants during the second task to record what they were actually saying.

For people exposed to high coping prime words during the first phase of the experiment, the 30 high coping words in the pronunciation task consisted of 15 (n_2) 'old' words that participants had subliminally seen before as part of the priming phase and 15 new high coping words they had not been exposed to in the priming phase (n_3). Similarly, for people exposed to low coping prime words in the first part of the experiment, the 30 low coping words in the pronunciation task consisted of 15 old low coping words and 15 new low coping words. For participants who had been exposed to neutral words during the priming phase, 15 of the 30 neutral words in the pronunciation

task were old, and 15 were new. The reason for having these 'old' and 'new' words was that if the priming procedure was truly successful, then participants should start pronouncing any word – old or new – representing the concept they had been primed with faster than any word unrelated to this concept.

RESULTS

Data reduction

First, errors (3% of the data) due to an incorrect response or an inappropriate activation of the voice key were removed. These errors were evenly distributed across conditions, $F(2, 57) = 0.918$, $p = 0.405$. Secondly, outliers (1.96%) were removed from the data files using a procedure suggested by Bargh and Chartrand (2000), and Uleman, Hon, Roman and Moskowitz (1996). Specifically, per participant, all reaction times were sorted, logarithmically transformed and standardized. All words with a transformed reaction time equal to or greater than |3| were removed from the data file. This procedure was repeated twice. The outliers were evenly distributed across conditions $F(2, 57) = 1.549$, $p = 0.221$.

Data Analysis

After removal of the outliers, we computed mean reaction times of the 5 different categories of words per participant and combined this information in a data sheet. We then executed a 3 (high coping, low coping, neutral primes) x 5 (high coping, low coping, positive, negative, neutral words) mixed ANOVA with the three priming conditions varied between subjects and the 5 different word types manipulated within subjects. Our

real point of interest here was the word type by condition interaction, as this would indicate whether or not our priming procedure was in fact effective at priming the desired concepts. If it was effective, people exposed to high coping prime words would show smaller reaction times (RT) in response to high coping words than to any other kind of words. Similarly, people exposed to low coping prime words would start pronouncing low coping words much faster than any other kind of word. Also, we expected that participants exposed to high coping words would start pronouncing high coping words faster than would people who were exposed to low coping words or neutral words. Along the same lines, people primed with low coping words would start pronouncing low coping words faster than those who had been primed with other types of words. Additionally, if we were truly successful at priming a given concept, we expected to find no differences in RT between 'old' words and 'new' words.

Results

Our analysis revealed that the word type by condition interaction was not significant, $F_{WILK'S\ LAMBDA}(8, 108) = 0.629$, $p = .752$. Hence, we were unable to demonstrate that our priming procedure did in fact lead to priming the desired concepts. Table 1 shows that our observed mean reaction times were not in the expected direction.

Table 1. Average reaction times for the onset of speech (in ms) per priming condition and word type.

	PRIMING CONDITION					
	High coping potential		Low coping potential		No coping potential	
WORD TYPE	Mean	SD	Mean	SD	Mean	SD
High coping words	604.969	73.124	575.938	81.812	552.076	86.410
Low coping words	620.778	84.071	584.897	81.352	555.622	70.738
Neutral words	609.826	77.487	576.135	79.783	553.762	74.731
Positive words	592.905	67.707	565.904	72.270	537.668	64.782
Negative words	593.189	64.421	566.815	74.795	542.051	59.409

Overall, we found that there was a marginally significant effect of condition, $F(2, 57) = 3.078$, $p = 0.054$. This effect indicated a trend that people exposed to high coping prime words ($M = 604.333$, $SD = 73.362$) were slower at starting to pronounce words in general than people who had been exposed to low coping prime words ($M = 573.938$, $SD = 78.002$) who in turn, were slower to start pronouncing words in general than participants who had been exposed to neutral prime words ($M = 548.236$, $SD = 67.614$).

There also was a main effect of word type, $F(4, 228) = 15.513$, $p < 0.001$. Participants were faster to start pronouncing positive ($M = 565.492$, $SD = 70.901$) and negative words ($M = 567.351$, $SD = 68.698$), than high coping ($M = 577.661$, $SD = 76.552$) and neutral words ($M = 579.908$, $SD = 79.510$), than low coping words ($M = 587.009$, $SD = 82.102$).

DISCUSSION

The results of this study indicated that our priming technique was not effective at priming high and low coping potential. Our priming procedures did not lead participants to start pronouncing words related to the primed concept faster than other words. Moreover, participants exposed to high coping prime words did not start pronouncing high coping words faster than did participants exposed to low coping prime words or neutral prime words. Across conditions, different types of words did lead to different response latencies, indicating that potentially, concepts such as positive affect and negative affect are more accessible in people's mind than high and low coping potential. Also, we found a marginally significant effect of condition, potentially indicating that exposure to different kinds of words leads to overall slowness or speed in pronouncing words.

CHAPTER III

CONCLUSIONS

Overview of findings

The impetus for this research project was to empirically test the process model of appraisal (Smith & Kirby, 2000), in particular associative processing. While a previous study by Kirby et al. in 2004 provided preliminary evidence that emotional and behavioral responses can be manipulated via associative processing, its experimental design left room for multiple interpretations of the results, rendering the study inconclusive. The current set of studies was designed to provide a more rigorous test of associative processing and to potentially strengthen the evidence in favor of the process model of emotion-eliciting appraisals. Three pilot studies were conducted in order to collect appropriate stimuli for (word validation study) and test important properties of the experimental procedure (awareness check study & priming check study) to be used in the main study. While appropriate primes of each type were collected and we demonstrated that our priming procedure was truly subliminal, we were unable to show effective priming. Since the priming paradigm and its success in activating a given concept was the cornerstone of our intended main study, we decided not to conduct this study.

Limitations

Before throwing out subliminal priming all together, a few cautionary notes should be made. First of all, it is uncertain to us at this time if the pronunciation task was an adequate measure to test the effectiveness of our priming procedure. Although often used in the past (e.g., Balota & Chumbley, 1984; Balota & Lorch, 1986; Bargh, Chaiken, Raymond, & Hymes, 1996; Bargh & Chartrand, 2000; Kahan, Neely, & Forsythe, 1999), our experience with the technical details of this task leaves us wondering about the causes of our findings. In setting up the task and preparing the microphone for registering participants' speech, it was extremely difficult to find a threshold at which the microphone would not be too sensitive (and get triggered by a deep exhale, a person walking in the hallway or a distant jackhammer) and at the same time not too insensitive and fail to register the actual onset of speech (rather than the pronunciation of the emphasized syllable). Moreover, four different experimenters ran participants and even though each of them had been thoroughly trained, we discovered that some of them made small, seemingly innocent variations to the protocol that might have affected the reliability of our data. One of the main variations was the position of the microphone. Quite remarkably however, post hoc analyses did not reveal any significant difference in variability of reaction times between a group of participants who held their microphone wherever they felt comfortable and participants for which the microphone was pinned on their right collar bone. Potentially, the random insensitivity and oversensitivity of the microphone was responsible for much more bias than the individual experimenters. Thus, very possibly, technical issues surrounding this procedure added a significant amount of error to our data, clouding our findings.

Future directions and Conclusion

In future studies, the effectiveness of this particular priming procedure could be tested in other ways by using a lexical decision task instead of a pronunciation task. In such a setup, participants would first be subliminally exposed to prime words and subsequently asked to make word – non-word decisions as quickly as possible. If the priming method is effective, lexical decisions would be made faster for words related to the primed concept than for words unrelated to it. Alternatively, one could use supraliminal priming again, using a design that conceals the purpose of exposure to the prime words more effectively. Finally, participants' awareness of the experimental purpose could be tested upon completion of the study and incorporated in the analyses as an extra variable.

With these potential future avenues in mind, one can set up studies that circumvent caveats that clouded our current findings, and continue to explore emotion elicitation. Empirical investigation of the Process Model of Appraisal (Smith & Kirby, 2000) and its two levels of emotional processing remains an important endeavor because it can increase our understanding of the emotion system of survival (Smith & Lazarus, 1990). Moreover, exploration of the interaction of these levels of processing might help unravel how we learn from our experiences. Also, beside the theoretical insights that accompany such research, its clinical applications can be quite far stretching (e.g., aid in development of more effective forms of treatment). In sum, this young research domain needs much exploration as it has the potential of ameliorating our wellbeing.

APPENDIX A.

SELECTION OF 90 HIGH AND LOW COPING,
POSITIVE, NEGATIVE AND NEUTRAL WORDS

HIGH COPING WORDS	LOW COPING WORDS	POSITIVE WORDS	NEGATIVE WORDS	NEUTRAL WORDS
ability	abandon	accolade	abrasive	abdomen
able	afraid	admire	abuse	absorb
accomplished	aimless	adorable	accusation	account
achieve	beaten	affectionate	agitation	accumulative
adaptive	cannot	amazing	agony	administer
adept	condemned	amiable	alienate	aerial
adroit	could not	amused	argue	airport
ambitious	crippled	awe	attack	aisle
aptitude	debilitated	beautiful	bad	alternate
assured	defeat	beauty	bomb	aluminum
attentive	defeated	beloved	bombings	annual
brave	defective	bliss	boring	approaching
brilliant	defenseless	breathtaking	brutal	assembly
capable	deficient	caring	burn	blank
champion	degrading	charming	cancer	briefly
commendable	demoralized	cheerful	cheat	brush
competent	depressed	clean	cheating	button
confident	despairing	comfortable	coma	cabinet
conquer	difficult	comforting	complicated	caloric
cope	difficulty	cordially	condescending	cards
determined	disabled	cuddly	crime	category
devoted	disaster	cute	crooked	chair
devotion	discouraged	decorated	crude	circular
dexterity	doubt	delighted	damage	cloud
diligence	dread	delightful	danger	corridor
driven	fail	ecstasy	dangerous	cylinder
dynamic	failed	enjoy	debt	dolphin
effort	failure	enjoyment	destroy	doorway
empower	fear	euphoric	detested	duration
empowered	feeble	exalted	disappointed	eventually
encouraged	fired	fabulous	disease	forest
energized	flunked	fascinating	dismal	fry
excellent	foolish	festival	disrespect	furry
exuberance	frail	free	divorce	goat
faith	futile	freedom	dreadful	immediately
flexible	futility	friends	egotistical	infinity
flourish	helpless	fun	embarrassing	inhabited
fortitude	helplessly	funny	enemy	intermingled

HIGH COPING WORDS	LOW COPING WORDS	POSITIVE WORDS	NEGATIVE WORDS	NEUTRAL WORDS
generous	hinder	gentle	evil	interval
genius	hopeless	glorious	fake	kilogram
gifted	hopelessly	glory	filthy	kitchen
helpful	hysterical	gracious	forlorn	label
hope	impaired	gratified	fraud	leaves
hopeful	impossible	handy	harassment	machinery
inspired	impotent	honored	harm	mainly
intelligent	inability	hug	hate	mauve
leader	inadequate	incredible	horror	metaphor
likable	incapable	intimate	hypocrite	microwave
loyal	incompetent	jubilant	insolent	mixed
mastery	inconsolable	kindness	invalid	mountain
mature	inept	kiss	leper	narrative
motivated	inferior	laughter	lie	neutral
optimist	insecure	leisure	lynch	occupation
optimistic	insufficient	lively	mean	officer
persevere	intolerable	love	missing	painted
persist	irrational	lovely	monstrous	pencil
persistent	lacking	lucky	moody	penguin
prepared	lose	luxurious	obnoxious	permanent
prevail	loser	magical	obscene	photograph
proficient	loss	magnificent	plague	planted
promote	lost	majestic	poison	pod
prosper	mediocre	mercy	polio	populous
purposeful	miserable	merry	problems	pour
qualified	neglected	neat	punish	powder
relaxation	nervous	nice	punished	rainy
resolute	overwhelmed	peace	revenge	rake
resolved	paralyzed	perfect	ridiculous	residential
sensible	pathetic	playful	rude	routine
sincere	pessimist	pretty	sarcastic	scissors
skilled	pessimistic	proud	shivering	seated
solve	pitiable	radiant	sinister	segment
strength	poor	rainbow	sloppy	serious
strive	powerless	rejoice	slum	silent
strong	quitting	romance	snobby	speaking
succeed	resigned	splendid	sorrow	specifically
success	selfish	striking	steal	spoken
successful	strengthless	stunning	stinky	spoon
surmount	stress	sturdy	terror	standing
tenacity	stupid	sunshine	theft	straight
thrive	submissive	supreme	uncontrolled	stream
triumph	suffering	sweetheart	undesirable	tendency
truthful	unable	tenderness	unfair	tinted

HIGH COPING WORDS	LOW COPING WORDS	POSITIVE WORDS	NEGATIVE WORDS	NEUTRAL WORDS
victory	unachievable	terrific	unfortunate	towel
vigor	unqualified	thankful	upsetting	triangular
virtue	useless	thrilled	vain	untied
vitality	vulnerable	unite	vulgar	visual
vivacious	weak	warmth	war	winter
win	wimp	welcoming	weapon	wooded
won	worthless	witty	worry	woven
worthy	wrong	wonderful	wounded	yearly

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