

THE FRIENDLY ENEMIES: EMERGENCE EFFECTS
IN WORD CHOICE FOR STORY GENERATION
RESPONSES TO CONCEPTUAL
COMBINATIONS

by

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ABSTRACT

Conceptual combination, the blending of separate ideas to produce new categories, is often accompanied by *emergence*, a process by which novel attributes that are not present in either parent idea emerge when the concepts are combined. Previous research shows that emergence is more common when the constituents of a combination are atypical than when they are typical, thus raising the possibility that the former may be more likely to provoke creativity. The present study extended previous findings by comparing stories written in response to typical combined concepts versus atypical combined concepts. In addition, the study examined individual differences in creative capacity and working memory as factors that may underlie people's likelihood of exploiting the creative potential of unusual combinations. Stories written from atypical story seeds were not rated by coders as being more creative than those written from similar seeds, but they did contain more verbs, auxiliary verbs and adverbs, as identified by the Linguistic Inquiry and Word Count (LIWC) program, possibly indicating a potential for more action and description in stories generated from unusual prompts. The individual difference variables were not predictive of performance on the story task.

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The Friendly Enemies: Emergence Effects in Word Choice for Story Generation Responses to Conceptual Combinations

One of the most interesting abilities of the human mind is the capability to generate novel solutions to complex, unique, or obscure problems. The way in which people develop new ideas is of considerable interest to the field of psychology, and much work has been done in an effort to understand creativity as an overall concept as well as the thought processes that underlie it. Attempts to study creative behavior in the laboratory tend to use one of two methodologies.

The first methodology involves standardized tests such as divergent thinking tasks (e.g., Guilford, Christensen, Merrifield, & Wilson, 1978). Some measures of this type ask the participant to list alternate uses for a common object, such as listing all the uses they can think of for a newspaper that differ from its ordinary use. The primary measures obtained in such tasks are *fluency*, the number of responses given, and *flexibility*, the number of different categories of response, thus providing quantitative assessments of creative capacity. In addition, the data can be examined to determine the extent to which participants' responses diverge from ideas suggested by others, a measure called *originality*, thus potentially gauging a person's ability to display novel methods of thinking.

The second methodology involves production tasks, such as asking participants to generate whole creative products (e.g., collages or stories) from brief prompts, and then having raters provide assessments of the originality or creativity of the products. The standardized test approach has the advantage of having clearly defined objective performance measures, such as fluency and flexibility, whereas the production task approach typically relies on subjective judgments of creativity. The current study made use of a production task, specifically asking participants to develop and write brief stories (approximately one page), and attempted to provide both quantitative and qualitative assessments of the products as well as examining

correlations between those assessments. In addition, the current study included quantitative measures of individual differences in creative capacity as measured via a divergent thinking task, a self-report inventory of creative activities, and a lag task testing working memory in an attempt to determine the factors that may relate to performance on the story production task.

Performance on divergent thinking and production tasks can provide evidence about individual differences in overall levels of creative functioning, but, in conjunction with task manipulations, can also highlight the underlying processes associated with creative idea generation, and the factors that promote or inhibit creative behavior. The specific process examined in the current study was *conceptual combination*, and the factor of most interest was the similarity of the ideas to be combined.

Conceptual Combination

The process of conceptual combination involves the amalgamation of two different concepts. The concepts “pet” and “fish,” for example, are separate and discrete, each with its own associated connotations and descriptors. We may think of pets in general as being comforting, physically affectionate, and warm, whereas we may visualize fish in general as being connected with unpleasant textures and smells, associate the word with an activity where we use a baited line to catch fish, or even associate it with the food we eat. The combination “pet fish”, however, may allow us to mentally revise our previous categories and allow us to entertain more flexibility of thought in our mental representations. From these representations emerge new examples of pets which are neither physically close nor warmly affectionate, overlapping with examples of fish which are prized for their calming and cheerful presence in a fish-tank rather than simply as animals used for food or sport (Murphy & Medin, 1985; Finke, Ward, & Smith, 1992; Hampton, 1997).

Emergence

One of the most interesting aspects of conceptual combination is this idea of truly novel attributes arising from the blending and clashing of separate ideas (Scott, Lonergan, & Mumford, 2005). Previous research has demonstrated that presenting paired ideas that are strongly atypical tends to give rise to ideas that are not naturally associated with either of the two priming concepts, in an effect known as *emergence*. Such a result may simply arise from *extensional feedback* from previously known information, as in the case where people already have knowledge about “pet fish,” (Hampton, 1988) and therefore not necessarily result in a creative outcome. However, some emergent ideas may also be truly innovative, especially when they spring from more novel conceptual combination pairs (Finke et al., 1992).

Early work on conceptual combination by Kunda, Miller, and Claire (1990) offers the example of the combination “Harvard-educated carpenter” in order to illustrate emergence effects (see also Estes & Ward, 2002; Hastie, Schroeder, & Weber, 1990). When asked to list the qualities one might expect of a Harvard-educated carpenter, some participants imagined that such a person would be non-materialistic, despite the fact that being non-materialistic is not necessarily associated with either Harvard-educated people or carpenters when presented individually. In short, these emergent characteristics are ideas that are not based on either single concept, only on the blending of the two. Such conceptual combination effects have implications not only in the realm of novel creation of stories, as in this study, but in novel approaches to problem solving (Estes & Ward, 2002), commercial product conception (Gill & Dubé, 2007), and even in speech comprehension (see Gagné & Shoben, 1997).

Cognitive Basis of Emergence

The generally accepted explanation for the effects of emergence in conceptual combination is that combining opposite concepts allows the germination of novel ideas because

the considerable difference between the parent concepts requires more conscious effort and attention in order to conceptualize how the incongruous ideas might be integrated. This in turn creates more complex and novel explanations to reconcile the disparity between the two ideas. In this light, it is easy to see how atypical combinations might lead to the discovery of more novel ideas than when a combination fits together with ease (Finke et al., 1992). The idea of a Harvard-educated lawyer or an unschooled carpenter are fairly common concepts, thus very few mental leaps are required to explain them because mental representations of the relation between the two ideas may already be extant in one's mind. It is far more atypical for a Harvard-education and a job as a carpenter to arise in the same context in real-world situations, and thus such a presentation requires one to imagine a more unique situation in order to mentally link the two concepts in a logical way. In essence, it can be argued that when presented with a combination that seems nonsensical on the surface, one is required to construct a creative sequence of events that explains what led to their unlikely pairing: for example, assuming a scenario in which a Harvard alumnus rejects his materialistic ways and chooses a blue-collar career despite the money he could be making, simply because the joy of the pursuit presumably outweighs his craving for monetary wealth (Estes & Ward, 2002).

Hypotheses

The direction of the current research is influenced by the findings of several previous studies. Hampton's (1997) research on emergent attributes in conjunctive semantic categories showed profound emergence effects for nonsensical conceptual combinations, such as flavors of food combined with mechanical tools, or common furniture combined with exotic fruits. A 2001 study by Wilkenfeld and Ward contrasting participants' definitions for single words and definitions of those same words in combinations with either alike or unlike others, revealed similar findings: that pairs of words which were less easily aligned with one another (e.g.,

motorcycle carpet) evoked more emergent properties than pairs that were readily aligned (e.g., guitar harp). Almost no research, however, has been done examining the differences in word use and thought between participants given synonymous versus antonymous conceptual combinations in longer, free-form production tasks, such as story writing.

One exception is a recent study by Ward, Kennedy, and Kaufman (2013) in which college student participants were asked to generate brief stories on the basis of typical or atypical conceptual combinations (e.g., “hostile enemy” versus “friendly enemy”). The hypothesis tested was that individuals forced to work from atypical combinations would generate stories that were rated as more creative than those of individuals who worked from typical combinations. The data did not support that hypothesis in that the stories based on atypical combinations were not rated by coders as more creative than those generated from typical combinations. However, quantitative differences emerged in specific types of word use, such as increases in verbs and adverbs. The higher overall proportion of verbs and adverbs in atypical stories could indicate a higher potential for description and action, but before building an elaborate interpretation of the finding, it is important to determine if the effect is replicable, which is one of the goals of the present study.

The current study examined participants' creative-writing responses to both typical and atypical conceptual combinations, as in Ward et al. (2013), but included several refinements. One possible reason for the failure to find a creative advantage with atypical combinations is that participants in the Ward et al. study had to generate ideas for 10 combinations, which may have led them to devote limited effort to any one combination, thus masking a potential advantage. In the present study, participants worked only with three combinations, thus allowing more resources per story. In addition, Ward et al., did not collect data on any preexisting differences between participants. Without such data, it is unclear whether or not some types of participants

(e.g., those with higher creative capacity or larger working memories) might have benefited from the atypical combinations whereas those with lesser capacity might have done worse. As described more fully below, in addition to having participants write stories, they also performed an alternate uses task, a working memory task, and they made self-reports of their own creativity.

Linguistic Evidence For Story Differences

The evidence for a greater use of verbs and adverbs by those in the atypical condition of Ward et al. (2013) was obtained using a word-sorting program called the Linguistic Inquiry and Word Count (LIWC), a program designed to recognize and categorize domains of cognition present in the word choice of written and spoken samples, originally developed by Pennebaker and Francis (1996). The LIWC parses ideas based on lexical differences and parts of speech as well as broader psychological domains (see *Measures* section below for a more in-depth description of the LIWC program and its application to the current research).

As a way of generating predictions for LIWC differences in stories from typical versus atypical concepts it is useful to consider previous LIWC findings on task or participant characteristics that may plausibly be associated with creativity. Previous research in the psychology of language has made some examination of the ways that word use correlates with mental representations, and the current study's hypotheses take inspiration from the most relevant findings from these studies.

Hancock, Curry, Goorha, and Woodworth (2007) performed a study on differences in word use between liars and truth-tellers, and discovered that liars use more words overall, ask more questions, and make use of more words meant to evoke sensory responses, while at the same time making use of fewer first-person pronouns. Additional research on language-use differences in individuals instructed to tell an entertaining story versus those instructed to tell a factual story discovered that storytellers employed more present tense verbs, more words

evocative of emotion, and more apparent certainty in their language, while at the same time using fewer sensory words and speaking less in the past tense. The authors of the study even go so far as to comment that entertaining stories were “told fluently, had lots of emotion words, were told in the present tense, and used words indicating certainty,” and also opine that these are “linguistic devices to hold a reader's attention” (Dudukovic, Marsh, & Tversky, 2004).

Although deception and creativity are certainly not synonymous, they may share some important correlates. In contrast to telling the truth, which requires only memory and recall, lying involves inventing new situations which diverge from reality, so it seems reasonable to expect that word use tendencies while lying would be indicative of novel idea generation, just as it occurs in explicitly creative output. The research cited above, however, does show some intriguing discrepancies, most conspicuously in the opposite effects for the use of sensory words between studies on lying (more sensory words) and entertaining stories (fewer sensory words). This presents an interesting opportunity for the current study to examine the differences in language depending on the purpose behind the creative endeavor, when compared with previous research. It is possible that the distinction stems from the idea that creative stories told for entertainment are free from the need to deceive, and thus require fewer sensory words to convince hearers of their believability. Thus it can be hypothesized that the present study, lacking the requirement for deception, would be expected to exhibit findings closer to those from the “entertaining” condition in the research of Dudukovic et al. Thus the prediction that follows is that there will be fewer sensory words in stories based on atypical combinations than those based on typical combinations, and that regardless of the type of combination, stories which coders rated as more creative will contain fewer sensory words.

Broader examinations of memory and lying show indications that accounts of imagined events evidence the cognitive processes required for their planning and invention, and lack the

wide range of sensory, contextual, spatial, emotional, and temporal details that experienced events often exhibit (see Johnson & Raye, 1998; Vrij, Mann, Kristen, & Fisher, 2007).

Additionally, research by Pennebaker and King (1999) on word use and the Five Factor Model of personality indicates that the personality trait of Openness (which has been positively linked to creativity; see Leung, Maddux, Galinsky, & Chiu, 2008; Fast & Funder, 2008; Thibodeau & Boroditsky, 2011) is correlated with higher use of prepositions, words evocative of positive emotions, and general inclusiveness in language, while at the same time using fewer first-person pronouns, fewer articles, less present-tense, and more words which indicate discrepancy. Therefore, such properties can be taken as markers of more creative stories, leading to the prediction that stories produced in response to atypical combinations (as well as the stories rated by coders as more creative) will exhibit similar linguistic properties. The novel use of the LIWC to study creativity in this context highlights the possibility of obtaining objective measures of creative output that has typically only been examined via subjective judgments.

The research of Ward et al. (2013) produced several interesting results of note. The LIWC of the Ward et al. study found fewer articles ($p=.024$), and Negative Emotion/Anger related words ($p=.018$) in the atypical story seed condition, as more words indicative of discrepancy ($p=.042$), all of which falls in agreement with the previous literature. Ward et al. also found that the atypical seed condition produced stories with fewer perceptual processes (overall, $p=.05$; seeing, $p=.014$), indicating that atypical stories were more similar to stories told for entertainment rather than stories told with the intention to deceive. The current study was intended to replicate and extend those findings and continue exploring the possibility that they might be integrated with creativity research. These connections would be supported most strongly if the atypical stories exhibited lower levels of perceptual processing as in the findings of Ward et al. and the entertaining-story research of Dudukovic and colleagues (2004).

In addition to focusing on rated creativity of stories and variations in word use in the stories generated from the different types of combinations, Ward et al. (2013) also assessed correlations between rated creativity and the use of the different types of words. Stories were judged as being more creative when they included a higher proportion of third-person pronouns and fewer first-person pronouns (a finding which agrees with Pennebaker and colleagues' findings on increased first-person pronoun use correlating with Openness). The amount of time they spend telling the story appears to make a difference (higher word-count in stories rated as more creative) which precipitates this study's focus on longer stories. Writing skill also appears to be taken into account, as the more creative stories are more clean and trim (higher word-count but equal words-per-sentence), with less extraneous and inappropriate punctuation (negative correlation for miscellaneous punctuation, punctuation overall, and dashes), which gave rise to this study's interest in ascertaining the individual differences in verbal creativity and working memory.

In light of this research, the current study hypothesized that atypical conceptual combination stories should exhibit higher levels of negative emotion words, possibly higher levels of emotion words overall, while exhibiting fewer words which communicate sensory detail, as well as fewer first-person pronouns and articles. The Ward et al. 2013 study also showed that words which connote action (such as verbs and adverbs) and words which evidence cognitive processes may also be associated with higher rated creativity in stories spurred by atypical combinations.

Finally, the current study also included a number of individual difference measures designed to assess the prediction that individuals with higher levels of verbal creativity and larger working memories may be the ones best able to exploit the creative potential of the atypical combinations. Specifically, it was predicted that individuals with higher creativity (both

self-report and assessed by a divergent thinking task) would be more influenced by manipulations in conceptual combination and would produce comparatively more creative stories in response to atypical conceptual combinations (i.e. show higher levels of emergence) than their less creative cohorts. It was also predicted that individuals with a stronger verbal working memory would evidence similar effects in increased creative output in response to manipulations in conceptual combinations when compared to their cohorts with less working memory capacity.

METHODS

Design and Procedure

The intent of the current research was to assess emergence effects in terms of creative story generation by giving the participants conceptual combinations framed as the seeds of a story, and asking for them to construct a page-long outline of a narrative plot which expands and explains each of the conceptual combinations. The differences in their responses were examined between conditions in terms of the kinds of psychologically relevant words they used, as well as in the coder-rated creative potential that their stories exhibited. In addition to their creative output, each participant completed a self-report inventory regarding their personal creativity, as well as their interest and aptitude for domains which require imagination and novel thinking, such as design, creative writing, and the arts (Hocevar, 1979).

When entering the lab, the participants were first briefed on what the study would entail, informed of their rights, and verbal assent was obtained. Then, the participants were given a packet that included all the measures used in the study. First, they completed a task designed to assess their basic verbal working memory, Daneman and Carpenter's Reading Span Task (Daneman & Carpenter, 1980). Second, the participants completed a brief objective measure of creativity, the Guilford Alternate Uses Task (Christensen, Guilford, Merrifield, & Wilson, 1960),

as well as the Creative Behavior Inventory (Hocevar, 1979), a self-report measure to gauge participation in creative activities. The measures obtained from these tasks are described more fully in the *Measures* section below.

Next, the packet contained three pairs of words, each pair at the top of its own blank page of lined paper. Participants were instructed to imagine each word pair as a possible title or seed for a fictional story, and to give a description of the story idea they imagined. Each participant was encouraged to include a plot and a setting, to tell us the nature of their characters, both heroes and villains, and the problems they face, to sketch the outline of the rising and falling action in the story as the characters struggle against those problems, and finally to explain how such a story might end. The instructions informed the participants that they should take whatever route felt natural for each story, and that the choice between making the tales fanciful, realistic, bizarre, or down-to-earth was entirely up to their imagination. It was also stressed that there was no “correct” story to achieve, and that they should work at their own pace and do their best to create an interesting, vibrant story that others might enjoy. Ninety-five of the participants randomly received packets with three typical word pairs (the typical condition), and 100 randomly received packets with three atypical word pairs (the atypical condition).

The stories were parsed via the Linguistic Inquiry and Word Count program, and were also read and rated on a Likert Scale from 1 (not creative) to 7 (extremely creative) by three coders looking for creative potential in the stories (see *Measures* below for elaboration on rating methods). It was expected that the stories produced by participants who worked from the atypical word pairs would be rated as exhibiting more creative potential than would those who worked from the typical word pairs.

Participants

The participants consisted of 195 college students from the Psychology 101 research pool

who participated in return for course credit in their Psychology 101 classes. The participants included 134 women, 31 men, and 35 who did not list their sex. Ninety-five participants completed the typical-word condition (65 women, 14 men, and 16 not responding), and 100 participants completed the atypical-word condition (67 women, 17 men, and 16 not responding). The participants completed the study in groups of 2 to 20 others, but at no point did any portion of the study involve cooperation. They were fully briefed on the nature of the study, as well as their right to withdraw their involvement at any time, and were given an hour to complete the entirety of the study.

Measures

Ideas for Stories. This study made use of relevant portions of the Ideas for Stories stimuli, based on work by Estes and Ward (2002) in the pretest for their study on emergence. The stimuli consisted of a set of *head nouns*, simple nouns that express a basic idea. To each noun was attached one of two possible adjectives: one of these consisted of a typical descriptor of the head noun, the other an oxymoron. The head nouns and their adjectives were: “Enemy” (paired with “Hostile” or “Friendly”), “Sky” (paired with “Blue” or “Grounded”), and “Death” (paired with “Tragic” or “Living”).

The Estes and Ward study utilized a variety of head nouns, each with a pool of adjectives assigned to them, ranging from highly typical to highly atypical, based partly on the authors' intuition and partly on previous research on oxymora and typicality (see Gibbs & Kearney, 1994; Murphy, 1990), and asked the participants in the pretest to rate each combination on a continuum of typicality. The Ideas for Stories stimuli refined from this research included stimuli from the pool of highest-rated typical combinations from the Estes and Ward study as well as stimuli from the pool of highest rated direct oxymora (for the atypical combination condition) directly from the Gibbs and Kearny study or based on the criteria for oxymora which

Gibbs and Kearney enumerated.

Linguistic Inquiry and Word Count. The Linguistic Inquiry and Word Count (LIWC) is a program which analyzes blocks of text and parses word use into categories, examining and categorizing words into groups that indicate cognitive processing, social functioning, physical health, and many other diverse mental domains. It is designed to study language and disclosure in therapy, and to examine how people's word choice in spoken and written samples correlates with their cognitive functioning and mental health, though it may have the flexibility to extend to applications beyond such parameters. The LIWC was developed by Pennebaker and Francis (1996) as part of a study on disclosure, based on previous research (Stiles, 1992) which indicated that an individual's mental wellness and stability were correlated with the type of words they used when writing. The LIWC and has been revised and updated several times since its first incarnation.

The current version of the program used in this study, the LIWC2007, can sort thousands of words into multiple domains within broad psychological categories as well as more seemingly pedestrian concerns, such as sentence length, word length and complexity, pronoun use, presence of filler words, and even punctuation. Particularly noteworthy as regards its uses in psychological research is the LIWC's ability to divide the words used in a sample of writing into categories that hint at the writer's state of mind and the writer's cognitive involvement in the writing.

The LIWC distinguishes between Social Processes (through the subcategories Family, Friends, and Humans), Affective Processes (through the subcategories Positive Emotion and Negative Emotion, which is further broken down into Anxiety, Anger, and Sadness), Cognitive Processes (through the subcategories Insight, Causation, Discrepancy, Tentativeness, Certainty, Inhibition, Inclusivity, and Exclusivity), Perceptual Processes (through the subcategories Seeing,

Hearing, and Feeling), and Personal Concerns (through the subcategories Work, Achievement, Leisure, Home, Money, Religion, and Death). Each word in the LIWC dictionary is assigned one or more of such categories, and when that word is located within the writing sample, the counter for that category is increased. For example, the word “cry” (and variants such as “cries,” “cried,” and “crying”) are connected to the psychological categories “Sadness,” “Negative Emotion,” and “Overall Affect,” as well as the linguistic category “Verb,” and so a story which used the word “cry” would be rated higher on these categories. The output for the psychological categories are expressed as pure numbers expressing the number of relevant words used, whereas the linguistic categories are expressed as the percentage of the text as a whole which conforms to a certain category (e.g. the percentage of verbs, pronouns, adjectives, etc. in each story). The current research uses the LIWC to sort the participants' word use into these psychologically significant categories (Pennebaker, Chung, Ireland, Gonzales, & Booth, 2007).

The LIWC has been meticulously tested in terms of both reliability and validity. Reliability measures are included in the most recently released manual for the 2007 version by Pennebaker et al. Pennebaker and colleagues applied the LIWC to 2800 different randomly selected writing samples and assembled binary Cronbach alphas for each category and subcategory, based on the rate of recurrence of different like-category words within the same writing samples. Reliabilities range from $\alpha=.14$ to $\alpha=.97$, though the vast majority of the categories (60 out of the 64 categories studied) achieving reliability scores higher than $\alpha=.60$. For validity, Pennebaker and Francis (1996) correlated the findings of the LIWC on participants' writing samples with questionnaires given to the same participants asking about their thoughts and feelings during the writing. Both were found to fall within statistically acceptable parameters.

LIWC scores were calculated both for individual stories, and for individual participants

across all three stories for each participant, with the score representing the participant's word use summed across all three stories.

Human coding. In addition to the electronic word-count sorting, the data were also coded by three human readers, who rated the stories based on the general creative potential found in those stories. The coders were trained to assess the creative potential of the stories by the amount of originality and novelty they contained, with the following guidelines: “On a scale from 1 to 7, with 1 being the least creative and 7 being the most creative, please provide a rating of your own opinion of the creative potential of each of these stories. Some things to consider in your rating include overall idea and content, such as fully fleshed out characters, original and imaginative plot, vibrant setting, logical and deliberate flow of action, and effective and fitting resolution. In addition, be mindful of each story's language, in the form of linguistic sophistication, appropriate and believable dialogue, and readable style. Thirdly, consider spelling and punctuation if such is particularly effective or especially difficult.” Their findings were also evaluated for inter-rater reliability. To illustrate the type of stories which merited high or low ratings, examples of exceptionally good and exceptionally poor stories are included below.

Upon cursory examination, stories which received extremely low ratings typically appear cliched or poorly constructed, lacking well-drawn characters or driving plot. A typical story of this type reads:

“Blue skies will always remind me of happy times. A clear, sunny pool day, splashing in the cool water or bathing in the hot sun. A nice picnic in the park under the blue sky with all my favorite people, and lots of great food. Taking my goldren retriever for a nice, long walk on a beautiful blue sky day. Is it possible to be unhappy on a day with blue skies? Is it possible that a blue sky could be more than just a blue sky? For me, a blue sky can

cheer me up instantly, it can make the gloomiest days turn around. Going outside and appreciating the beauty could be enough to put a smile on anyone's face.”

Conversely, stories which received extremely high ratings typically appear to be more thoughtfully constructed or surprising, with a definite plot structure and sequence. A typical story of this type reads:

“It's the middle of a hot summer day on the African savanna, and Lion and Gazelle are lounging underneath a tree by the watering hole. They discuss how their days are going, how their weekend plans are, why they prefer this watering hole to other watering holes. All goes well until Gazelle forgets himself and asks Lion if she wants to grab some lunch. “I would,” says Lion, “but lunch for me is often gazelles like you. I'm not sure that'd be fun for either of us. In this story, Gazelle & Lion are best friends, and their friendship is the most unlikely one around for miles. Natural enemies, they have overcome nature because their personalities mesh so well. But when a famine breaks out all across Saharan Africa, Lion has a tough decision to make: revert to her natural instincts & start eating gazelles again, or stay true to her friendship and continue to abstain? Gazelle has his own worries as he struggles to decide whether Lion was really his friend all along, or if she just wanted to cozy up to him to get close to her natural prey. Lion's fellow lions think it's ridiculous that she'd even think twice about eating gazelles. Gazelle's fellow gazelles blame him for their heightened danger surrounding the issue. Eventually, after the friendship has been strained for a long time and the animals are close to death, Gazelle, weak and feeble from hunger, offers himself to Lion, thinking she'll adamantly refuse, even be repulsed. This doesn't happen: Lion eats him and gets her strength back. She's a changed lion now. A natural lion. Lowercase L.”

Creative Behavior Inventory. To ascertain individual differences in creativity and interest

in creative activities among participants, this study made use of an abbreviated version of the Creative Behavior Inventory (CBI), in which participants indicate their past participation or non-participation in a variety of common creative actions. For the sake of time and simplicity, the measure included 38 of the most general questions that make up Hocevar's 90-question Creative Behavior Inventory, and rather than rating activities on their frequency, as in Hocevar (1979) participants were simply asked to answer yes or no to whether they had ever taken part in the listed creative endeavor.

Guilford's Alternate Uses. In addition to the self-report individual differences gleaned from the CBI, the study also used a classic divergent thinking measure, Guilford's Alternate Uses task, in which participants list as many different uses for various common items as they can within a time limit. The task consisted of three pages, each of which contained three items, and participants were given four minutes in which to complete each page. The purpose of this task was to ascertain the participant's ability to see common objects in novel ways, to display resourcefulness and originality, and to employ divergent thinking (Christensen et al., 1960). The primary measure used was fluency, the total number of ideas listed.

Reading Span Lag Task. Participants also completed a brief measure of verbal working memory (VWM) based on the work of Daneman and Carpenter to determine the possible links between VWM and the ability to construct and maintain creative output. In the task, participants viewed a slide show which presented a list of random words one at a time. At the end of the list, they were asked to recall and write down one of the words that occurred at a specific point in the list, either last, second-to-last, or third-to-last. To prevent the participants anticipating the ends of the lists, the list lengths varied between six, seven, and eight words long. The lists were organized 3x3 with each lag condition (last, second-to-last, or third-to-last) assigned to each one of the three list lengths (six, seven, or eight words), three times each, to make a total of 27

different lists (see Daneman & Carpenter, 1980). Overall number of correct responses was used as the estimate of verbal working memory.

RESULTS

The LIWC data were analyzed using one-way ANOVAs, looking for significant differences between the conditions in language usage on the domains of action (e.g., verbs), emotion, and other cognitive involvement. Next, the data which resulted from the human coding process were analyzed. In addition, I performed a series of exploratory correlations between the objective LIWC word count data and the ratings done by the human coders, as well as Pearson correlations between each data set and the data on the individual differences in self-rated creativity between each participant. Lastly, I also performed analysis to explore whether verbal creativity and working memory predict overall performance.

	Sig.	Typical Mean	Atypical Mean	F
Article	.002	9.1752	8.1129	10.306
Verb	.009	14.0787	15.0519	7.049
Auxverb	.000	7.4136	8.5529	16.127
Adverb	.001	3.6587	4.2302	10.937
Preps	.005	13.8321	13.0353	8.116
Friend	.000	.5240	1.0801	27.985
Posemo	.001	2.9633	3.6437	11.947
Negemo	.003	3.3881	2.8590	8.945
Sad	.011	.7118	.5253	6.638
Discrep	.051	1.3022	1.6448	3.872
Excl	.001	1.4994	1.9612	10.931
Percep	.031	2.4478	2.0162	4.750
See	.001	1.4237	.9671	11.725
Health	.001	.7680	1.1644	14.990
Apostro	.045	.9446	1.1886	4.079

Table 1. Significant differences between conditions on LIWC word use categories.

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LIWC Between Conditions

The individual stories were analyzed via the LIWC program. A great number of significant mean differences were found between the the types of words used in stories generated from the two types of combinations (typical vs. atypical). As shown in Table 1, in comparison to stories generated in the typical condition, stories generated in the atypical condition contained significantly more “Common Verbs,” $F(1, 193) = 7.049, p < .01$, “Auxiliary Verbs,” $F(1, 193) = 16.127, p < .001$, and “Adverbs,” $F(1, 193) = 11.706, p < .001$, and the psychological categories “Friendship,” $F(1, 193) = 27.985, p < .001$, “Positive Emotions,” $F(1, 193) = 11.947, p < .001$, “Discrepancy,” $F(1, 193) = 4.251, p < .05$, “Exclusive,” $F(1, 193) = 10.931, p < .001$, and “Health” $F(1, 193) = 13.912, p < .001$, as well as the punctuation category “Apostrophe” $F(1, 193) = 4.079, p < .05$ (nine categories overall).

By contrast, the stories in the atypical condition included significantly fewer “Articles,” $F(1, 193) = 10.306, p < .05$ and “Prepositions,” $F(1, 193) = 17.238, p < .001$, and the psychological categories “Negative Emotion,” $F(1, 193) = 8.945, p < .01$, “Sadness,” $F(1, 193) = 6.638, p < .05$, “Perception,” $F(1, 193) = 4.750, p < .05$, and “Seeing,” $F(1, 193) = 11.725, p < .001$ (six categories overall).

LIWC Between Conditions Comparison Between Studies

Due to the high number of categories included in the LIWC analysis, there is some concern that significance may emerge unnaturally due to random fluctuations in the data.

	Previous Study				Present Study			
	Sig.	Typical Mean	Atypical Mean	F	Sig.	Typical Mean	Atypical Mean	F
Article	.024	9.524524	8.390455	5.281	.002	9.1752	8.1129	10.306
Verb	.035	13.66690	14.97636	4.586	.009	14.0787	15.0519	7.049
Auxverb	.030	6.416429	7.680227	4.874	.000	7.4136	8.5529	16.127
Adverb	.001	3.609048	4.808636	11.706	.001	3.6587	4.2302	10.937
Preps	.000	13.36952	12.00772	17.238	.005	13.8321	13.0353	8.116
Family	.026	1.626667	1.144318	5.127	.043	1.0684	.8009	4.135
Anger	.018	1.687857	1.314545	5.867	.005	1.7333	1.3611	8.255
Discrep	.042	.960714	1.374318	4.251	.051	1.3022	1.6448	3.872
Excl	.006	1.660238	2.389545	8.102	.001	1.4994	1.9612	10.931
Percep	.050	1.499524	1.135909	3.950	.031	2.4478	2.0162	4.750
See	.014	.678571	.416364	6.316	.001	1.4237	.9671	11.725
Health	.000	1.426905	1.980455	13.912	.001	.7680	1.1644	14.990

Table 2. Significant mean differences in LIWC word use between conditions that showed the same direction of significance in both studies.

However, to alleviate such concerns, the results were compared to the significant results found in the study by Ward et al. (2013), and the current results were found to largely replicate the pattern of significance of the previous study. Out of a total of 26 LIWC categories which reached significance in either study, 12 categories were significant across both of the studies, all with the effect in the same direction (see Table 2). The categories which showed significantly higher

presence in the atypical condition included “Common Verbs,” (Present study, $F(1, 193) = 4.586$, $p < .05$, and Previous, $F(1, 84) = 7.049$, $p < .01$), “Auxiliary Verbs,” (Present study, $F(1, 193) = 16.127$, $p < .001$, and Previous, $F(1, 84) = 4.874$, $p < .05$), and “Adverbs,” (Present study, $F(1, 193) = 10.937$, $p < .001$, and Previous, $F(1, 84) = 11.706$, $p < .001$), and the psychological categories “Discrepancy,” (Present study, $F(1, 193) = 3.872$, $p < .05$, and Previous, $F(1, 84) = 4.251$, $p < .05$), “Exclusive,” (Present study, $F(1, 193) = 10.931$, $p < .001$, and Previous, $F(1, 84) = 8.102$, $p < .05$), “Health” (Present study, $F(1, 193) = 14.990$, $p < .001$, and Previous, $F(1, 84) = 13.912$, $p < .001$) (six categories overall).

	Previous Study				Present Study			
	Sig.	Typical Mean	Atypical Mean	F	Sig.	Typical Mean	Atypical Mean	F
WPS	.020*	15.36809	17.14704	5.657	.493	16.5047	16.9417	.472
ipron	.015*	3.8438	4.734091	6.210	.453	4.1259	4.3105	.565
conj	.006*	5.445476	6.533409	8.058	.755	6.3764	6.4495	.097
friend	.850	.620000	.598409	.036	.000*	.5240	1.0801	27.985
posemo	.561	3.897143	3.747955	.342	.001*	2.9633	3.6437	11.947
negemo	.127	3.093095	2.715909	2.382	.003*	3.3881	2.8590	8.945
sad	.338	.525952	.448409	.927	.011*	.7118	.5253	6.638
cogmech	.005*	14.49285	16.35295	8.431	.205	15.0779	15.6732	1.621
tentat	.004*	1.345238	2.126591	8.665	.986	1.4888	1.4917	.000
bio	.023*	2.371429	2.902500	5.397	.066	1.8739	2.1476	3.431
leisure	.004*	1.775238	1.221136	8.724	.387	1.2187	1.0877	.751
home	.002*	.745714	.409773	10.274	.129	.8107	.6655	2.321
assent	.003*	.176429	.074318	10.049	.805	.0592	.0544	.061
apostro	.628	.063571	.048636	.237	.045*	.9446	1.1886	4.079

Table 3. Significant mean differences in LIWC word use between conditions that showed significance in only one study. All categories but “Friend,” “Positive Emotions,” and “Apostrophes” showed the same direction of effects.

By contrast, the stories in the atypical condition included fewer “Articles,” (Present study, $F(1, 193) = 10.306$, $p < .01$, and Previous, $F(1, 84) = 5.281$, $p < .05$), and “Prepositions,” (Present study, $F(1, 193) = 8.116$, $p < .01$, and Previous, $F(1, 84) = 17.238$, $p < .001$), and the psychological categories “Family,” (Present study, $F(1, 193) = 4.135$, $p < .05$, and Previous, $F(1,$

84) = 5.127, $p < .05$), “Anger,” (Present study, $F(1, 193) = 8.255$, $p < .01$, and Previous, $F(1, 84) = 5.867$, $p < .05$), “Perception,” (Present study, $F(1, 193) = 4.750$, $p < .05$, and Previous, $F(1, 84) = 3.950$, $p < .05$), and “Seeing,” (Present study, $F(1, 193) = 11.725$, $p < .001$, and Previous, $F(1, 84) = 6.316$, $p < .05$), (six categories overall).

Of the 14 categories which were significant in only one of the two studies, 11 showed the same direction of effects, indicating that the overall pattern of the findings is largely consistent across studies (see Table 3). The categories which showed higher presence in the atypical condition but reached significance in only one of the studies included “Words Per Sentence,” (Present study, $F(1, 193) = .472$, $p > .05$, and Previous, $F(1, 84) = 5.657$, $p < .05$), “Impersonal Pronouns,” (Present study, $F(1, 193) = .565$, $p > .05$, and Previous, $F(1, 84) = 6.210$, $p < .05$), “Conjunctions,” (Present study, $F(1, 193) = .097$, $p > .05$, and Previous, $F(1, 84) = 8.058$, $p < .01$), and the psychological categories “Cognitive Mechanisms,” (Present study, $F(1, 193) = 1.621$, $p > .05$, and Previous, $F(1, 84) = 8.431$, $p < .01$), “Tentative,” (Present study, $F(1, 193) = .000$, $p > .05$, and Previous, $F(1, 84) = 8.665$, $p < .01$), “Body,” (Present study, $F(1, 193) = 3.431$, $p > .05$, and and Previous, $F(1, 84) = 5.397$, $p < .05$) (six categories overall).

By contrast, the categories which showed lower presence in the atypical condition but reached significance in only one of the studies included “Negative Emotion,” (Present study, $F(1, 193) = 8.945$, $p < .01$, and Previous, $F(1, 84) = 2.382$, $p > .05$), “Sadness,” (Present study, $F(1, 193) = 6.638$, $p < .01$, and Previous, $F(1, 84) = 8.945$, $p > .01$), “Leisure,” (Present study, $F(1, 193) = .751$, $p > .05$, and Previous, $F(1, 84) = 8.724$, $p < .01$), “Home,” (Present study, $F(1, 193) = 2.321$, $p > .05$, and Previous, $F(1, 84) = 10.274$, $p < .01$), and “Assent” (Present study, $F(1, 193) = .061$, $p > .05$, and Previous, $F(1, 84) = 10.049$, $p < .01$) (five categories overall).

Coder Ratings and LIWC Analysis

Difficulties were presented by the coder ratings, as the intraclass correlations between the

three raters were slightly too low to provide a baseline creativity score within acceptable levels of reliability, with Chronbach alpha coefficients of .656 (Enemy), .599 (Sky), and .632 (Death). Thus, it is important to interpret any comparisons involving these findings cautiously, as the pattern presented here could simply be a function of the lower than optimal reliability. It should be noted, however, that the absence of a significant effect is consistent with Ward et al. (2013). However, a one-way ANOVA showed no significant relationship between study condition and total coder ratings $F(1, 193) = 1.680, p > .05$. Similarly, a one-way ANOVA showed no significant relationship between study condition and coder ratings for the category “Enemy” $F(1, 193) = .016, p > .05$, or for the category “Death” $F(1, 193) = 1.680, p > .05$, though the category “Sky” showed a modest correlation $F(1, 193) = 4.446, p < .05$.

However, Regression analysis was run to further examine any connections between the LIWC outputs and the coder ratings, with only the overarching LIWC categories (Word Count, Function Words, Common Verbs, Social Processes, Affective Processes, Cognitive Mechanisms, Perceptual Processes, Biological Processes, and Relativity) entered into the model as independent variables, along with condition, to assess how well they predict coder ratings. The total variance of the model was 24.1%, $F(10, 184) = 5.837, p < .000$. In the final model, the only categories which were significant were Word Count, $\beta = .393, p < .001$, and Common Verbs, $\beta = -.208, p < .001$.

The findings of Ward et al. do indicate a connection between rated creativity and differences in the LIWC data, such as rated creativity being significantly positively correlated with increases in word count (r 's ranging from .450 to .616) and third-person pronouns (r 's ranging from .219 to .476), and negatively correlated with first-person pronouns (r 's ranging from -.229 to -.331) and punctuation (range -.230 to -.316), indicating that aspects of the LIWC output are capable of correlating with differences in rated creativity. The present study performed

an ANOVA between the coder ratings to the LIWC variables in the present study, by collapsing the continuous total ratings variable into an ordinal variable consisting of two groups, one with high ratings (above 4.33, approximately 50.3% of participants) and one with low ratings (equal to or below 4.33, approximately 49.7% of participants). Visual binning on SPSS was used to achieve groups of approximately equal proportion.

For the present study, significant results were found in the ANOVA between binned total coder ratings (high vs. low) and the LIWC output, in 8 different dimensions, including the grammatical categories “Word Count” $F(1, 193) = 31.243, p < .001$, “Verbs” $F(1, 193) = 6.330, p < .05$, “Auxiliary Verbs” $F(1, 193) = 4.280, p < .05$, “Commas” $F(1, 193) = 6.382, p < .05$, and “Dashes” $F(1, 193) = 4.617, p < .05$, and the psychological categories “Affect” $F(1, 193) = 5.228, p < .05$, “Hearing” $F(1, 193) = 4.708, p < .05$, “Relativity” $F(1, 193) = 3.997, p < .05$, “Motion” $F(1, 193) = 4.243, p < .05$, and “Leisure” $F(1, 193) = 7.479, p < .01$. Most of these results do not show direct consistency with the findings of Ward et al., with the notable exception of the findings for Word Count.

Individual Differences and Coder Ratings

The current analysis showed no significant Pearson correlations between overall ratings of creativity of stories and self-reported creative activity (Creative Behavior Inventory, $r = .070, n = 195, p > .05$), task-measured creativity (Alternate Uses Task, $r = .022, n = 195, p > .05$), or verbal working memory (Lag Task, $r = .120, n = 195, p > .05$).

In addition, a Regression analysis run to assess the differences between condition and their effect on coder ratings after controlling for the influence of individual differences variables. The total variance explained by the model was 2.8%, $F(4, 189) = 1.39, p > .05$. The model was not significant.

Correlations Between Individual Differences

Because the most consistent findings are with the objective LIWC outcomes and their ties to creativity in conceptual combination the bulk of the discussion will focus on those outcomes. Pearson correlations performed on the individual differences tasks serve as a manipulation check for the study, however, as the results show a small but significant correlation between the CBI and the AUT score, $r = .231$, $n = 195$, $p < .001$. This indicates a significant positive correlation between the participants' self-reported creativity and the flexibility of thought they demonstrated on an objective test of creativity. These findings point to validity amongst the measures of individual difference, and speak as well to the efficacy of the measures themselves and their administration in this study.

DISCUSSION

The direction of the effects, especially those which were replicated between this study and the findings of Ward et al. (2013), presents an interesting pattern of results. The discussion will focus on the patterns of similar findings and explore the possible interpretations of these results.

Action Words

The first and most compelling effect which comes out in the analysis across both the current research and the findings of the Ward et al. (2013) is the strong and consistent increase in words which connote action, specifically in the form of Verbs, Auxiliary Verbs, and Adverbs. Such output seems to indicate that creativity spurred by the more atypical conceptual combinations evinces higher character and story action. At its most basic, emergence in conceptual combination involves resolving the conflict between two disparate ideas, and it seems logical that such action words should play a role in the emergence of novel ideas.

Cognitive Mechanisms

The output indicated a positive influence of atypical story seeds on the presence of several different measures indicating the participant's psychological involvement in the story they wrote, namely the categories of Discrepancy, Tentative, Exclusive, and the overarching category of Cognitive Mechanisms. As these psychological categories are more complex than simple grammatical distinctions, some extrapolation on the driving force behind each dimension is necessary. The “Discrepancy” category in the LIWC is based on such words as “should,” “would,” or “could,” indicating situations in which the language of story makes a distinction between different ideas and makes moral choices between them. It also could be indicative of an awareness on the part of the writer of a contrast between what is and what could be. Similarly, the category “Tentative” stems from words such as “maybe,” “perhaps,” and “guess,” words which indicate an individual holding back from quick choices. The “Exclusive” category includes words such as “but,” “except,” and “without,” indicating more broad language which makes distinctions between different categories. The overall “Cognitive Mechanisms” category in general contains all three of the previous categories, as well as several other dimensions, all of which contain words such as “cause,” “know,” and “ought,” language which describes an individual's internal psychological processes. These results could therefore indicate that atypical conceptual combinations may inspire higher levels of cognitive involvement in the story, with the writer exploring the thoughts and motivations of the character more strongly. More specifically, the increase in categories such as Discrepancy, Tentativeness, and Exclusivity seem to indicate more cognitive and psychological action, tying back to the similar themes of physical action indicated by the higher presence of action words in creative stories.

In addition, such data are exciting because they many indicate higher cognitive involvement in the story on the part of the participant. The original vision for use of the LIWC program was for therapy and the spoken word, and thus the data have the power to measure not

only the inherent creativity of the stories, but also to measure the storyteller's mental wellness and state of mind through cognitive involvement (Pennebaker et al., 2007). Therefore, findings of increased cognitive involvement may offer support to the hypotheses on the cognitive basis of emergence, in which an atypical conceptual combination requires more thoughtfulness and sheer mental effort in order to explain the linking of two totally disparate ideas.

Perception and Personal Concerns

The opposite direction of effect was found for the presence of words related to Seeing and Perception, namely that they appeared more often in stories spurred by typical conceptual combinations. This finding seems to indicate the inverse of the previous findings on action words and cognitive mechanisms. The category “Seeing” is made up of words such as “view,” “saw,” and “look,” offering a specific linguistic category of words that indicate an individual's observation of the world around him or her. “Perception” is a superordinate category which includes all language of the five senses, with words such as “see,” “touch,” and “listen,” offering broader insight into when the story makes use of language about sensing the world around one. From the nature of these categories, it seems that stories spurred by typical conceptual combinations were more likely to express descriptions of the settings that the characters see around them, rather than focus on the action of the story and the way that the characters interact with that setting or on more abstract cognitive aspects. This is also supported by the previous work of Dudukovic et al. (2004) on lexical differences in entertaining storytelling, in which storytellers seeking to entertain rather than instruct tended to use fewer sensory words. The same direction of effects for cognitive categories such as Leisure (consisting of words such as “house,” “TV,” or “music”) and Home (words such as “kitchen” or “lawn”) support this view of typical conceptual combinations tending to spur the creation of stories which are more mundane or commonplace as opposed to the higher action and cognitive mechanism language in the atypical

stories.

Results Potentially Linked to Specific Words

The comparison of the findings to Ward et al. found several categories in which the effect was significant in one study but not the other, although in almost all cases the mean differences were in the same direction. There were also three cases in which the mean differences were in the opposite direction. It is also important to note that some of the effects may be based on the specific words used as prompts rather than a more general influence of the typicality of the combinations. A prime example of such is the results for categories in the Affective group, such as positive and negative emotions, sadness, and anger. While some of the effect could be due to the typicality of the combinations, it could also reflect the specific effects of the adjectives used. Hostile (paired with Enemy) and Tragic (paired with Death) could reasonably be expected to evoke more negative and less positive emotion than Friendly and Living, respectively, independent of the typicality of their association with the head nouns.

Similarly, the categories Body and Health, while showing a strong trend towards atypical stories over typical stories, were possibly influenced by the fact that the atypical story seed is “Living Death,” which naturally provokes more discussion of the specifics of bodily health, rather than the typical condition's seed “Tragic Death,” which would presumably provoke stories more about the tragedy itself and its effect on those who are left behind. Thus such results must be interpreted with care, even when the effect is fairly strong. Nevertheless, it is conceivable that some of the effect may indeed stem from the contrast between the negative nouns (death, enemy) and positive adjectives (living, friendly) in the atypical combination condition, which falls within the predictions of the conceptual combinations in the current study.

Conclusion and Future Directions

One of the most intriguing findings of this research was the replication of many of the

findings from the Ward et al. (2013). The common findings across the two studies provide compelling evidence that the LIWC variables which reached significance exhibited a series of real effects that bear further scrutiny. In this way, the current study provides a replication and extension of the Ward et al. research, and taken together, the two studies provide a convincing picture of the relevant lexical variables involved in creative thought and conceptual combination. In the same vein, this study failed to discover any truly compelling connections between coder ratings of creativity and the differences between atypical and typical conceptual combination conditions, which was also missing in the previous Ward et al. research. This lack of a connection, now replicated in this extended study, may provide evidence for the inefficacy of the study design to reproduce emergence effects in longer stories. Though the individual difference variables failed to provide an explanation for the lack of rated differences, this may change with greater inter-rater reliability, and may be ameliorated with data paring based on the individual differences data itself in order to prune out the less creative individuals. In addition, the individual differences measures correlated well with each other, indicating the reliability of those measures for use in the future of this kind of research.

Many intriguing connections were found in these data between the objective findings of the LIWC and the manipulation of varying the atypical and typical conceptual combinations, thus these findings made up the bulk of this discussion. In addition, however, there are many other possible aspects of the data set collected in this research which could be examined, as well as many possible future directions for studies as indicated by the findings of this research. Future research may explore the relationship between the coder-rated creativity and the conceptual combination condition, as well as the connections between the coders and the LIWC in more detail, facilitated by further refinement of the methodology of the coding to produce improvements in the inter-rater reliability. In addition, such reliability could be further clarified

by the application of coder ratings for different aspects of creativity, such as raters providing different scores for Story Structure, Novelty, Beauty, and other such specific subjective categories.

Further research may also benefit from a deeper look into the possible within-group variance in rated creative potential for the atypical group. It may be possible that due to emergence effects, the cohort of participants who worked from the atypical seed concepts will show greater variety in story output within the atypical group, as the atypical word pairs may be interpreted differently by different participants, while the cohort of participants who were given typically themed seed concepts may show more similarity in their stories (see Estes and Ward's thoughts on the cognitive basis of emergence, 2002).

Since a strong connection was found between the individual differences measures in creativity, further exploration of the individual differences in relation to the coder ratings may provide a more complex and nuanced view of the ratings themselves. In addition, a systematic correlation of individual difference measures with each category of the LIWC data may provide insight into the kinds of language that more participants with higher scores in creativity and even working memory used in their stories, and the possible differences that may exist. In addition, such data would allow the removal of participants with low scores of creativity to see if the presence of only those participants with high creativity alter the shape of the data, both in the LIWC and the coder ratings.

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APPENDIX A

Ideas for Stories

At the top of each of the next three pages, you will find a two-word phrase. For this study, please imagine that each word pair is a title or concept for a fictional story. In the page provided beneath each phrase, write a few paragraphs describing of the story you imagine that phrase could represent. Include a plot and a setting, describe the nature of the characters in the story and the problems they face, sketch the outline of the rising and falling action in the story as the characters struggle against those problems, and finally, explain how such a story might end. Feel free to follow whatever route feels natural for each story and fitting for the word pair: the choice of genre, tone, setting, fictionality, degree of realism, etc. is entirely up to your imagination. Remember that there is no “correct” story, so rather than relating a story from another source, you should do your best to imagine a unique story of your own, even if it's not quite as polished. Work at you own pace and do your best to create an interesting, vibrant story that others might enjoy.

APPENDIX B

Creative Behavior Inventory

Activities Inventory

The following items are an inventory, not a test, and contain a list of activities and accomplishments that are commonly considered creative. For each item indicate whether or not you have done it by writing the word yes or no out in the left hand margin. Be sure to answer every question.

1. Worked as an editor for a newspaper, school literary publication, or similar organization
2. Founded a literary magazine or similar publication
3. Participated in a writers' workshop, club, or similar organization (excluding school course work)
4. Wrote a short story, poem, or novel (excluding school course work)
5. Wrote the lyrics to a song (excluding school course work)
6. Gave a music recital (excluding school course work)
7. Wrote music for one or more instruments (excluding school course work)
8. Composed and recorded an original music recording
9. Had original music published or publicly performed
10. Played percussion (including piano), brass, string, or wind instrument with a reasonable degree of proficiency
11. Played more than one of the following instruments with a reasonable degree of proficiency: percussion (including piano), brass, string, wind
12. Made candles
13. Designed and made your own greeting cards
14. Received an award for making a craft
15. Participated in a craft workshop, club, or similar organization (excluding school course work)
16. Made your own holiday decorations
17. Knitted or crocheted something
18. Painted an original picture (excluding school course work)
19. Made a sculpture (excluding school course work)
20. Received an award for an artistic accomplishment
21. Had artwork published
22. Kept a sketch book (excluding school course work)
23. Constructed something that required scientific knowledge such as a radio, telescope, scientific apparatus, etc (excluding school course work)
24. Developed a design for a scientific experiment (excluding school course work)
25. Wrote an original computer program (excluding school course work)
26. Won an award for a scientific project or paper
27. Entered a mathematical paper or project into a contest
28. Received an award for acting

29. Received an award for performance in ballet, modern dance, or popular dance
30. Entered a contest as a singer
31. Put on a radio show
32. Directed or managed a dramatic production
33. Wrote a play (excluding school course work)
34. Planned and presented an original speech (excluding school course work)
35. Took and developed your own photographs (excluding school course work)
36. Made or helped make a film or videotape (excluding school course work)
37. Planned and directed a school or community event
38. Please list any other activities that you have done that you consider to be creative.

APPENDIX C

**ALTERNATE USES
Form A**

Paul R. Christensen, J. P. Guilford, Philip R. Merrifield, and Robert C. Wilson

NAME _____ SEX: M ___ F ___ SCORES: I _____
II _____
III _____
Total _____

GROUP _____ DATE _____

In this test, you will be asked to consider some common objects. Each object has a common use, which will be stated. You are to list as many as six other uses for which the object or parts of the object could serve.

EXAMPLE:

Given: A NEWSPAPER (used for reading). You might think of the following other uses for a newspaper.

- a. start a fire
- b. wrap garbage
- c. swat flies
- d. stuffing to pack boxes
- e. line drawers or shelves
- f. make up a kidnap note

Notice that all of the uses listed are different from each other and different from the primary use of a newspaper. Each acceptable use must be different from others and from the common use.

Do not spend too much time on any one item. Write down those uses that occur to you and go on to the others in the same Part. You may return to the incomplete items in a Part if time for that Part permits.

There are three parts to this test, with three items per part. You will have 4 minutes for each part.

If you have any questions, ask them now.

STOP HERE. WAIT FOR FURTHER INSTRUCTIONS.

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written permission of the copyright owner.

Part I

List as many as six possible uses for each of the following objects:

1. SHOE (used as footwear)

- a. _____
- b. _____
- c. _____
- d. _____
- e. _____
- f. _____

2. BUTTON (used to fasten things)

- a. _____
- b. _____
- c. _____
- d. _____
- e. _____
- f. _____

3. KEY (used to open a lock)

- a. _____
- b. _____
- c. _____
- d. _____
- e. _____
- f. _____

STOP HERE. WAIT FOR FURTHER INSTRUCTIONS.

Part II

List as many as six possible uses for each of the following objects:

1. CHAIR (used for sitting)

- a. _____
- b. _____
- c. _____
- d. _____
- e. _____
- f. _____

2. WATCH (used for telling time)

- a. _____
- b. _____
- c. _____
- d. _____
- e. _____
- f. _____

3. SAFETY PIN (used for fastening)

- a. _____
- b. _____
- c. _____
- d. _____
- e. _____
- f. _____

STOP HERE. WAIT FOR FURTHER INSTRUCTIONS.

Part III

List as many as six possible uses for each of the following objects:

1. WOODEN PENCIL (used for writing)

- a. _____
- b. _____

- c. _____
- d. _____
- e. _____
- f. _____

2. AUTOMOBILE TIRE (used used on the wheel of an automobile)

- a. _____
- b. _____
- c. _____
- d. _____
- e. _____
- f. _____

3. EYEGGLASS (used to improve vision)

- a. _____
- b. _____
- c. _____
- d. _____
- e. _____
- f. _____

STOP HERE. WAIT FOR FURTHER INSTRUCTIONS.

APPENDIX D

Lag Task Word List

Author
Sunburn
Picture
Glass
Cigar
Doctor
Circus
Library
Lever
Olive
Profile
Valley
Anchor
Painter
Collar
Onion
Basket
Estate
Region
Chest
Learn
Heart
Trouble
Sleigh
Gallery
Reason
Attend
Leopard
Gravity
Paper
Beach
Colony
Dinner
Nation
Quail
Lemon
Creamer
Concert
Garden
Friend
Ounce
Custom
Maple
Forbid
Mileage
Couch
Algebra
Dress
Eagle
Spinach
Resort
Sadness
Pencil
Diamond
Pedal
Frost
Apple
Hunger

Blister
Dreamer
Impulse
Recital
Purse
Gender
Horse
Sponge
Badge
Vault
Welfare
Dweller
Travel
Lumber
Thought
Monarch
Fruit
Bread
Butter
Loyalty
Charter
Sodium
Helmet
Slice
Floor
Dynasty
Umpire
Machine
Gallon
Plant
Safety
Pickle
Building
Economy
Brush
Defrost
Globe
Rumble
Persist
Shrimp
Breath
Abdomen
Freeze
Choose
Bribe
Supreme
Texture
Graph
Squeak
Pepper
Money
Exhibit
Liver
Balance
Pupil
Testify
Tongue
Number
Tobacco
Hearing
Cheese
Ivory
Glove
Candy

Import
Present
Fiddle
Belly
Prairie
Build
Orange
Opinion
Church
Snail
Miracle
Lesson
Fruit
Victory
Scarlet
Light
Tragedy
Choir
Cereal
Device
Juice
Cloak
Watch
Robbery
Anxiety
Officer
Madness
Level
Table
Monkey
Flower
Queen
Patch
Goddess
Gravel
Camera
Disease
Jacket
Magnet
Camel
Ability
Lunch
Wizard
Settler
Woman
Vision
Mixer
Cement
Berry
Volcano
Speaker
Toast
Costume
Smoke
Relic
Brick
Circle
Velvet
Boulder
Journal
Fortune
Hockey
Justice
Uncle

Violin
Cable
Loafer
Product
Artist
Essence
Sheep
Prize
Glacier
Tribute
Shotgun
Beard
Satin
Comrade
Thread
Cottage
Unique

APPENDIX E

Participant Debriefing Form

What Was This All About?

Wondering why we had you do all this today? If you're interested, this form is a brief attempt to explain what it is that we're after.

Broadly, we're interested in exploring the field of creativity in the form of *conceptual combination*. Conceptual combination refers to the way that people combine different, seemingly unrelated concepts in an attempt to create novel ideas, and the way that these ideas may come about. Furthermore, we're interested in how the types of combinations might lead to more or less creative potential. For this, we get into what's called *emergence*. Previous research has found that when people have to find a way to fit two different concepts together, that new ideas emerge from the combination that weren't related to either of the parent concepts. There's also some evidence that if you have two wildly different original concepts, that the new ideas that come from them will be more different and novel too. Currently, we're testing the hypothesis that the more unusual combinations may produce more novel ideas, and we also want to know how your personal creativity and memory might influence this effect.

We appreciate your help in exploring this question. If you have any questions or concerns, feel free to ask the experimenter before you leave, or to email us at eskennedy@crimson.ua.edu.

Thanks again!

APPENDIX F

Lag Task Instructions

The Lag Task functions as a test of your working memory. You will watch a slide show on the screen in the front of the room which will present a brief list of random words, one at a time. At the end of the list, you will be asked to recall to the best of your ability and write down, in the spaces provided below, one of the words that occurred at a specific point in the list. You will be presented with 27 different lists and be asked to provide a response for each one.

- 1.) _____
- 2.) _____
- 3.) _____
- 4.) _____
- 5.) _____
- 6.) _____
- 7.) _____
- 8.) _____
- 9.) _____
- 10.) _____
- 11.) _____
- 12.) _____
- 13.) _____
- 14.) _____
- 15.) _____
- 16.) _____
- 17.) _____
- 18.) _____
- 19.) _____
- 20.) _____
- 21.) _____
- 22.) _____
- 23.) _____
- 24.) _____
- 25.) _____
- 26.) _____

27.) _____

APPENDIX G

Complete ANOVA for LIWC Output

		ANOVA				
		Sum of Squares	df	Mean Square	F	Sig.
WC	Between Groups	17024.674	1	17024.674	1.406	.237
	Within Groups	2337236.044	193	12110.031		
	Total	2354260.718	194			
WPS	Between Groups	9.302	1	9.302	.472	.493
	Within Groups	3803.001	193	19.705		
	Total	3812.303	194			
Sixltr	Between Groups	2.515	1	2.515	.261	.610
	Within Groups	1857.264	193	9.623		
	Total	1859.778	194			
Dic	Between Groups	.207	1	.207	.012	.914
	Within Groups	3435.554	193	17.801		
	Total	3435.761	194			
funct	Between Groups	19.103	1	19.103	1.134	.288
	Within Groups	3250.844	193	16.844		
	Total	3269.947	194			
pronoun	Between Groups	2.712	1	2.712	.257	.613
	Within Groups	2034.815	193	10.543		
	Total	2037.527	194			
ppron	Between Groups	.133	1	.133	.018	.894
	Within Groups	1443.132	193	7.477		
	Total	1443.265	194			
i	Between Groups	.045	1	.045	.010	.920
	Within Groups	864.928	193	4.481		
	Total	864.974	194			
we	Between Groups	.102	1	.102	.150	.699
	Within Groups	130.528	193	.676		
	Total	130.630	194			
you	Between Groups	.450	1	.450	.508	.477
	Within Groups	170.764	193	.885		
	Total	171.214	194			
shehe	Between Groups	4.843	1	4.843	.548	.460
	Within Groups	1704.401	193	8.831		
	Total	1709.243	194			
they	Between Groups	3.813	1	3.813	1.897	.170
	Within Groups	387.948	193	2.010		
	Total	391.761	194			
ipron	Between Groups	1.660	1	1.660	.565	.453

	Within Groups	567.194	193	2.939		
	Total	568.854	194			
article	Between Groups	54.973	1	54.973	10.306	.002
	Within Groups	1029.429	193	5.334		
	Total	1084.402	194			
verb	Between Groups	46.138	1	46.138	7.049	.009
	Within Groups	1263.288	193	6.546		
	Total	1309.426	194			
auxverb	Between Groups	63.238	1	63.238	16.127	.000
	Within Groups	756.790	193	3.921		
	Total	820.029	194			
past	Between Groups	11.450	1	11.450	.772	.381
	Within Groups	2863.165	193	14.835		
	Total	2874.615	194			
present	Between Groups	2.091	1	2.091	.238	.626
	Within Groups	1695.992	193	8.788		
	Total	1698.083	194			
future	Between Groups	.945	1	.945	.919	.339
	Within Groups	198.494	193	1.028		
	Total	199.439	194			
adverb	Between Groups	15.910	1	15.910	10.937	.001
	Within Groups	280.752	193	1.455		
	Total	296.662	194			
preps	Between Groups	30.931	1	30.931	8.116	.005
	Within Groups	735.553	193	3.811		
	Total	766.484	194			
conj	Between Groups	.260	1	.260	.097	.755
	Within Groups	516.334	193	2.675		
	Total	516.594	194			
negate	Between Groups	1.167	1	1.167	1.757	.187
	Within Groups	128.123	193	.664		
	Total	129.290	194			
quant	Between Groups	2.470	1	2.470	2.119	.147
	Within Groups	225.023	193	1.166		
	Total	227.493	194			
number	Between Groups	1.103	1	1.103	2.203	.139
	Within Groups	96.626	193	.501		
	Total	97.729	194			
swear	Between Groups	.019	1	.019	2.969	.086
	Within Groups	1.247	193	.006		
	Total	1.267	194			

social	Between Groups	2.037	1	2.037	.141	.708
	Within Groups	2794.384	193	14.479		
	Total	2796.421	194			
family	Between Groups	3.487	1	3.487	4.135	.043
	Within Groups	162.719	193	.843		
	Total	166.206	194			
friend	Between Groups	15.066	1	15.066	27.985	.000
	Within Groups	103.903	193	.538		
	Total	118.969	194			
humans	Between Groups	1.247	1	1.247	1.217	.271
	Within Groups	197.786	193	1.025		
	Total	199.034	194			
affect	Between Groups	1.277	1	1.277	.378	.539
	Within Groups	651.367	193	3.375		
	Total	652.643	194			
posemo	Between Groups	22.556	1	22.556	11.947	.001
	Within Groups	364.386	193	1.888		
	Total	386.942	194			
negemo	Between Groups	13.639	1	13.639	8.945	.003
	Within Groups	294.263	193	1.525		
	Total	307.902	194			
anx	Between Groups	.121	1	.121	.824	.365
	Within Groups	28.296	193	.147		
	Total	28.417	194			
anger	Between Groups	6.748	1	6.748	8.255	.005
	Within Groups	157.768	193	.817		
	Total	164.516	194			
sad	Between Groups	1.694	1	1.694	6.638	.011
	Within Groups	49.260	193	.255		
	Total	50.955	194			
cogmech	Between Groups	17.265	1	17.265	1.621	.205
	Within Groups	2055.969	193	10.653		
	Total	2073.234	194			
insight	Between Groups	2.839	1	2.839	2.497	.116
	Within Groups	219.482	193	1.137		
	Total	222.322	194			
cause	Between Groups	.494	1	.494	1.104	.295
	Within Groups	86.322	193	.447		
	Total	86.816	194			
discrep	Between Groups	5.718	1	5.718	3.872	.051
	Within Groups	284.983	193	1.477		

	Total	290.701	194			
tentat	Between Groups	.000	1	.000	.000	.986
	Within Groups	244.391	193	1.266		
	Total	244.392	194			
certain	Between Groups	.142	1	.142	.176	.675
	Within Groups	155.930	193	.808		
	Total	156.073	194			
inhib	Between Groups	.026	1	.026	.178	.674
	Within Groups	28.386	193	.147		
	Total	28.412	194			
incl	Between Groups	6.389	1	6.389	2.532	.113
	Within Groups	487.000	193	2.523		
	Total	493.388	194			
excl	Between Groups	10.391	1	10.391	10.931	.001
	Within Groups	183.472	193	.951		
	Total	193.863	194			
percept	Between Groups	9.075	1	9.075	4.750	.031
	Within Groups	368.701	193	1.910		
	Total	377.776	194			
see	Between Groups	10.156	1	10.156	11.725	.001
	Within Groups	167.180	193	.866		
	Total	177.336	194			
hear	Between Groups	.041	1	.041	.164	.686
	Within Groups	48.053	193	.249		
	Total	48.094	194			
feel	Between Groups	.070	1	.070	.349	.556
	Within Groups	38.910	193	.202		
	Total	38.980	194			
bio	Between Groups	3.650	1	3.650	3.431	.066
	Within Groups	205.327	193	1.064		
	Total	208.977	194			
body	Between Groups	.030	1	.030	.089	.766
	Within Groups	64.327	193	.333		
	Total	64.356	194			
health	Between Groups	7.655	1	7.655	14.990	.000
	Within Groups	98.560	193	.511		
	Total	106.215	194			
sexual	Between Groups	.000	1	.000	.000	.997
	Within Groups	29.718	193	.154		
	Total	29.718	194			
ingest	Between Groups	.358	1	.358	1.946	.165

	Within Groups	35.520	193	.184		
	Total	35.878	194			
relativ	Between Groups	5.342	1	5.342	.634	.427
	Within Groups	1626.062	193	8.425		
	Total	1631.404	194			
motion	Between Groups	3.392	1	3.392	3.182	.076
	Within Groups	205.776	193	1.066		
	Total	209.168	194			
space	Between Groups	.550	1	.550	.180	.671
	Within Groups	588.624	193	3.050		
	Total	589.174	194			
time	Between Groups	.541	1	.541	.176	.675
	Within Groups	591.821	193	3.066		
	Total	592.362	194			
work	Between Groups	1.975	1	1.975	1.538	.216
	Within Groups	247.774	193	1.284		
	Total	249.748	194			
achieve	Between Groups	1.040	1	1.040	1.244	.266
	Within Groups	161.247	193	.835		
	Total	162.286	194			
leisure	Between Groups	.837	1	.837	.751	.387
	Within Groups	214.965	193	1.114		
	Total	215.801	194			
home	Between Groups	1.028	1	1.028	2.321	.129
	Within Groups	85.435	193	.443		
	Total	86.462	194			
money	Between Groups	.252	1	.252	1.910	.169
	Within Groups	25.467	193	.132		
	Total	25.719	194			
relig	Between Groups	.214	1	.214	1.077	.301
	Within Groups	38.447	193	.199		
	Total	38.661	194			
death	Between Groups	.002	1	.002	.004	.952
	Within Groups	109.234	193	.566		
	Total	109.236	194			
assent	Between Groups	.001	1	.001	.061	.805
	Within Groups	3.469	193	.018		
	Total	3.470	194			
nonfl	Between Groups	.013	1	.013	.639	.425
	Within Groups	3.911	193	.020		
	Total	3.924	194			

filler	Between Groups	.213	1	.213	2.895	.090
	Within Groups	14.181	193	.073		
	Total	14.394	194			
Period	Between Groups	.009	1	.009	.004	.951
	Within Groups	459.267	193	2.380		
	Total	459.276	194			
Comma	Between Groups	.816	1	.816	.238	.626
	Within Groups	660.896	193	3.424		
	Total	661.712	194			
Colon	Between Groups	.022	1	.022	.256	.614
	Within Groups	16.596	193	.086		
	Total	16.618	194			
SemiC	Between Groups	.043	1	.043	1.490	.224
	Within Groups	5.556	193	.029		
	Total	5.599	194			
QMark	Between Groups	.000	1	.000	.000	1.000
	Within Groups	47.405	193	.246		
	Total	47.405	194			
Exclam	Between Groups	.038	1	.038	.354	.552
	Within Groups	20.473	193	.106		
	Total	20.510	194			
Dash	Between Groups	.040	1	.040	.056	.813
	Within Groups	138.193	193	.716		
	Total	138.233	194			
Quote	Between Groups	.671	1	.671	.579	.448
	Within Groups	223.548	193	1.158		
	Total	224.218	194			
Apostro	Between Groups	2.900	1	2.900	4.079	.045
	Within Groups	137.207	193	.711		
	Total	140.107	194			
Parenth	Between Groups	.000	1	.000	.008	.929
	Within Groups	10.800	193	.056		
	Total	10.800	194			
OtherP	Between Groups	.361	1	.361	.421	.517
	Within Groups	165.523	193	.858		
	Total	165.884	194			
AllPct	Between Groups	14.547	1	14.547	1.127	.290
	Within Groups	2490.373	193	12.903		
	Total	2504.920	194			

APPENDIX H

IRB Approval

Office for Research
Institutional Review Board for the
Protection of Human Subjects



August 28, 2013

Evan Kennedy
Dept of Psychology
College of Arts & Sciences
Box 870348

Re: IRB#: 13-OR-282 "The Friendly Enemies: Emergence Effects in Word Choice for Story Generation Responses to Conceptual Combinations"

Dear Mr. Kennedy:

The University of Alabama Institutional Review Board has granted approval for your proposed research.

Your application has been given expedited approval according to 45 CFR part 46. You have also been granted the requested waiver. Approval has been given under expedited review category 7 as outlined below:

(7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies

Your application will expire on August 27, 2014. If your research will continue beyond this date, complete the relevant portions of the IRB Renewal Application. If you wish to modify the application, complete the Modification of an Approved Protocol Form. Changes in this study cannot be initiated without IRB approval, except when necessary to eliminate apparent immediate hazards to participants. When the study closes, complete the appropriate portions of the IRB Request for Study Closure Form.

Please use reproductions of the IRB approved stamped information sheets to obtain consent from your participants.

Should you need to submit any further correspondence regarding this proposal, please include the above application number.

Good luck with your research.

Sincerely,


Carpantak T. Myles, MSM, CMA
Director & Research Compliance Officer
Office of Research Compliance
The University of Alabama



358 Rose Administration Building
Box 870127
Tuscaloosa, Alabama 35487-0127
(205) 348-8461
fax (205) 348-7189
TOLL FREE (877) 820-3066

13-OR-282

IRB Project #:

UNIVERSITY OF ALABAMA
INSTITUTIONAL REVIEW BOARD FOR THE PROTECTION OF HUMAN SUBJECTS
REQUEST FOR APPROVAL OF RESEARCH INVOLVING HUMAN SUBJECTS

I. Identifying information

	Principal Investigator	Second Investigator	Third Investigator
Names:	Evan Kennedy	Tom Ward	
Department:	Cognitive Psychology	Cognitive Psychology	
College:	Experimental Psychology	Experimental Psychology	
University:	University of Alabama	University of Alabama	
Address:			
Telephone:	256.282.0617		
FAX:			
E-mail:	eskennedy@crimson.ua.edu		

Title of Research Project: *The Friendly Enemies: Emergence Effects in Word Choice for Story Generation Responses to Conceptual Combinations*

Date Submitted: 06/22/13
Funding Source: No necessary funding.

Type of Proposal New Revision Renewal Completed Exempt

Please attach a renewal application

Please attach a continuing review of studies form

Please enter the original IRB # at the top of the page

UA faculty or staff member signature: _____

II. NOTIFICATION OF IRB ACTION (to be completed by IRB):

Type of Review: _____ Full board Expedited

IRB Action:

Rejected Date: _____

Tabled Pending Revisions Date: _____

Approved Pending Revisions Date: _____

Approved-this proposal complies with University and federal regulations for the protection of human subjects.

Approval is effective until the following date: 6/27/2014

Items approved: Research protocol (dated _____)

Informed consent (dated _____)

Recruitment materials (dated _____)

Other info sheet (dated _____)

Approval signature: _____ Date: 8/28/2013

Information about Task and Participants' Rights

Please read the following statement about the task and your rights as a participant before deciding whether or not you want to participate.

This research study deals with people's knowledge, their concepts and beliefs about the world, how they think about them, and how they use them in different situations. For this particular situation, you will be asked to develop ideas for stories based on combinations of words, as well as completing a few other tasks and questionnaires designed to test your creativity and working memory. The first task will ask you to write three brief stories based on two-word prompts. Next, a Creative Behavior Inventory, will ask you to answer questions about your past participation or non-participation in a variety of common creative hobbies and activities. Thirdly, Guilford's Alternate Uses task will ask you to list as many different uses for various common items as you can within a short time limit. Lastly, a Lag Task will present you with a brief list of random words and ask you to recall one of the words that occurred at a specific point in the list. The tasks overall should not take you more than one hour to complete.

Your participation is entirely voluntary, and you may choose to terminate your participation at any point without losing any credit you have built up to that point. You may also refuse to answer any questions you do not wish to answer.

None of the materials are harmful, and there are no risks associated with participation, beyond those encountered in the normal course of everyday life. It is possible that you may become bored or tired at some point in the task.

By participating you are not giving up any rights, and you will not be personally identified with any of the information collected. Your responses will be combined with those from many other participants, and combined data from the group may be presented at scientific meetings or published in scientific journals or other appropriate media.

You will receive one and one-half experimental credits for your participation, and as described in your class, if you are required to obtain experimental credits there are alternative ways of obtaining those credits, such as writing a report on a research study. Aside from the experimental credit, there are no direct benefits to you from participating, although you may learn about psychological research by participating in it first-hand.

This study is supervised by Dr. Thomas Ward (Office: 179 Gordon Palmer, Email: tward@bama.ua.edu, Phone (205)-348-3178). Any questions about the research can be directed to him. If you have questions about your rights as a person taking part in a research study, make suggestions or file complaints and concerns, you may call Ms. Tanta Myles, the Research Compliance Officer of the University at (205)-348-8461 or toll-free at 1-877-820-3066. You may also ask questions, make suggestions, or file complaints and concerns through the IRB Outreach Website at http://osp.ua.edu/site/PRCO_Welcome.html. You may email us at participantoutreach@bama.ua.edu.

UA IRB Approved Document
Approval date: 8/28/13
Expiration date: 8/27/2014