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The impact of induced mood on visual information processing

Nicolae Dumitrascu
The University of Toledo

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A Dissertation

entitled

The Impact of Induced Mood on Visual Information Processing

by

Nicolae Dumitrascu

Submitted to the Graduate Faculty as partial fulfillment of the requirements for

the Doctor of Philosophy Degree in Clinical Psychology

Joni L. Mihura, Ph.D., Committee Chair

______________________________

Gregory J. Meyer, Ph.D., Committee Member

______________________________

John D. Jasper, Ph.D., Committee Member

______________________________

Mary E. Haines, Ph.D., Committee Member

______________________________

Jeanne Brockmyer, Ph.D., Committee Member

______________________________

Patricia Komuniecki, Ph.D., Dean
College of Graduate Studies

The University of Toledo

December 2011
An Abstract of

The Impact of Induced Mood on Visual Information Processing

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Nicolae Dumitrascu

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Previous research in the areas of social psychology, perception, memory,
thinking, and creativity suggests that a happy mood promotes global, flexible, top-down
processing, whereas a sad mood leads to a more analytic, less flexible, bottom-up
processing. The main goal of this study was to determine if selected variables of the
Rorschach Inkblot Test can capture the mood effects associated with a happy and a sad
mood, respectively. A linear increase was predicted in Global Focus-\(W\), Global Focus
Synthesis-\(WSy\), Synthesis-\(Sy\), Perceptual Originality-\(Xu\)\%\, and Ideational Flexibility-
Content Range and a linear decrease was predicted in Local Focus-\(Dd\) across the three
mood conditions (sad/neutral/happy). Also, an increase was predicted in Perceptual
Inaccuracy-\(X\)\%- in both happy and sad mood conditions as compared to neutral. A
secondary goal of this study was to replicate the findings showing a global/local bias as a
function of mood state on two perceptual tasks requiring hierarchical processing. The
participants were 124 college students, randomly assigned to three mood conditions
(sad/happy/neutral), with each mood condition going through experimental procedures
separately from the other two conditions. Mood was induced using movie clips.
Following mood induction, the hierarchical perceptual tasks and inkblot task were
administered in a group format. Due to a higher than expected positive mood at baseline, the neutral condition was excluded from analyses, so the linearity predictions and the hypothesis pertaining to Perceptual Inaccuracy could not be tested. Instead, the study hypotheses were tested by comparing the dependent variables across two mood induction conditions (happy/sad). The hypotheses were supported for the inkblot variables Local Focus-$Dd^\%$ and Ideational Flexibility-$Content Range$, but not for the remaining four Rorschach variables or the other two perceptual tasks. Implications for clinical practice and further research are discussed.
Acknowledgments

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Chapter One

Mood and Information Processing

Research on the impact of affect on cognition has been one of the most active and interesting areas of exploration in psychology over the last decades (Forgas, 2001). The reasons for this interest are both practical (e.g., improving cognitive performance) and theoretical (e.g., understanding better the architecture of mind). Whereas one line of research has attempted to determine how people’s mood affects the contents of their mental processes, another line has tried to shed light on how people attend to information when in different mood states. Regarding the latter topic, a rather large body of evidence suggests that different emotions have different impacts on cognitive strategies that people use when perceiving, retrieving information from memory, making decisions and judgments, and solving problems. Specifically, research suggests that a happy mood leads to heuristic, global, flexible, top-down, decontextualized processing, whereas a sad mood leads to more systematic, analytic, and stimulus-based or bottom-up, contextualized processing (Bless, 2001; Bless & Schwarz, 1999; Clore & Storbeck, 2006; Derryberry & Tucker, 1994; Fiedler, 2001; Forgas, 1995, 2001; Gasper, 2004; Gasper & Clore, 2002; Isen, Daubman, & Nowicki, 1987, Murray, Sujan, Hirt, & Sujan, 1990).

Mood and impression formation. An area where the processing strategies induced by mood have received particular attention is cognitive social psychology. Research in this domain has shown that people induced into a happy mood tend to use more general (i.e., stereotypic) knowledge when forming impressions of others, as compared to people in a negative mood, who attend to more particular, situational information. For instance, Bodenhausen, Kramer, and Süsser (1994) reported that people
who had a happy mood induced by recalling positive events from their lives rated more highly, as compared to a neutral mood group, the probability that a hypothetical student was guilty for misconduct (assault and cheating), when the offender was presented as a member of an ethnic group stereotypically associated with that offense. This finding can be interpreted as suggesting that a positive mood (as measured by a one-item self-reported mood manipulation check) led to judgment based on general knowledge (stereotypes) rather than on individuating information.

Symmetrical effects were reported by Bless, Schwarz, and Wieland (1996) on an impression formation task, where the participants had to rate a target person along a series of dimensions (e.g., consumer orientation or likeability) after listening to a description containing both categorical (i.e., profession) and individuating information (i.e., specific behaviors) about the person. The participants who previously had a negative mood induced by being asked to recall in detail a negative event from their lives were more influenced by the individuating information about the target person. In contrast, people who had been previously asked to recall a positive event were more influenced by the category (general) information provided in relation to the target person. Thus, apparently a happy mood activated the general rather than specific information about the target person, whereas the opposite was true for the sad mood.

Similar findings were reported by Edwards and Weary (1993). In a study conducted with college students selected as a function of their self-reported depression, the researchers showed that mildly depressed participants tended to be influenced by specific trait attributes (e.g., daydreamer, enthusiastic) rather than more general category information (i.e., their college major) when rating the likeability of a person, even when
they were primed to use categories rather than traits. Thus, a sad mood was associated with using the specific rather than general information about the target person.

Assuming similar processing differences as a function of mood valence, Forgas (1998) hypothesized and found that mood influences the occurrence of the fundamental attribution error. He induced happy and sad moods by giving the participants either positive or negative feedback on cognitive tasks or using either happy or sad movie clips and then measured the effects of the mood induction using a one-item self-report manipulation check. Forgas reported that people induced into a happy mood inferred internal causation ignoring the situational constraints (coercion/free choice) more often than sad people when they were asked to rate the author of an essay supporting or opposing an unpopular issue (e.g., nuclear tests) in terms of his actual attitude towards this issue and his personality traits. Specifically, people in a positive mood were more prone than sad participants to attribute a more positive attitude to the author towards the issue and more negative characteristics (e.g., shy, incompetent, unpopular), even though they had been informed that the author was actually forced to write the essay. Thus, the happy participants made more dispositional inferences than people in negative mood, since they attended more to the general information (i.e., the favorable position adopted by the author towards the unpopular issue) rather than to the relevant contextual information provided (coercion). In other words, people in a happy mood, as compared to those in a sad mood, focused more on the general information provided and ignored the particular constraints of the situation.

Bless, Hamilton, and Mackie (1992) conducted an experiment on impression formation where either positive or negative mood was induced by movie clips. Next, all
participants read a series of behavioral descriptors (e.g., “received a prize for his senior essay exam at his college”) in order to form an impression about a hypothetical person. The authors reported that, as compared to the sad mood condition, people put in a positive mood were more likely to recall the information about the target person by grouping it in broader categories or traits (e.g., “intelligent”).

**Mood and persuasion and attitude change.** Studies on persuasion also supported the notion that people in a negative mood tend to process information more systematically and analytically, whereas people in a positive mood resort to simplifying heuristics (e.g., reliance on general or stereotypic knowledge) in dealing with persuasion messages. Thus, Worth and Mackie (1987) and Mackie and Worth (1989) successfully induced a happy mood (as measured by a self-reported manipulation check) by informing the participants that they were randomly selected by the computer to win a small amount of money. These participants, when exposed to a persuasive message (e.g., a person advocating for or opposing an unpopular issue), tended to base their judgments of the message quality more on weak, general arguments (like “experts can be trusted”) than did neutral mood participants. Bless, Bohner, Schwarz, and Strack (1990) replicated this finding using a different mood induction procedure (i.e., asking people to provide detailed reports of either happy or sad events from their personal lives) and a similar self-reported manipulation check in an experiment where the participants were exposed to a persuasive message supporting an increase in the student service fees with either weak or strong arguments. They also found that the weak arguments were more likely to convince happy rather than sad people, which suggests that sad participants processed the information more systematically than happy participants.
A similar finding was reported by Bless, Mackie, and Schwarz (1992), using the same autobiographical mood induction procedure (Experiment 1), but also movie clips (Experiment 2) and a self-reported mood manipulation check. They showed that the participants in a good mood were more influenced by a global (e.g., “These arguments are pathetic”) rather than a specific, argument-focused representation (e.g., “New equipment was purchased”) of the persuasive messages, whereas the opposite was true for the sad participants.

Finally, on a task of generating arguments supporting a change in the educational system, Ruder and Bless (2003), using an autobiographical mood induction procedure and two self-reported manipulation check items, found that individuals who had a happy mood induced were more influenced by the availability heuristics (i.e., how easy was for them to generate the arguments) rather than by the contents of the arguments in their resulting attitude towards the educational system change, as compared to the participants who had a sad mood induced. The latter were influenced more by the content of the arguments.

**Mood and language.** The same tendency of the happy mood to promote a focus on general information accounts for the findings suggesting that positive affect leads to a more integrative, abstract use of language. Beukeboom and Semin (2006) showed that a positive mood leads to more abstract linguistic descriptions of social events (e.g., autobiographical memories, film scenes) as compared to sad mood. Specifically, people put in a positive mood were more likely than people put in a sad mood to use adjectives (i.e., “aggressive”), rather than descriptive-action verbs (“A punches B”). Beukeboom and Semin showed these effects using two mood induction procedures (describing
positive/negative autobiographical events and watching happy/sad film clips), the effects of which were assessed by a three-item self-report manipulation check.

Similarly, Avramova and Stapel (2008) reported that people who had a happy mood induced by asking them to either read a happy story (Experiment 1) or listen to a happy music (Experiments 2 and 3) tended to activate from memory abstract traits (e.g., “stubborn”) rather than concrete actor-trait links (e.g., “Ralph is stubborn”) when asked to rate a person on a number of personality dimensions, as compared to people who had to read a sad story or listen to sad music, respectively. The notion of differential level of language abstractness as a function of mood valence is consistent with the “action identification theory” (Valacher & Wegner, 1987), holding that successful actions are represented on a more general level than unsuccessful actions. Presumably, this happens because successful actions are more positively evaluated and trigger more positive emotions than unsuccessful actions (Bless & Fiedler, 2006).

**Mood and memory.** Given that a happy mood apparently induces a reliance on general knowledge structures, it is expected that the effects of general schemas on memory will be more pronounced under a happy mood. Research on memory supports this idea. For example, Gasper and Clore (2002) reported that people who were asked to recall a positive autobiographical event were more likely than people who were asked to recall a negative event to use an accessible global concept (e.g., title) to guide attempts to reproduce a drawing from memory.

Using a similar paradigm (i.e., an autobiographical mood induction procedure and a one-item self-report mood manipulation check), Bless, Clore, Schwarz, Golisano et al. (1996) found that happy people, as compared to sad people, made more intrusion errors
consistent with a general script (e.g., “going out for dinner”) on a recognition memory task after listening to a story that included both consistent (e.g., “Jack sat down at the table”) and inconsistent (e.g., “Jack put a pen in his pocket”) information with the script. This suggests that a happy mood prompted the participants to reconstruct the information based more on the general category (i.e., the script) rather than on the specifics of the story.

Similarly, Isen, Daubman, and Gorgoglione (1987), after inducing either a happy or sad mood using movie clips, primed half of the participants with cues related to the theme “American Revolution” (i.e., “patriot”, “eagle”, and “revolution”). Next, all participants were asked to memorize a list of words among which words slightly related to the “American Revolution” theme were interspersed (e.g., “stars”, “stripes”, “colony”). Isen et al. found that, as compared to the sad mood condition, people put in a happy mood showed a better recall of the theme-related words than did sad mood people, irrespective of the cued/non-cued condition. This suggests that a happy mood promoted the organization of the material around a general label, which did not happen with the sad mood people. The latter were less likely to cluster the stimuli around the general theme, even when they were cued to do so.

**Mood and perception.** The symmetric processing effects as a function of mood received further support from studies on perception. Research in this area suggests that people in a happy mood cluster information in larger chunks, whereas in a sad mood they tend to process it in detail. Hence, a happy mood promotes a global focus in perception, whereas a sad mood induces an analytical focus (Bless & Fiedler, 2006). A direct test of this hypothesis was provided by Gasper and Clore (2002) and Gasper (2004), in
experiments where mood was induced using an autobiographical recall procedure (i.e., recalling either happy or sad events) and measured by self-reported manipulation checks. Following the mood induction, the participants were asked to complete a visual matching task in which a geometrical figure could be viewed from either a global or a local perspective (see Figure 1).

Figure 1. An example of a visual-matching task used by Gasper and Clore (2002) and Gasper (2004) to assess global/local perceptual focus.

The respondents had to rate whether the target figure was more similar to a figure that matched its global, but not local, aspects or one that matched by its local, but not global, aspects. The participants in a happy mood were more likely than people in a sad mood to use the global form as a basis of matching the figures. This suggests that people in a happy mood attended more to the global features than sad participants. However, no difference in global focus was found between happy mood and the neutral mood conditions. Gasper and Clore (2002) explained this negative finding by the fact that the
participants in the neutral mood condition actually rated their mood as quite positive, even though it was significantly less positive as compared to the happy mood condition (see Diener & Diener, 1996, for a discussion of the idea that neutral mood is actually by default a moderately good mood). Thus, Gasper and Clore considered their neutral mood condition a positive “resting mood” condition.

Another study (Basso, Schefft, Ris, & Dember, 1996) showed that self-reported dispositional traits associated with positive mood (i.e., happiness) were positively correlated ($r = .49^1$) with a global bias on a perceptually ambiguous task similar to that used by Gasper and Clore (2002). Conversely, self-reported dispositional depression and anxiety were negatively related to a global bias ($r = -.45$ and $r = -.65$, respectively).

To test the hypothesis that a negative state restricts the perceptual attention focus, Brandt, Derryberry, and Reed (as cited in Derryberry & Tucker, 1994) found that the state of failure (commonly associated with negative emotions) induced by a negative feedback signal restricted the attention focus on a perceptual task where the participants had to detect targets at various distances from a fixed central point. Specifically, administering negative feedback slowed down the reaction times of detecting the peripheral stimuli, but did not affect the reaction times for the stimuli in the close or medium locations.

The authors reported a similar finding when the participants had to detect a target as fast as possible on a perceptual task consisting of stimuli made up of local elements arranged in a global pattern (i.e., T-shaped elements arranged into larger T-shaped patterns). The state of failure impaired the ability to detect the targets at the global level,

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1 All effect sizes in this study will be reported as Pearson’s $r$. 
suggesting that it promoted a narrow focus of attention to the local level of the stimuli (Derryberry & Tucker, 1994). Again, since failure states are usually associated with negative emotions, these experiments are indirect evidence of the “local bias” promoted by negative mood.

Mood and thinking. Studies on thinking and conceptualization provided findings consistent with those reported in other areas: a happy mood leads to heuristic processing, based on a reliance on general knowledge structures and overcategorization, whereas sad mood leads to analytic and contextual processing. Isen and Daubman (1984) induced a happy mood by offering the participants a small gift (Study 1) or asking them to watch a comedy clip (Study 2) and then measured the effects of the induction with a two-item self-reported mood manipulation check. The authors found that happy people created broader categories than people in a neutral mood on two types of tasks (rating and sorting). On the rating task, happy participants rated weak exemplars of a category (e.g., “purse” and “ring” for the category “clothing”) as better members of the category than neutral mood people. Likewise, in the sorting task, they put more items together than did control neutral mood participants, even though some of them were weakly related to the underlying category (e.g., “camel” for the category “vehicle”). Thus, the authors concluded that people in a positive affect exhibit more cognitive flexibility (since their ability to see interrelations between items increases), which allows them to process material in a more integrated way.

Murray et al. (1990) induced either a positive or negative mood by asking the participants to read a series of emotional statements (e.g., “I feel so vivacious and efficient today- I'm sitting on top of the world”) (Velten, 1968) and then used a four-item
rating scale as a manipulation check. The authors showed that a happy mood enhanced flexibility in categorization criteria as compared to neutral and sad mood conditions, which resulted in fewer (broader) categories on a categorization task (i.e., sorting a series of TV shows). They did not find, however, differences between the neutral and sad mood conditions in categorization. Murray et al. (1990) also reported that, on a task of cognitive flexibility consisting of finding as many similarities and differences between two familiar movie characters, people in a positive mood generated more distinct and creative similarities and differences among items as compared to the neutral mood condition. Thus, apparently a happy mood promoted a flexible and original approach to information.

**Mood and creativity.** The idea that positive mood stimulates cognitive flexibility and originality received further support from research in the area of creativity. For example, Isen, Johnson, Mertz, and Robinson (1985) induced positive mood by exposing the participants to positively valenced words (e.g., “happiness”) and asking them to write down their first associations to each of them. As a manipulation check, they asked the participants to rate the pleasantness of a series of unfamiliar words. Isen et al. (1985) found that people in a happy mood offered more unusual first-associations to words than did people in a neutral mood condition.

In another study, Isen, Daubman, and Nowicki (1987) induced a happy mood by asking the participants to watch a comedy clip or by offering them small gifts. As a manipulation check, the participants completed a word-rating scale in which they rated the pleasantness of unfamiliar words. Isen et al. (1987) reported that happy people gave more unusual or personal responses on word association tasks and improved their
performance on a task requiring creative ingenuity (i.e., the Duncker’s Candle problem) as compared to people in a neutral mood. This suggests that a happy mood improves the ability to see things in new ways.

Hertel and Fiedler (1994) induced either a happy or sad mood by using movie clips and measured the effects of the mood induction with a one-item self-report scale. They showed that the participants who were put in a happy state exhibited a wider range of responses and strategies (of both cooperativeness and competition) on a social dilemma game than people in a sad mood, who tended to stick more with a particular strategy (of either competition or cooperativeness).

All of these studies suggest that positive mood enhances cognitive flexibility and originality by facilitating an extensive or decontextualized long-term memory search, thus enlarging the scope of conceptual attention (Derryberry & Tucker, 1994). As a result, the range and unusualness of potential responses retrieved from memory are higher.

**Mood and psychopathology.** In addition to the clinical observations that people in hypomanic states exhibit idiosyncratic thinking and flight of ideas, clinical empirical studies report the same “expansive” effects of elated mood on processing. For example, Andreasen and Powers (1975) found that a sample of inpatients diagnosed with mania and a group of accomplished creative writers were similar in their tendency to create overinclusive categories (e.g., “pipe”, “matches”, “apple” and “sugar cube” were all related to “consumption”) on a sorting test, indicating superior cognitive flexibility in their criteria of clustering information, as compared to a control group of inpatients diagnosed with schizophrenia, who exhibited more rigidity in their clustering criteria and
thus tended to be underinclusive. This finding may be consistent with the frequently reported occurrence of affective disorders in creative writers (Derryberry & Tucker, 1994). However, in this study the group of creative writers was not matched by intelligence and SES with the inpatient sample. In addition, pathological symptoms were a confounding variable, as some writers had a psychiatric history too.

Fodor (1999) selected a sample of non-patients high and low in their self-reported inclination to manic symptoms and induced a happy mood in half of them by asking them to recall a positive event from their lives. The other half of the participants were put in a neutral mood by asking them to recall an emotionally neutral event. Next, all participants were given a word association task measuring the flexibility of mental associations. Fodor reported no difference on this task between people put in a neutral mood, irrespective of their inclination to manic symptoms. However, he found that, among people who were put in a happy mood, those with a high manic inclination gave significantly more remote word associations than participants low in manic tendency. In other words, Fodor showed that the association of a positive mood with an inclination to experience positive intense emotions is associated with higher cognitive flexibility.

Santosa, Strong, Nowakowska, Wang et al. (2007) reported mixed findings concerning the relationship between bipolar disorder and creativity. They found that euthymic patients diagnosed with bipolar disorder obtained similar scores with creative healthy controls (and higher than non-creative healthy controls) on some measures of creativity (i.e., preference for complex, non-symmetrical geometrical figures), but not on others (Torrance Test of Creative Thinking, Torrance, 1974). They also found that patients diagnosed with major depressive disorder scored lower than creative controls on
Torrance- Figural Form. Taken together, their findings suggest that a positive mood can enhance performance at least on some types of creative tasks and that a negative mood seems to have an inhibiting effect on creativity.

In a clinical study using a repeated measures design, Shaw, Mann, Stokes, and Manevitz (1986) found that the number and unusualness of associations on a standard verbal association measure in euthymic outpatients diagnosed with an affective disorder varied as a function of the amount of lithium prescribed as a treatment. The verbal associations were more numerous and more remote or idiosyncratic when lithium was discontinued, as compared to the periods when it was readministered. This suggests that, when the affective symptoms were not treated, the patients exhibited greater cognitive flexibility.

In summary, a positive mood apparently leads to an extensive propagation of long-term memory search. In contrast, a negative mood leads to a more narrowly focused attention to the internal or external stimulus, which limits the range of available responses (Derryberry & Tucker, 1994).

**Theoretical models of mood effects on processing.** In summary, there is convergent evidence indicating that a positive mood leads to a more general, flexible and creative processing style and to a broader scope of both perceptual and conceptual attention (e.g., Andreasen & Powers, 1975; Bless et al., 1992; Bless et al., 1996; Gasper & Clore, 2002; Gasper, 2004; Isen et al., 1985, 1987; Isen & Daubman, 1984; Shaw et al., 1986). In contrast, research suggests that negative mood leads to a more analytic, stimulus dependent and systematic processing and to a narrower focus of perceptual and
conceptual attention (e.g., Basso et al., 1996; Derryberry & Tucker, 1994; Gasper & Clore, 2002; Gasper, 2004; Murray et al., 1990).

How can these symmetric effects of mood on how we organize information be explained? One of the most prominent theories is the “affect-as-information” model (Schwarz & Clore, 1996). This model stipulates that mood has an intrinsic informational value for cognition; that is, people consult their mood to make inferences about the situation. Thus, a negative mood promotes a more careful and detail-oriented processing, since it signals that something is problematic in the subject or environment. On the contrary, positive mood induces a more liberal, heuristic-based and decontextualized processing, since good mood is a sign that things “are going well,” so there is no urge to scan the situation in detail. This promotes a more liberal approach to the situations, based on heuristics or general knowledge structures (e.g., stereotypes, schemas), because they are more economical in term of mental effort and more parsimonious in terms of processing operations (Bless, 2001). In contrast, a sad mood can signal that a problem occurred, so stimulus-specific rather than general knowledge is activated to solve the problem. A similar model was articulated by Fiedler (2001), who stated that affective states trigger assimilation and accommodation based on two mood-depending learning sets: “whereas negative mood supports the conservative function of sticking with the stimulus and avoiding mistakes, positive mood supports the creative function of active generation or enriching the stimulus input with inferences based on prior knowledge.” (Fiedler, 2001, p. 87).

Variables moderating the mood effects on processing. It is important to note that the literature also specifies a series of factors moderating the symmetrical effects of
mood on processing. For instance, if the task promises to maintain or enhance a positive mood, happy people will engage in more systematic processing. However, if the task threatens their mood, happy people will defensively avoid processing it in depth. Thus, Wegener, Petty, and Smith (1995) reported that college students who were put in a happy mood processed more carefully a happy message (i.e., arguments supporting a bill that would give students the opportunity to work as part-time staff at the university for a significant tuition reduction) than a depressing message (i.e., arguments supporting a bill that obliges all students to work as a part-time staff at the university to avoid a tuition increase). People in a sad mood did not exhibit differences in processing depth as a function of the message valence (happy/depressing), which is in line with Wegener et al.’s theory that people in a happy mood are more involved in their mood management than sad people.

Similarly, increasing processing motivation (Bless et al., 1990; Bless & Schwarz, 1999; Forgas, 1995) can make the mood effects disappear. For instance, Bless et al. (1990) found that people who had been put in a happy mood were more likely to be convinced by weak arguments than the participants who had a sad mood induced, suggesting that happy people processed the information heuristically. However, when the people put in a happy mood were specifically instructed to evaluate the quality of the arguments, the differences between them and people inducing into a sad mood disappeared. Thus, when the level of processing motivation increased among the happy people, their mood did not infuse their judgment anymore.

In addition, increasing processing capacity will decrease the reliance on stereotypes and heuristics triggered by a happy mood. As an example, Mackie and Worth
(1989) found that under time pressure, the participants who were put in a happy mood were similarly influenced by weak and strong arguments supporting a counter-attitudinal message concerning a social issue, whereas neutral mood people were more convinced by strong rather than weak arguments. This finding suggests that happy people used a heuristics-based processing more often than neutral mood people when their processing capacity was limited by the time pressure. However, this effect disappeared when the processing capacity was improved by providing the participants unlimited time to analyze the arguments. In this condition, no difference between the happy and neutral mood conditions was noticed anymore in their reliance on weak and strong arguments.

Mood effects also tend to dissipate when the informational value of one’s mood is questioned or when people are warned that their affective states are irrelevant for the task (Beukeboom & Semin, 2006; Gasper, 2004; Schwarz & Clore, 1983; Sinclair, Mark, & Clore, 1994), in line with the affect-as-information model. As an example, Gasper (2004) induced either a positive or a negative mood by asking the participants to recall in detail either a happy or a sad moment from their lives. Then, she asked half of the participants to evaluate a series of statements suggesting that their current mood state was caused by the event they recalled (e.g., “If I did not think about the event, I might not feel as pleasant (unpleasant) as I do right now” (Gasper, 2004, p. 412). This task had as a goal increasing the participant’s awareness of the connection between their current state and valence of the recalled event. The author found that people who were put in a happy mood were more likely, as compared to people in a sad mood, to have a global approach on the perceptual matching task described before (see Gasper & Clore, 2002). However, the global bias differences between the happy and sad mood conditions essentially
disappeared among the participants who were warned that their current mood state was
determined by the recalled event.

In addition, mood effects apparently tend to be more prominent when the task is
ambiguous, rather than well-structured (Forgas, 1995). For instance, Gasper (2004) found
that, on an unambiguous perceptual matching task allowing only one correct response,
induced mood did not make any difference in the participants’ responses as a function of
their moods. However, when the perceptual task was ambiguous, (i.e., allowing a target
figure to be matched by either its global shape or the shape of its subcomponents with
another figure), Gasper (2004) found that the mood effects were apparent, following the
global/local pattern, in a positive and negative mood, respectively. The studies on
creativity and mood mentioned before (e.g., Hertel & Fiedler, 1994; Isen, Daubman, &
Nowicki, 1987; Isen, Johnson, Mertz, & Robinson, 1985; Shaw, Mann, Stokes, &
Manevitz, 1986) also suggest that performance on tasks that require creative inferences or
multiple solutions should profit more from positive rather than from negative mood, since
positive mood stimulates cognitive flexibility and divergent search (Fiedler, 2001). From
a clinical viewpoint, an interesting consequence of this idea is that performance on
ambiguous and creative tasks can constitute an implicit measure of the individual’s mood
state.

In summary, there are a series of factors moderating the effects of mood on
processing. Some of these factors are the hedonic value of the task (Wegener et al.,
1995), processing motivation (Bless et al., 1990; Bless & Schwarz, 1999; Forgas, 1995),
processing capacity (Mackie & Worth, 1989), questioning the informational value of
one’s mood (Beukeboom & Semin, 2006; Gasper, 2004; Schwarz & Clore, 1983; Sinclair, Mark, & Clore, 1994), and task ambiguity (Forgas, 1995; Gasper, 2004).

The Rorschach Inkblot Method

The performance on ambiguous and creative tasks such as the Rorschach Inkblot method (Exner, 2003; Rorschach 1921/1942) can constitute an implicit measure of the individual’s mood state. The Rorschach is a perceptual-cognitive task widely used in clinical assessment for collecting information about mental processes of people (Camara, Nathan, & Puente, 2000), from cognitive to emotional and interpersonal aspects of their psychological functioning. The stimuli consist of a series of 10 symmetrical quasi-ambiguous inkblots (see Figure 2 for an example).

Figure 2. An inkblot analogous to one of the Rorschach Inkblot Test cards.

The administration of the task requires the examinee to generate responses to each inkblot, following the instruction “What might this be?” (Exner, 2003, p. 51). Thus, the Rorschach is a task that gives individuals much freedom in terms of how they decide to respond, based on how they interpret the perceptual stimuli. There are several aspects of
this task that may capture the processing characteristics associated with positive and negative mood described above.

**Rorschach Locations and mood.** The Rorschach task allows the examinees to choose the area of the stimulus when they formulate a response. For instance, some responses can include the whole blot (e.g., “A bat”, including the entire card). Other responses can be limited to discrete areas of the blots. Thus, the examinees decide if they want to focus on the global field or only on its parts. As mentioned before, research suggests that mood has a specific influence on the global/local perceptual focus, with happy people being prone to process information globally, and sad people analytically (e.g., Basso et al., 1996; Derryberry & Tucker, 1994; Gasper, 2002; Gasper & Clore, 2002). As a consequence, it may be expected that the Rorschach locations (i.e., global or detail) that the respondents use to give their responses are affected by their mood.

The Rorschach test actually includes several types of locations. The ones of interest here are the *Whole (W)*- a global location, and *Unusual Detail (Dd)*- an uncommon area, usually small. A perceptual style dominated by global responses reflects a tendency to focus on the general characteristics of the situations by integrating all parts of the stimulus in a meaningful global image (Rorschach, 1921/1942)². This is consistent with the documented tendency to integrate perceptual data when in a happy mood (Gasper, 2004; Gasper & Clore, 2002).

² However, not all *W* responses reflect the same degree of perceptual integration. They can differ from simplistic (“A bat”) or impressionistic (“Abstract painting symbolizing the beauty of the world”) to detailed and integrated responses (“Two people dancing at a party, they wear black suits and in the background I can see decorations”). Thus, a differentiation can be made between simplistic or impressionistic *Whole* responses on one hand, and more elaborated and integrated *Whole* responses, on the other hand. The latter responses may reflect better the tendency to integrate perceptual data.
Conversely, sad people would tend to select partial locations of the blots, as a consequence of the analytical perceptual focus promoted by a negative mood (Derryberry & Tucker, 1994). In particular, the Rorschach $Dd$ responses may reflect a detail-oriented focus, as suggested by Exner (2003), who held that $Dd$ occurs after considerable scanning of the stimulus and can reflect a more defensive approach of the field by creating a narrower environment that is easier to manage. This assertion is consistent with the notion of the defensive set induced by a sad mood, as predicted by the affect-as-information model (Schwarz & Clore, 1996). A study by Smith, Bistis, Zahka, and Blais (2007) seems to support the positive relationship between $Dd$ and local focus. They reported a moderate correlation ($r = .37$) between $Dd$ and attention to details as measured by a test of visuo-spatial abilities (Rey-Osterrieth Complex Figure Test; ROCF). However, Crawford, Horn, and Meyer (2009) did not replicate this finding. They reported a low and unexpectedly negative correlation between $Dd$ and ROCF ($r = -.12, p > .20$), as well as between $Dd$ and a hierarchical task measuring a local focus ($r = -.14, p > .20$). However, the Crawford et al. focused more on the organization of the ROCF details, whereas Smith et al. paid more attention to the number and accuracy of the reproduced ROCF details. Thus, they used different scoring criteria, which may explain that discrepancy between their results.

However, the validity of $Dd$ is a measure of the local focus needs more empirical support. Experimentally manipulating the perceptual focus (i.e., global/local) by inducing a positive or a negative mood can shed more light on this issue.

Rorschach literature offers some evidence concerning the association between mood and global/local dimension of the responses. Early clinical observations made by
Beck (1946), Klopfer and Kelley (1946), Levy and Beck (1934), Rorschach (1921/1942), and Varvel (1941) suggest that depression is associated with a low frequency of *Whole* ($W$) Rorschach responses, whereas euthymic states are associated with a higher $W$ frequency. Consistent with these observations, Spielberger, Borgman, Becker, and Parker (1966) found a positive correlation ($r_s = .35$) between self-reported happy mood and $W$ on a sample of 27 inpatients diagnosed with manic-depressive disorder.

More recently, in a study conducted on a sample of 68 non-patients who were administered a brief version of the Rorschach, Kingery (2004) found that the number of the responses given to the small details of the inkblots ($D_d$) was positively correlated with a self-reported measure of dispositional negative affect ($r = .33$) and negatively correlated with a self-reported measure of dispositional positive mood ($r = -.28$). However, he found no correlation between the Rorschach *Whole* responses and self-reported dispositional mood. A possible explanation of this negative finding is that, as mentioned before, the *Whole* responses are not homogenous. They may reflect different degrees of perceptual integration, ranging from simplistic or impressionistic to elaborated and integrated responses.

Schmidt and Fonda (1954) found that 42 inpatients diagnosed with mania (associated with an expansive mood) had a higher frequency of Rorschach $W$ as compared to 157 non-patients. In an exploratory within-subjects design study conducted on a sample of 16 inpatients diagnosed with bipolar disorder, Wagner and Heise (1981) reported significantly more *Whole* responses in the manic than in the depressive phase of the disorder. However, the total number of Rorschach responses per protocol is a
confounding variable in their study, since the manic group gave significantly more responses per protocol than the depressive group.

In summary, the Rorschach literature offers some empirical evidence for the association between a positive mood and the *Whole* responses. However, the evidence concerning the relationship between *Dd* and negative mood is sparse, so more research is needed to test this relationship.

**Rorschach perceptual organization and mood.** Another aspect of the Rorschach task is how complex the response is in terms of its perceptual organization. For instance, some responses reflect a complex organization of the field, as its areas are combined in a meaningful way. These responses usually include two or more objects perceived in a relationship (e.g., “Two people discussing”). Other responses include discrete objects (e.g., “Two people”). As mentioned before, research shows that a happy mood promotes a synthesis of disparate elements, whereas a sad mood induces an analytical focus (Andreasen & Powers, 1975; Bless & Fiedler, 2006; Gasper & Clore, 2002; Gasper, 2004; Isen & Daubman, 1984; Murray et al., 1990). Since the Rorschach task involves both types of processing approach (i.e., analysis and synthesis), this suggests that it may capture the mood effects associated with these processing modes. The Rorschach code for the synthesis response is *DQ*+ (Exner, 2003).

In terms of the validity of *DQ*+ as a measure of perceptual organization, Acklin and Fechner-Bates (1989) found that *DQ*+ was correlated \( r = .21 \) with a measure of non-verbal intelligence (WAIS-R PIQ). This result was replicated by Wood, Krishnamurthy, and Archer (2003), who reported that *DQ*+ was positively correlated \( r = .26 \) with non-verbal intelligence, as measured by the WAIS-III PIQ. In addition,
Ferracuti, Cannoni, Burla, and Lazzari (1999) found positive correlations between the Rorschach $DQ^+$ and several indices of figural creative thinking, as measured by the Torrance Test of Creative Thinking (Torrance, 1974): Elaboration ($r = .62$), Flexibility ($r = .41$), Fluidity ($r = .39$), and Originality ($r = .49$). Perry, Potterat, Kaplan, and Jeste (1996) reported that patients diagnosed with dementia of Alzheimer type gave significantly fewer $DQ^+$ than a control group of non-patients ($r_{pb} = .71$), which is consistent with the idea that patients with this disorder exhibit neuropsychological impairment significantly affecting their perceptual processes.

Rorschach literature also provides some evidence that a happy mood is associated with an increase in the perceptual organization. For instance, Singer and Brabender (1993) conducted an exploratory Rorschach study on three groups of inpatients ($N = 62$) diagnosed with affective disorders (bipolar in manic state, bipolar in depressive state, and unipolar). There were no significant differences in educational level and intelligence among the groups. The authors found that the bipolar subgroup in the manic phase gave significantly more $DQ^+$ responses than the bipolar subgroup in a depressive phase. However, they found no difference in $DQ^+$ between the bipolar manic subgroup and unipolar (depressive) subgroup.

In summary, the Rorschach data offer some support for the notion that higher values of the variable related to perceptual organization ($DQ^+$) is associated with a positive mood. In contrast, the studies mentioned above suggest that lower values of this variable is associated with a negative mood.

**Rorschach response originality and mood.** As mentioned before, given the quasi-ambiguous nature of its stimuli, the Rorschach task allows freedom in how people
interpret the inkblots (e.g., the same area of a blot can be seen alternatively as a “bat” or as “an insect”). Some of these interpretations (or responses) are common among people for a blot or area of the blot. Others responses can be very original or personal. In other words, the Rorschach task can reflect the originality of examinee’s mental associations. The variable measuring this aspect on the Rorschach is $Xu\%$. The notion that $Xu\%$ reflects unconventionality or originality in thinking is supported by a study by Ferracuti, Cannoni, Burla, and Lazzari (1999), who showed that $Xu\%$ is positively correlated with verbal originality ($r = .40$), verbal flexibility ($r = .39$), and figural elaboration ($r = .41$), as measured by the Torrance Test of Creative Thinking (1974).

Given that research indicates that a happy mood enhances originality in thinking, whereas a sad mood promotes a more stereotypic approach (e.g., Isen et al., 1985, 1987; Shaw et al., 1986), this suggests that the number of the original (or unusual) responses on the Rorschach can be affected by the respondent’s mood. Unfortunately, no previous Rorschach study addressing the relationship between $Xu\%$ and mood was identified. Thus, this conceptually meaningful relationship still needs to be empirically tested.

**Rorschach perceptual accuracy and mood.** As mentioned above, there are differences in how accurately or systematically people process information, as a function of their mood. People in a sad mood stick more with the stimulus (showing a predominance of a contextualized, bottom-up processing), whereas people in a happy mood approach stimuli in a more casual and heuristic way (exhibiting a preference for decontextualized, liberal, top-down processing) (e.g., Bless et al., 1990; 1996; Bodenhausen et al., 1994; Fiedler, 2001; Forgas, 2001). This would suggest that a sad mood improves accuracy in problem solving as compared to a happy mood, since sad
people simply attend more carefully to the data at hand. A number of studies already cited supported this notion (e.g., Bless et al., 1990; Bless et al., 1992; Edwards & Weary, 1993; Forgas, 1998, Ruder & Bless, 2003) in the area of persuasion and impression formation.

However, another line of research documents that a negative mood can also lead to impaired problem solving or reduced accuracy on neuropsychological tasks (see Austin, Mitchell, & Goodwin, 2001, for a review). Since the Rorschach test is primarily a perceptual-cognitive task rather than a task requiring interpersonal judgments or argument evaluations, it can be surmised that a negative mood can have a negative rather than a positive influence on the Rorschach response accuracy.

Response accuracy is one of the Rorschach criteria of evaluating a response. Some responses are the result of a careful analysis of the inkblot’s contours or subcomponents, and thus they match well with the actual blot. Other responses can violate the shape of the specific inkblot and may reflect a poorer scrutiny of its boundaries. The percentage of the distorted responses on the Rorschach is called $X\%$. This variable is known to measure perceptual inaccuracy, as suggested by research showing that $X\%$ is high in psychopathological conditions associated with a higher level of perceptual distortions. For instance, a series of studies reported elevated $X\%$ in psychosis, with a median effect size of $r = .57$ (e.g., Dao & Prevatt, 2006; di Nuovo, Laicardi, & Tobino, 1988; Hartmann, Norbech, & Gronnerod, 2006; Hilsenroth, Eudell-Simmons, DeFife, & Charnas, 2007; Lee, Kim, & Kwon, 2005; Meyer, 2002; Vanem, Krog, & Hartmann, 2008).
In light of the documented differences between happy and sad mood processing styles, it can be surmised that perceptual accuracy of the Rorschach responses (i.e., their degree of fit with the blot) may be also influenced by an individual’s mood. Thus, both sad and positive mood people would exhibit higher perceptual inaccuracy than people in a neutral mood.

Early clinical observations by Rorschach (1921/1942) and Beck (1946) indicated that depression increases the percentage of “accurate (good) forms” (i.e., responses congruent with the contour of the inkblots), whereas the manic state decreases it. However, the few Rorschach studies that addressed the relationship between mood and perceptual accuracy tend to suggest that actually both clinical depression and mania impair the response accuracy.

For instance, Schmidt and Fonda (1954) found that a sample of 42 inpatients diagnosed with mania offered significantly fewer “good forms” on the Rorschach than 157 non-patients from the normative sample (Beck, 1937). Recently, Kumar, Kumar, and Kumar (2004) compared a sample of 50 patients diagnosed with mania with 50 patients diagnosed with depression and a control group of 50 non-patients. The three groups were roughly matched by gender and education level. The authors found that the patients diagnosed with mania presented with the highest rate of perceptual distortions on the Rorschach as compared to both the depressive and control non-patient groups. However, they also reported that the patients diagnosed with depression had a higher rate of perceptual inaccuracies than the non-patient control group. Finally, Hartmann and Wang (2003) reported that 16 patients with a depressive diagnosis exhibited a higher level of perceptual inaccuracy on the Rorschach than 18 never depressed participants ($r = .41$).
Interestingly, however, they did not find any relationship between Rorschach perceptual inaccuracy when depression was assessed by a self-report ($r = .01$).

In summary, Rorschach clinical research suggests that in both expansive and depressive states the rate of perceptual distortions is higher as compared to non-clinical conditions. However, there is only sparse evidence regarding differences in perceptual inaccuracy between expansive and depressive mood.

**The Rorschach content range and mood.** Finally, another dimension of the Rorschach task is the semantic category of the response (response content). The quasi-ambiguous character of the stimuli allows for a wide range of classes of responses: animals, humans, landscapes, anatomical contents, cultural or art objects, etc. Given the diversity of the response categories, the Rorschach task may be a good candidate to assess ideational flexibility. Empirically, two Rorschach studies suggest that the variety of contents is related to mental flexibility. For instance, Porcelli and Meyer (2002) reported that psychosomatic patients high on self-reported alexithymia exhibited a more constricted range of Rorschach contents than non-alexithymic patients ($r_{pb} = .39$). This is fully consistent with the definition of alexithymia, which includes rigidity of mental associations and inhibited thinking as central features. In a longitudinal study conducted on people with ages between 60 and 96 years old, Shimonaka and Nakazato (1991) reported a progressive restriction of the Rorschach content range over a 10-year interval. This finding is in line with the fact that the age-related decline is more pronounced in fluid abilities (e.g., Dellenbach & Zimprich, 2008), which includes ideational flexibility.

As reported before, research shows that cognitive flexibility is influenced by an individual’s mood: a happy mood stimulates flexibility by facilitating a decontextualized
long-term memory search, whereas sad mood inhibits flexibility by narrowing the scope of conceptual attention and limiting the range of possible responses (Derryberry & Tucker, 1994; Hertel & Fiedler, 1994; Isen et al., 1985, 1987; Shaw et al., 1986). Thus, it can be expected that the range of contents on the Rorschach may be influenced by individual’s mood.

In an empirical study, Spielberger et al. (1966) reported a non-significant (although in the predicted direction) correlation ($r_s = .15$) between the number of Rorschach content categories and a self-reported measure of state positive/negative mood (e.g., “I’m full of enthusiasm”) on a mixed sample of 27 depressive and manic inpatients. However, the sample in their study was small, which decreased the power of the design and the reliability of the findings.

Two studies provided indirect support for an association between mood and the range of content categories on the Rorschach. Berger (1953) showed that the range of the Rorschach contents significantly increased in a sample of 40 tuberculosis patients who were tested at their first admission (presumably a stressful, threatening, or depressing experience) and retested over a 6-week interval (when presumably their distress diminished following their adjustment to the sanatorium). A problem with Berger’s study is that he did not use any direct measure of stress or depression. However, if Berger’s assumptions regarding the evolution of stress in his patients were correct, his finding may suggest that the increase in the Rorschach contents range was associated with a mood improvement, since stress and negative mood are correlated (e.g., Lethbridge & Allen, 2008).
The second study (Porcelli & Meyer, 2002) refers to a finding already cited: psychosomatic patients high on self-reported alexithymia \((N = 32)\) exhibited a more constricted range of Rorschach contents than non-alexithymic patients \((N = 45)\) \((r_{pb} = .39)\). Since there is a strong association between alexithymia and predisposition to depression (e.g., De Gennaro, Martina, Curcio, & Ferrara, 2004), this finding may suggest that a predisposition to sad mood is associated with a reduced Rorschach content range.

**Statement of the Problem**

In summary, an extensive line of research indicates that mood valence influences people’s perception, attention, thinking, judgment, memory, and problem solving. Specifically, a positive mood promotes a heuristic, global, synthetic, flexible, and creative, top-down approach, whereas a sad mood induces a local, analytical, systematic and stimulus-dependent, bottom-up approach of information (Andreasen & Powers, 1975; Basso et al., 1996; Bless, 2001; Bless & Fiedler, 2006; Bless & Schwarz, 1999; Clore & Storbeck, 2006; Derryberry & Tucker, 1994; Fiedler, 2001; Forgas, 2001; Gasper, 2004; Gasper & Clore, 2002; Isen & Daubman, 1984; Isen et al., 1985; Isen et al., 1987; Murray et al., 1990; Schwarz & Clore, 1996; Shaw et al., 1986). These processing differences as a function of mood can be explained by the different informational value of the two mood states, as suggested by the affect-as-information model (Schwarz & Clore, 1996).

The perceptually quasi-ambiguous nature of the Rorschach stimuli may be well-suited to reveal the mood effects, since these effects apparently tend to be more prominent when the task is ambiguous, rather than well-structured (Forgas, 1995). Thus,
the main goal of this study is to determine to what extent the Rorschach task can capture the mood effects documented in the literature on information processing. The clinical relevance of this study is that, if the Rorschach is sensitive to these effects, this can improve its diagnostic value for detecting individuals’ mood states, which can help clinicians in diagnosis or in evaluating the severity of the affective symptoms beyond patients’ self-reports.

As reported above, there are several aspects of the Rorschach task that may be able to capture these effects of mood on processing: (a) response location of the blot (global/local) (Beck, 1946; Kingery, 2004; Klopfer & Kelley, 1946; Levy & Beck, 1934; Rorschach, 1921/1942; Schmidt & Fonda, 1954; Spielberger et al., 1966; Varvel, 1941; Wagner & Heise, 1981); (b) perceptual organization of the response (i.e., synthetic/analytic) (Schmidt & Fonda, 1954; Singer & Brabender, 1993); (c) response unusualness; (d) perceptual accuracy of the response (Beck, 1946; Hartmann & Wang, 2003; Kumar, Kumar, & Kumar, 2004; Schmidt & Fonda, 1954); and (e) range of the semantic categories of the responses (Berger, 1953; Porcelli & Meyer, 2002).

A general problem with all studies cited above addressing the relationship between the Rorschach and mood is that all of them are clinical studies based on pre-existent depression or manic states. Thus, as with any design relying on subject variables, it may be difficult to draw firm conclusions about the causal link of a mood state and a particular Rorschach variable. An experimental approach using mood induction can help in determining more clearly the causal relationship between mood and Rorschach performance (see Borsboom, Mellenbergh, & van Heerden, 2004).
Based on the research findings regarding the effects of mood on processing, as well as on previous Rorschach studies on mood, it is suggested that a happy mood would lead to a global, heuristic, synthetic, flexible, and creative approach to the Rorschach stimuli, whereas a sad mood would promote a more analytic, objective, and rigid approach to the Rorschach.

A secondary goal of this study is to replicate the findings showing a global/local bias as a function of mood state on two perceptual task requiring hierarchical processing: one using processing of simple geometrical figures (i.e., a Kimchi task similar to that used by Gasper & Clore, 2002) and the other one involving processing of letters.

**Hypotheses**

Specifically, the hypotheses of this study are:

*Hypothesis 1.* On a task requiring hierarchical processing of geometrical patterns, the global approach will linearly increase across the three mood states (sad, neutral, and happy).

*Hypothesis 2.* On a task requiring hierarchical processing of letter patterns, the local approach will linearly increase across the three mood states (happy, neutral, and sad).

*Hypothesis 3.* On a perceptual-cognitive inkblot task (Rorschach):

*H3a)* the global approach (as measured by the frequency of *Whole* and *Vague Whole* responses) will linearly increase across the three mood states (sad, neutral, happy), whereas a local focus (as measured by the frequency of *Dd* responses) will linearly decrease across the three moods.
$H3b)$ perceptual organization (as measured by $DQ^+$ and $W^+$) will linearly increase across the three mood states (sad, neutral, happy).

$H3c)$ the rate of unusual percepts (as measured by $Xu\%$) will linearly increase across the three mood states (sad, neutral, and happy).

$H3d)$ the level of perceptual inaccuracy (as measured by $X^-%$) will increase in both sad and happy mood states, as compared to the neutral mood condition.

$H3e)$ cognitive flexibility (as measured by the response content range) will linearly increase across the three mood states (sad, neutral, and happy), with a happy mood showing the highest level of ideational flexibility.
Chapter Two

Method

Participants

A total of 124 college students (54% females) aged 18 years or older ($M = 19.51; SD = 2.02$) participated in this study. All of them were Introductory Psychology students. The distribution of the participants’ ethnic background is listed in Table 1 below. Most participants were European American (58.9%) and African American (20.2%). The remainder of 20.9% identified themselves as Asian, Hispanic, Middle Eastern, Multiracial or Other in terms of ethnic background.

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>African American</td>
<td>25</td>
<td>20.2</td>
</tr>
<tr>
<td>Asian</td>
<td>4</td>
<td>3.2</td>
</tr>
<tr>
<td>European American</td>
<td>73</td>
<td>58.9</td>
</tr>
<tr>
<td>Hispanic</td>
<td>4</td>
<td>3.2</td>
</tr>
<tr>
<td>Middle Eastern</td>
<td>6</td>
<td>4.8</td>
</tr>
<tr>
<td>Bi- or Multi-Racial</td>
<td>6</td>
<td>4.8</td>
</tr>
<tr>
<td>Other</td>
<td>6</td>
<td>4.8</td>
</tr>
</tbody>
</table>

Note: $N = 124$
Participants were recruited through the SONA system, the Psychology Department’s research sign-up system on the internet at University of Toledo. An ad was posted asking undergraduate students to participate in a study on the impact of media images on perception. The reward for participation was academic extra credits. IRB approval was obtained before starting the experiment.

Materials

**MediaLab.** All measures in this study used the MediaLab psychology research software (Jarvis, 2002) as an interface. This software was installed on 9 computers at the periphery of a large computer lab located in the University of Toledo main campus. MediaLab allowed for computerized administration and display of self-report items, movie clips, and perceptual tasks. Thus, it enhanced the standardization of the measure administration, self-pacing through the tasks, and also assisted in data collection.

**Mood induction.** Two movie clips were used to induce mood for each experimental condition (positive/negative/neutral). Each movie clip was watched by the participants at the same time (the password to access the video-clips was entered by the participants at the same time).

Following Rottenberg, Ray, and Gross’ recommendation (2007, p. 12), the participants were instructed to watch the films carefully, so that they could get involved as much as possible in the events and/or emotions displayed by the characters. Before the participants watched the films, brief notes about the content of the clips was displayed on the screen.

The first clip was used in the beginning of the experiment, just before the first task (either the perceptual tasks or Rorschach Response Phase). The second clip, of the
same emotional valence as the previous one, was intercalated between the perceptual
tasks and the Rorschach, with the intention to re-induce or enhance the mood effects for
the following task.

The two movie clips used for inducing a happy mood were: (1) a selection of
funny slips of tongue selected from various TV news programs and shows (3’ 49”)(for
an example, see http://www.youtube.com/watch?v=pcjuCotYGj8&feature=related) and
(2) a collage of real-life scenes depicting cats in amusing postures or situations (2’ 50”)(for
an example, see
http://www.youtube.com/watch?v=IytNBm8WA1c&feature=PlayList&p=AB3DB9B4F1
2AD662&index=8). Both clips had been initially pre-tested for their capacity to induce
positive emotions in the Psychological Assessment Lab of the Ph.D. Clinical Psychology
program of the University of Toledo on a sample of 15 people. Before watching both
clips, the participants were informed about the comic nature of the clip.

For inducing a sad mood, two clips were employed: (1) a 2’ 45” scene from the
commercial movie The Champ
(www.youtube.com/watch?v=FAhrqKqK_cA&feature=PlayList&p=08EA6A27BFC1F4
BF) including a moribund boxer who is lying on a table in a locker room, surrounded by
several people and his young son. The boxer is dying in front of his son after a short
goodbye dialogue. His son is crying and implores the other people around to bring his
father back to life. This clip was selected from the list of clips pretested by Rottenberg et
al. (2007) for their effectiveness in inducing a temporary sad mood; and (2) a 2’ 05”
fragment from the movie Armageddon
(http://www.youtube.com/watch?v=qXj4Edr0ig0&feature=PlayList&p=D69A35111E95)
depicting a goodbye scene between a girl and her father before the latter is going to sacrifice himself to save our planet from the catastrophic collision with a meteorite. This clip had been pretested for its capacity to induce a sad mood in the Psychological Assessment Lab of the Ph.D. Clinical Psychology program of the University of Toledo on a sample of 15 people.

For the neutral mood condition, two movie clips (of 2’ 56” and 1’ 53”, respectively) describing natural parks of Europe were used. (www.youtube.com/watch?v=80kzNUkox5U&feature=PlayList&p=E52DBF9A414AD9AC). These clips included landscapes and wildlife forms. A narrator’s neutral voice traced the natural history of those places and species. The choice of these clips followed Rottenberg et al.’s (2007) suggestion to include as a neutral condition clips depicting wildlife scenes that are emotionally neutral without inducing boredom or frustration.

Mood manipulation check. The participants were asked to indicate how they felt (“How are you feeling right now?”) on a 9-point scale with the endpoints negative and positive after both mood inductions. For the last 45 participants, this scale was also used as a baseline measure in the beginning of the experiment, before mood induction. This type of one-item scale was previously used in studies where mood was induced in the lab (e.g., Avramova & Stapel, 2008; Bless & al., 1990). Higher ratings on this scale indicate a positive mood.

Global/local perceptual measures. Global and local perception was assessed using two perceptual tasks that were completed on the computer using the MediaLab: a Navon-type task and a Kimchi-type task.
**Navon-type task (Navon, 1977).** This perceptual task consists of a series of three-level figures, where the large letters are made up of medium-size letters, which in turn are made up of small letters (see Appendix A). Thus, these stimuli allow both a global focus (i.e., on the largest letters) and a local focus (i.e., on the smallest letters) (Navon, 1977).

The task contains 12 stimuli and lasts about 5-6 minutes. The participants were presented 4 stimuli at a time on the computer screen and were asked to record all letters they saw in the order they saw them. The responses to each series of 4 stimuli were later rated on a 9-point scale. A score of 1 indicates that the person only recorded global letters. A score of 2 was assigned if the participant strictly followed the order global-medium-small letters. A score of 3 showed that the response was mostly global and 4 showed that the global focus predominated over the local focus. A score of 5 indicated that there was a mixed order of all levels of letters. The scores from 6 to 9 were given for a local focus, using the same format as the global focus. Thus, higher scores on this task indicate a preference for a local focus.

Crawford, Horn, and Meyer (2009) reported a very high interrater reliability for this task ($r = .97$). A search in the literature did not reveal any studies addressing the temporal stability of the Navon-type task. Support for the validity of the Navon task was provided by a study showing that self-reported obsessive-compulsive cognitive style (i.e., characterized by an intense focus on details) was correlated ($r = .33; N = 79$) with excessive visual attention to the small aspects of the Navon task stimuli (Yovel, Revelle, & Mineka, 2005).

All the Navon-type data in this study were scored by the author. As an interrater reliability check, the author independently scored the Navon-type data in Crawford et
al.’s study (2009) of 128 participants and then interrater reliability was computed between his and authors’ scoring. The coefficient was excellent (absolute ICC, Single Measures = .99).

**Kimchi-type task (Gasper, 2004; Kimchi & Palmer, 1982).** This is a global/local focus task consisting of a series of overall shapes (e.g., a triangle) made up of smaller geometric figures (e.g., squares). There were 24 trials consisting of a target figure and two figures symmetrically displayed under the target figure (to the right and left) (see Appendix B). For each trial, the participants indicated whether the target figure (e.g., a square of triangles) looked more like a sample figure that shared local, but not global features with the target (e.g., a triangle of triangles); or one that shared global, but not local features with the target (e.g., a square of squares). They were instructed to do the task as quickly as possible.

There were three sets of trials of 8 stimuli each, for a total of 24 stimuli. In all of them, the global form was either a square or a triangle that measured 55 mm x 55 mm. The local elements were also squares or triangles, but their size and number varied. One set contained local elements that were 20 mm x 20 mm. Three elements were arranged to form a triangle and 4 to form a square. The second set contained local elements that were 13 mm x 13 mm, with 3 elements forming triangles and 4 elements forming squares. The third set also contained local elements that were 13 mm x 13 mm, but 6 of them were used to form a triangle and 9 to form a square. Within each set, four possible targets exist (square of squares, square of triangles, triangle of squares, and triangle of triangles). Like in Gaspar’s study (2004), each of these targets was presented twice, so that whether the
local or global match was on the left or right could be counterbalanced, resulting in 24 trials.

This task was previously used in other studies as a measure of perceptual focus (local/global) as a function of mood valence (Basso, Schefft, Ris, & Dember, 1996; Gasper, 2004; Gasper & Clore, 2002). There are no data available on its test-retest reliability. In the current study, its internal reliability was very good (Cronbach alpha = .96).

**Rorschach Inkblot Test measures.** In this study, the Rorschach test was administered in a group format using a computer-based interface. It also followed the group administration procedures described in Horn, Meyer, and Mihura (2009). The administration procedures also followed as closely as possible Exner’s (2003) Comprehensive System guidelines, revised by Meyer, Viglione, and Mihura (2009). They were adapted to allow for written responses. Each participant had his/her own set of Rorschach stimuli (cards) and the instructions were given in a group by the experimenter. Only five out of the ten original cards were used in this experiment, as administering the whole set of cards would have taken too long and the induced mood effects might have dissipated. The five cards that were selected for this study were II, III, VIII, IX, and X and they all have both chromatic and achromatic colors, which was considered to be more cognitively stimulating than the black-and-white cards.

The Rorschach testing consisted of the two phases of the standard administration (Exner, 2003): response phase and clarification. The response phase consisted of instructing the participants to look at each blot and type their responses on the computer screen, following the instructions written on the screen and orally given by experimenter
“What might this be?” The instructions also required the participant to “Try to give two or maybe three responses to each card. That is, on each card try to see 2 or 3 different things.” (Meyer et al., 2009, p. 1). The participants were informed that they had 1 ½ minutes for delivering their responses to each card. All in all, the Rorschach response phase took maximum 9-10 minutes and all participants went at the same pace through each card.

The Rorschach clarification phase was always conducted at the end of the experiment and consisted of asking the participants to read and clarify each of their previous responses: “describe in more detail what there is in the inkblot that makes it look like that to you.” (Crawford et al., 2009). The participants could read each of their previous responses on the screen and typed in the clarification for each previous response, below their original response.

The experimenter demonstrated in group how a response should be clarified. This demonstration used two hypothetical responses (a fire engine and pig-shaped clouds) and included Exner’s recommendations (2003, p. 60) pertaining to how clarification phase can be explained and practiced with children. When the participants clarified their Rorschach responses, they also indicated the location of each response on a sheet depicting miniature versions of the actual inkblots. Three minutes were devoted for each of the 5 cards. All in all, the clarification phase took 18-20 minutes, including the demonstration.

The Rorschach variables in this study were scored following the Comprehensive System (CS; Exner, 2003) and revised according to the Rorschach-Performance Assessment System (R-PAS) coding guidelines (Meyer, Viglione, Mihura, Erard, et al., 2011). When this study started, the R-PAS was not developed yet. Since then, R-PAS has been emerging as a popular approach and the author’s advisor (Joni L. Mihura, Ph.D.)
and a member in his dissertation committee (Gregory J. Meyer, Ph.D.) are two of its developers. In order to make this study more relevant for future use, the coding guidelines of the Rorschach variables used in this study were adjusted to fit the R-PAS coding criteria. The exception were the variables pertaining to perceptual unusualness (Xu%) and perceptual inaccuracy (X-%), as at the time of the data analysis, R-PAS was still finalizing the coding for these variables. Thus, perceptual unusualness and perceptual inaccuracy were coded using the CS guidelines (Exner, 2003). The three variables pertaining to perceptual focus (i.e., Global Focus-W, Vague Global Focus-Wv, and Local Focus-Dd) have identical scoring criteria in both Rorschach systems, so no adjustment was made in their scoring. The two CS variables reflecting perceptual organization (W+ and DQ+) were slightly adjusted to fit the coding criteria of R-PAS (see the Perceptual Organization subheading below). The corresponding R-PAS variables used in this study were WSy and Sy, respectively. Finally, the variable pertaining to cognitive flexibility (Content Range) was also adjusted to the R-PAS content range (see the Ideational Flexibility subheading below). Except the variable Content Range, all the Rorschach variables in this study were divided by the number of responses per protocol (see details in the Results section), so they will be presented as relative values (%), including in the reliability table below.

A random sample of 20 Rorschach protocols was independently coded by two coders (the author of this study and an advanced Clinical Psychology graduate student) for the variables selected in this study and interrater reliability was computed. For 4 out of the 8 Rorschach variables (i.e., Global Focus-W%, Whole Synthesis-WSy%, Synthesis-Sy%, and Content Range) the reliability coefficients ranged from good to excellent (see
Table 2 below. For the other 4 variables—Vague Global Focus-$W_v\%$, Local Focus-$D_d\%$, Perceptual Unusualness-$X_u\%$, and Perceptual Inaccuracy-$X\%$—the coefficients were unsatisfactory ($<.66$). The Rorschach variable $W_v\%$ had a very low base rate (the means were .02 in the sad and neutral conditions and .03 in the happy condition) and a very low interrater reliability ($ICC$, single measures = .36). Most importantly, it is not clear if this variable is a valid measure of the construct “vague global focus” since it is not interpreted in the CS or R-PAS and there is no research on it. $W_v\%$ was just created conceptually for this study. Considering all these, the decision was to drop it from further analyses. For the remainder of the 3 variables (i.e., Local Focus-$D_d\%$, Perceptual Unusualness-$X_u\%$, and Perceptual Inaccuracy-$X\%$), a new reliability check was computed on a different set of 20 protocols between the first author and his advisor, who is a very experienced Rorschach researcher and practitioner. The reliability check was conducted after the coding guidelines of the author were discussed. The reliability coefficients were very good (see Table 2 below).
Table 2

*Interrater Reliability Results (ICC, Single Measures) for the Rorschach Variables*

<table>
<thead>
<tr>
<th>Variable</th>
<th>ICC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global Focus (W%)</td>
<td>.94</td>
</tr>
<tr>
<td>Synthesis Global Focus (WSy%)</td>
<td>.91</td>
</tr>
<tr>
<td>Synthesis (Sy%)</td>
<td>.93</td>
</tr>
<tr>
<td>Perceptual Inaccuracy (X-%)</td>
<td>.84</td>
</tr>
<tr>
<td>Ideational Flexibility (Content Range)</td>
<td>.83</td>
</tr>
<tr>
<td>Local Focus (Dd%)</td>
<td>.75</td>
</tr>
<tr>
<td>Perceptual Originality (Xu%)</td>
<td>.75</td>
</tr>
</tbody>
</table>

*Note: N = 20.*

The following sections describe the Rorschach variables used in this study and their reliability. The relevant validity studies can be found in the *Introduction.*

**Global/Local focus.** The preference for a global or an analytical focus on the Rorschach stimuli was measured by the frequency of the *Whole (W)* and *Unusual Detail (Dd)* responses (Exner, 2003; Meyer et al., 2011). Both variables have the same scoring criteria in both CS (Exner, 2003) and R-PAS (Meyer et al., 2011). The *Whole (W)* response includes the entire area of the inkblot. The *Dd* response includes an uncommon and usually small area of the stimulus (Exner, 2003). Meyer, Hilsenroth, Baxter, Exner, et al. (2002) found excellent interrater reliability coefficients for both *W* (absolute

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3 Those *Whole* responses consisting of an integration of *Dd* areas may be more difficult to study in a group Rorschach format. A group format may limit too much the number of reported components of the responses, as compared to the standard individual administration.
agreement $ICC = .99$) and $Dd$ (absolute $ICC = .98$) on a composite clinical sample of protocols scored by students, researchers, and clinicians. In terms of test-retest reliability, Sultan, Andronikof, Réveillère, and Lemmel (2006) reported a good temporal stability coefficient for $W (r = .82)$ and a satisfactory coefficient for $Dd (r = .61)$ after a 3-month interval on a sample of 75 adult non-patients.

**Perceptual organization.** To measure the perceptual organization of the Rorschach stimuli, two variables were used: Synthesis response ($S_y$), and Whole Synthesis ($W_Sy$) (Meyer et al., 2011). The $S_y$ response is the code ascribed to any response when two or more objects are perceived in a meaningful relationship (e.g., “Two people dancing together”). This is an R-PAS variable that slightly adjusts the CS (Exner, 2000, 2003) $DQ^+$ variable by including those infrequent responses that are scored $DQy/+$(i.e., objects that have a vague form demand and are in a meaningful relationship). According to Exner (2000, 2003), a high number of synthesis responses in a Rorschach protocol indicates a superior ability to organize perceptual information.

Meyer et al. (2002) found an excellent interrater reliability for $DQ^+$ on a composite clinical sample of protocols scored by students, researchers, and clinicians (absolute $ICC = .98$). Sultan et al. (2006) reported a good temporal stability coefficient for $DQ^+ (r = .71)$, on a sample of 75 adult non-patients retested after a 3-month interval.

The *Whole Synthesis* response ($WSy$) only includes the *Synthesis* responses that are given to the entire inkblot area. This score category is not a standard variable in either the CS (Exner, 2003) or R-PAS (Meyer et al., 2011), but was selected for this study as it combines the holistic dimension of the perception with its integrative quality, which is directly relevant for assessing the assumed mood effects on perceptual processing.
**Perceptual distortions (inaccuracy).** The Rorschach variable that captures perceptual distortions is $X\%-\%$ (Exner, 2003). $X\%-\%$ is the percentage of the responses that violate the contour of the inkblot area. Meyer et al. (2002) reported an excellent interrater reliability for $X\%-\%$ on a composite clinical sample of protocols scored by students, researchers, and clinicians (absolute $ICC = .93$). Sultan et al. (2006) found a lower, but still acceptable level of interrater reliability for $X\%-\%$ (protocol level $ICC = .69$). Exner (2003) reported a very good temporal stability of this variable ($r = .92$) after a one-year interval. However, Sultan et al. (2006) found a lower test-retest coefficient of $X\%-\%$ after a three-month interval ($r = .51$).

**Perceptual unusualness (originality).** The Rorschach variable capturing the originality of a response for an inkblot area is $Xu\%$ (Exner, 2003). This variable is the percentage of the responses that fit the contour of the inkblot, but are rarely given to a particular blot location. Exner (2000, 2003) interpreted $Xu\%$ as a measure of unconventionality in thinking.

The interrater reliability as reported by Sultan et al. (2006) was good (protocol level $ICC = .78$). Similarly, Meyer et al. (2002) found a good interrater reliability for $Xu\%$ on a composite clinical sample of protocols scored by students, researchers, and clinicians (absolute $ICC = .83$). Exner (1999) reported a high test-retest coefficient for $Xu\%$ over a one-year interval ($r = .85$). However, Sultan et al. (2006) found a much lower test-retest coefficient for $Xu\%$ ($r = .32$) after a three-month interval.

**Ideational flexibility.** The Rorschach measure of ideational flexibility used in this study was the number of content categories ($Content\ Range$). R-PAS response contents were easily derived from the CS ones since basically some CS contents are collapsed into
an "NC" coding category. Thus, the R-PAS content range is more restricted than in the CS (18 vs. 27 contents). Given that certain categories of contents are overlapping (e.g., Animal with Animal detail, or Human with Human detail), it was decided to collapse these categories, which resulted in a final list of 14 contents that were used in this study.

No study was identified reporting the temporal stability or interrater reliability for the content range, as this variable is not an index incorporated in the CS (Exner, 2003) or R-PAS (Meyer et al., 2011). Porcelli and Meyer (2002) used content range as a variable in their study. Although they did not report specific interrater reliabilities per study variable, they reported that their interrater reliability coefficients (ICC) ranged from .72 to 1.00.

**Procedures**

The experiment took place in a large computer lab at the University of Toledo. The experimental sessions were held with groups varying between 3 and 9 participants. Each session included participants who were exposed to the same mood induction procedure (sad/neutral/happy). This procedure was used so that participants’ potential emotional reactions (e.g., laughing in the happy condition) would not be visibly incongruent with the reactions of the participants exposed to a different mood induction (e.g., crying in the sad condition), which might create a dissonance effect with potential implications on people’s mood states. The experimental design was between-subjects and the participants’ selection for each mood condition was made on a rotation basis (i.e., following the order happy-sad-neutral), until the desired number of participants for each condition was attained (roughly an equal number of participants for each condition). Within each mood condition, the administration order of the Rorschach task and of the
two global/local perceptual tasks was counterbalanced (i.e., roughly half of participants completed first the Rorschach task and then the two global/local measures, whereas the other half completed first the two global/local measures and then the Rorschach task). The administration order of the two global/local measures was counterbalanced too, resulting in half of the people completing first the Kimchi task followed by the Navon-type task, whereas half of them completed these tasks in the reverse order.

As the participants entered the experimental room, the experimenter asked them to sit down at a desk provided with a MediaLab computer. The experimenter made sure that there was enough space among participants to provide some sense of privacy.

After the session slots were occupied, the experimenter greeted the participants as a group, introduced himself, and told them that they were invited to participate in an experiment on the impact of media images on perception and that the experiment consists of tasks such as watching movie clips and completing perceptual tasks on the computer. Then, the participants were invited to read the consent forms on their desks and sign them if they had no further questions about their participation. None of them asked any questions.

Next, all the participants completed a demographics section on the computer and some of them completed a baseline measure of their mood by answering a question on the computer screen (“How are you feeling now?”) on a 9-point scale, with the endpoints negative and positive. This measure was a late addition in the experiment and was introduced as a control measure to better estimate the effects of the mood induction procedures, as it was noticed that the participants in the neutral condition appeared to have high self-reported mood ratings. Only the last 45 participants (10 in the sad
condition, 15 in the happy condition and 20 in the neutral condition) answered the baseline question.

Next, all participants watched a happy/sad/neutral movie clip on their computer screens, followed by the same one-item mood measure mentioned above. All people watched the movie clips at the same time. Then either the two global/local tasks (Navontype and Kimchi) or Rorschach Response Phase was administered on the computer to all participants. Next, they watched another short movie clip of the same valence as the previous one (mood re-induction) and their mood was checked again using the same brief self-report measure. Afterwards, the participants completed the remaining tasks (either the global/local measures or Rorschach Response Phase). Finally, the participants completed the Clarification Phase of the Rorschach test, consisting of clarifying their previous Rorschach responses.

As seen, the Rorschach Clarification Phase was always conducted after both the perceptual tasks and Rorschach Response Phase were completed. The reason for situating the Rorschach Clarification Phase in the terminal stage of the experiment was that the induced mood states were not anticipated to last more than 10-15 minutes. Thus, it was important that the crucial tasks (i.e., the perceptual tasks and Rorschach Response Phase) were administered first to make sure that the participants were in their desired mood states. The Rorschach Clarification Phase only consisted of clarifying the original Rorschach responses. Thus, it did not influence the original participants’ responses given under the influence of their mood. Previous research (Ritzler & Nalesnik, 1990) showed that the Clarification Phase does not change the values of the 6 out of 7 Rorschach variables that are used in the current study ($W$, $Dd$, $DQ^+$, $Xu\%$, $X^-\%$, and Contents). As
for the $W_Sy$ variable, since it is not a standard Rorschach variable, there are no data available concerning the effect of the Clarification Phase on this variable.

After the Rorschach Clarification Phase was completed, the experimenter let the participants know that the session was over and offered to answer any questions they had about the experiment. Finally, the participants were thanked for their participation and dismissed.
Chapter Three

Results

Preliminary Analyses

Random assignment. A One-Way Analysis of Variance (ANOVA) that was conducted to determine if there were significant age differences among the 3 groups (happy/sad/neutral) resulted in a non-significant finding, $F(2, 121) = .50, p = .61$. Similarly, a One-Way ANOVA was conducted to determine if there were significant gender (with male participants coded as 1 and female participants coded as 2) differences among the 3 conditions. The result was not significant, $F(2, 121) = .38, p = .69$. Thus, it was concluded that there were no significant age or gender differences among the 3 experimental conditions.

To estimate if there were baseline differences in participants’ mood states, three independent $t$-tests were conducted on a subsample of 45 participants (10 in the sad condition, 15 in the happy condition and 20 in the neutral condition)\(^4\), with the three mood conditions as the independent variables and mood ratings (on a 1 to 9 scale) as the dependent variable. Because this analysis was underpowered, both the significance level and the magnitude of the effect size were evaluated. The analysis resulted in a non-significant difference between the baseline mood of the sad and neutral conditions, $t(28) = -.76, p = .45, d = -.30$. There was also a non-significant difference between the happy and neutral mood ratings at baseline, $t(33) = 1.28, p = .21$, although the effect size was $d = .46$, suggesting a slightly more positive mood in the neutral condition than the happy condition at baseline. That is, the participants in the neutral condition may have started

\(^4\) As mentioned in the Method section, the baseline measure of the participants’ mood states was a late addition in the experiment.
off in a slightly better mood than the participants in the happy condition, suggesting that analyses comparing study variables between the happy and neutral experimental conditions might underestimate the magnitude of the effect size. Finally, the difference between the sad and happy condition at baseline was not significant, \(t(23) = .24, p = .81, d = .10\).

**Experimental manipulation.** Next, the successfulness of the experimental manipulations was checked. To determine if the mood induction procedures had an effect on the participants’ mood states, three independent \(t\)-tests were conducted using condition (happy, sad, neutral) as the independent variable and the average of the two participants’ mood manipulation check ratings as the dependent variable. Based on a meta-analysis by Lench, Flores, and Bench (2011), the mood inductions were anticipated to result in large effect size differences between the sad and happy compared to the neutral conditions. These researchers found an effect size of \(g = .70\) for happy versus neutral mood conditions and \(g = .73\) for sad versus neutral mood conditions.

Figure 1 shows the mean level mood ratings for each of the mood induction conditions. Independent \(t\)-tests revealed that, as expected, people in the sad condition reported feeling more negatively \((M = 3.48, SD = 1.55)\) than people in the neutral condition \((M = 6.99, SD = 1.60, t(80) = -10.09, p < .01)\) with a large effect size difference \((d = -2.26)\). The participants in the happy condition also reported feeling better \((M = 7.78, SD = 1.05)\) than people in the neutral condition, \(t(81) = 2.65, p = .01\). However, the effect size difference was smaller than expected \((d = .59)\), which may in part have been due to the participants in the neutral condition starting off in a slightly more positive mood than those in the happy condition.
Therefore, it was decided to examine more closely the impact of the mood induction procedures on people’s mood ratings. As another way to check the success of the experimental manipulations, the available baseline mood ratings were compared with the average of the post-induction mood ratings for each mood condition using repeated measures t-tests. Specifically, we were concerned that the neutral movie clip may have inadvertently induced a more positive mood. The results are presented in Table 3 below.

*Figure 3. Average mood ratings across the 3 conditions (sad/neutral/happy) after mood induction*
Table 3

Baseline and Post-Induction Composite Mood Ratings for the 3 Mood Conditions (Sad, Neutral, Happy) in a Subsample of 45 Participants

<table>
<thead>
<tr>
<th>Mood condition</th>
<th>Mean (SD)</th>
<th>t value</th>
<th>df</th>
<th>p</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline</td>
<td>Post-induction</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sad (N = 10)</td>
<td>6.80 (1.69)</td>
<td>3.20 (2.00)</td>
<td>-5.21</td>
<td>9</td>
<td>&lt; .01</td>
</tr>
<tr>
<td>Neutral (N = 20)</td>
<td>7.30 (1.69)</td>
<td>7.15 (1.65)</td>
<td>1.06</td>
<td>19</td>
<td>.30</td>
</tr>
<tr>
<td>Happy (N = 15)</td>
<td>6.67 (1.05)</td>
<td>7.90 (.85)</td>
<td>5.29</td>
<td>14</td>
<td>&lt; .01</td>
</tr>
</tbody>
</table>

As seen in the table, the emotionally neutral movie clip did not change the participants’ mood ratings, which suggests that the smaller than expected difference between the happy and neutral mood conditions was not due to the neutral movie clips inadvertently improving participants’ mood. In both Sad and Happy mood conditions, the mood manipulation significantly decreased and significantly increased, respectively, the self-reported mood ratings as compared to baseline. Therefore, even though these analyses only included the one third of the participants who had their baseline mood measured, the results suggest that the mood induction procedures generally had their intended results. It appears that the participants’ baseline mood may have been a moderately positive mood, which may account for the relative difficulty to induce a major mood increment in people in the happy condition.

Therefore, for the major study analyses only those that target hypotheses for the sad versus happy condition will be conducted. We were not able to test hypothesis 3d, which predicted an increase in perceptual inaccuracy (X%) for both the happy and sad
conditions compared to the neutral condition. Otherwise, although we lost the midpoint of our comparisons, we were still able to test our major hypotheses in manner consistent with the affect-as- information model. For the analyses, since there were only two groups, instead of performing ANOVAs using linear contrasts, we used independent t-tests to compare the happy and sad conditions.

**Rorschach response productivity.** In order to control for the variable “number of Rorschach responses” - which would be a confounding factor as research shows that many Rorschach variables are correlated with the number of responses per protocol - all the Rorschach variables in this study except one were divided by the number of responses (R). These modified Rorschach variables were used in all subsequent statistical analyses, including the computation of interrater reliability. The only exception was the variable Cognitive Flexibility (Content Range), which was viewed as conceptually related with R in that both are tapping ideational flexibility. Thus, it was considered that removing the variance associated with R from this variable can decrease its validity as a measure of cognitive flexibility, so it was decided to conduct the analyses with the original Content Range variable\(^5\). However, to make sure that response productivity was not a confounding variable when testing the hypothesis pertaining to the variable Content Range, an independent samples t-test was conducted to determine if there was a significant difference in the number of Rorschach responses (R) between the sad (M = 11.85, SD = 2.10) and happy (M = 12.19, SD = 1.70) mood conditions. This resulted in a non-significant finding, t(81) = -.80, p = .42, indicating that the number of Rorschach responses did not significantly differ between the two mood conditions.

\(^5\) The variables R and Content Range were positively correlated in this study (r = .36, p < .01, if considering the whole sample; and r = .28, p < .05, if considering the happy and sad conditions only). This supports the idea that the two variables are conceptually related (i.e., both are facets of cognitive flexibility).
Statistical assumptions and descriptives. Before proceeding with the data analysis, all variables were screened for possible statistical assumption violations, as well as for missing values and outliers. One participant’s Rorschach data (from the Neutral condition) were excluded from further analyses, as she gave unscorable responses. This did not affect the hypothesis testing analyses, as the entire neutral condition was removed from these analyses. The Rorschach $Dd\%$ variable exhibited one extreme outlier ($> 3\ SD$) in the happy condition. However, since that participant was not an outlier across the other study variables, and since the variable $Dd\%$ did not show a major departure from a normal distribution, it was decided to keep that extreme value in the pool of data.

The descriptive statistics for all the variables in this study are presented in the Table 4 below. Table 4 also contains the inferential statistics that address the study hypotheses. This data is reported in one table in order to allow the reader to more easily review the main study data.
Table 4

Means and SD for the Study Variables as a Function of Mood (Sad, Happy)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mood Condition</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sad</td>
<td>Happy</td>
</tr>
<tr>
<td></td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
</tr>
<tr>
<td><strong>Global Focus</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kimchi Task</td>
<td>13.29 (8.45)</td>
<td>14.69 (8.40)</td>
</tr>
<tr>
<td>Whole Responses (W%)(^1)</td>
<td>.40 (.22)</td>
<td>.40 (.19)</td>
</tr>
<tr>
<td><strong>Local Focus</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Navon Task</td>
<td>14.71 (6.85)</td>
<td>16.07 (6.25)</td>
</tr>
<tr>
<td>Unusual Detail (Dd%)(^1)</td>
<td>.16 (.13)</td>
<td>.11 (.09)</td>
</tr>
<tr>
<td><strong>Perceptual Organization</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Synthesis (Sy%)(^1)</td>
<td>.45 (.22)</td>
<td>.44 (.18)</td>
</tr>
<tr>
<td>Synthesis Global Focus (WSy%)(^1)</td>
<td>.20 (.16)</td>
<td>.21 (.15)</td>
</tr>
<tr>
<td>Originality (Xu%)(^1)</td>
<td>.22 (.12)</td>
<td>.25 (.14)</td>
</tr>
<tr>
<td>Cognitive Flexibility (Content Range)(^1)</td>
<td>5.10 (1.61)</td>
<td>5.76 (1.49)</td>
</tr>
</tbody>
</table>

Notes: \(N_{\text{Sad}} = 41; N_{\text{Happy}} = 42.\) \(^1\) Rorschach variable

Hypothesis Testing

**Hypothesis 1.** On a task requiring hierarchical processing of geometrical patterns (i.e., Kimchi task), the global approach will be used more often in the happy condition than the sad condition.

An independent samples t-test was conducted, with the mood condition (sad vs. happy) as the independent variable and variable “Kimchi Global” as the dependent variable. This analysis revealed no increase in the global approach of geometrical figures.
on the Kimchi task in the happy condition compared to the sad condition, $t(81) = .77, p = .45, d = .17$. Thus, Hypothesis 1 was not supported by the data.

**Hypothesis 2.** *On a task requiring hierarchical processing of letter patterns (i.e., Navon-type task), the local approach will be used more often in the sad condition than the happy condition.*

An independent samples $t$-test was conducted, with the mood condition (sad vs. happy) as the independent variable and variable “Navon Local” as the dependent variable. This analysis resulted in a non-significant finding, $t(81) = -.95, p = .35, d = -.21$. Thus, Hypothesis 2 was not supported by the data. There was no evidence of more local approach in the sad condition as compared to the happy condition. On the contrary, there was a slight tendency to a global approach in the sad condition.

**Hypothesis 3a.** *On a perceptual-cognitive inkblot task (Rorschach), the global approach (as measured by the frequency of Whole responses) will be used more in the happy condition than in the sad condition, whereas a local approach will be used more in the sad as compared to the happy condition.*

An independent samples $t$-test was conducted, with the mood condition (sad vs. happy) as the independent variable and variable “Global Focus” ($W\%$) as the dependent variable. This analysis resulted in a non-significant finding, $t(81) = -.01, p = .99, d = .00$, indicating no difference in the global approach on the inkblot task as a function of mood valence.

Similarly, an independent samples $t$-test was conducted, with the mood condition (sad vs. happy) as the independent variable and variable “Local Focus” ($Dd\%$) as the
dependent variable. This analysis resulted in a significant finding, $t(81) = 2.09, p = .04, d = .45$.

In summary, Hypothesis 3a received partial support from the data. There was no evidence of more global focus on the inkblot task in the happy condition as compared to the sad condition. However, there was more local focus in the sad condition as compared to the happy mood condition.

**Hypothesis 3b.** *On a perceptual-cognitive inkblot task (Rorschach), more perceptual organization (as measured by Sy% and WSy%) will be visible in the happy mood condition as compared to the sad mood condition.*

An independent samples $t$-test was conducted, with the mood condition (sad vs. happy) as the independent variable and variable “Synthesis” (Sy%) as the dependent variable. This analysis was not significant, $t(81) = -20, p = .84, d = -.04$.

Similarly, an independent samples $t$-test was conducted, with the mood condition (sad vs. happy) as the independent variable and variable “Synthesis Global Focus” (WSy%) as the dependent variable. This analysis resulted in a non-significant finding, $t(81) = .17, p = .87, d = -.04$.

In summary, Hypothesis 3b was not supported by the data. There was no evidence that the happy mood condition resulted in more perceptual organization than the sad mood condition.

**Hypothesis 3c.** *On a perceptual-cognitive inkblot task (Rorschach), the rate of unusual percepts (as measured by Xu%) will be higher in the happy condition than in the sad condition.*
An independent samples $t$-test was conducted, with the mood condition (sad vs. happy) as the independent variable and variable “Perceptual Originality” ($Xu\%$) as the dependent variable. This analysis was not-significant, $t(81) = 1.10$, $p = .27$, $d = .24$, indicating no significant differences in perceptual unusualness between the happy and sad condition. Thus, Hypothesis 3c was not supported by the data.

**Hypothesis 3d.** *On a perceptual-cognitive inkblot task (Rorschach), the level of perceptual inaccuracy (as measured by $X\%-\%$) will increase in both sad and happy mood states, as compared to the neutral mood condition.*

As previously noted, due to more positive mood in the neutral group than expected, this hypothesis was not tested.

**Hypothesis 3e.** *On a perceptual-cognitive inkblot task (Rorschach), cognitive flexibility (as measured by the response content range) will be higher in the happy condition than in the sad condition.*

An independent samples $t$-test was conducted, with the mood condition (sad vs. happy) as the independent variable and variable “Content Range” (i.e., the diversity of Rorschach contents) as the dependent variable. The result was marginally significant, $t(81) = 1.95$, $p = .05$, $d = .43$, suggesting that people in a happy mood tended to exhibit more ideational flexibility than people in the sad condition.

**Post-Hoc Analyses**

**Measure intercorrelations.** Due to the failure to replicate previous findings with the Kimchi task (Gasper, 2004; Gasper & Clore, 2002) and the fact that the direction of the finding for the Navon task was in the opposite of the expected condition, we decided
to further examine the associations between study variables irrespective of the experimental condition (happy/neutral/sad).

Table 5

The Intercorrelation Matrix for the Study Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Kimchi Global</td>
<td></td>
<td>-.08</td>
<td></td>
<td></td>
<td>-.11</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Navon Local</td>
<td>.03</td>
<td>.03</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Global Focus-(W%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.66</td>
<td>-.36</td>
<td>.32</td>
<td>.00</td>
</tr>
<tr>
<td>5. Synthesis Global Focus-(W_{Sy}%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.30</td>
<td></td>
<td>.74</td>
<td>-.01</td>
</tr>
<tr>
<td>6. Local Focus-(Dd%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.21</td>
<td>-.07</td>
<td>-.07</td>
</tr>
<tr>
<td>7. Synthesis-(Sy%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Originality-(Xu%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: \(N = 124; \; ^2N = 123\); *Italicized* variables are Rorschach inkblot variables; *Underlined* values are significant at \(p < .05\); Mood Ratings = Sum of the standard \(z\) scores of the “Mood Check 1” and “Mood Check 2 variables”

As seen in the Table 5 above, there was low heteromethod correspondence across measures. Surprisingly, the two hierarchical perceptual measures were not significantly correlated with each other \((r = -.08)\), even though they conceptually are tapping the same construct. Also in the opposite of the expected direction was the significant negative correlation between “Navon Local” and Rorschach “Local Focus” variables. As
previously noted, the Navon task also performed in the opposite of the expected direction when comparing the sad and happy mood conditions. The inkblot variables correlated more with each other than with any other variable. Overall, this pattern of data indicates a low heteromethod correspondence across measures and a potential problem with the Navon task as a measure of local perceptual focus.

Effects of the administration order on the two hierarchical perception measures. In order to check if the results on the Kimchi and Navon-type tasks were affected by their position relative to mood induction (first vs. second), independent $t$-tests were conducted considering people who took the measures first and second, respectively, after mood induction. Again, these analyses included the sad and happy conditions only. The independent variable was mood condition (sad vs. happy) and the dependent variables were the Kimchi and Navon-type data, respectively. When the Kimchi task was administered immediately after the mood induction, the $t$-test was significant in the predicted direction, $t(40) = 2.31, p = .03, d = .71$, suggesting that the participants in the happy condition ($M = 16.95, SD = 7.02$) had a more global approach than people in the sad condition ($M = 11.29, SD = 8.79$). However, when the Kimchi task was administered second relative to mood induction (i.e., after the Navon-type task), the finding was not significant, $t(39) = -1.12, p = .27, d = -.35$, indicating no difference in global approach between people in the happy ($M = 12.43, SD = 9.21$) vs. sad ($M = 15.40, SD = 7.74$) conditions. These findings may suggest a potential issue with the duration of the mood induction (i.e., the mood effects may have dissipated quickly, so people who were administered the Kimchi task after a delay may have not been in their desired mood states anymore).
Concerning the Navon-type task, when it was administered immediately after the mood induction, the \( t \)-test was not significant, \( t(39) = .36, p = .72, d = .11 \), indicating no difference in local approach between people in the sad condition (\( M = 18.10, SD = 5.13 \)) as compared to those in the happy condition (\( M = 17.48, SD = 5.95 \)). A non significant result was also obtained when this measure was administered second relative to mood induction (i.e., after the Kimchi task), \( t(40) = -1.57, p = .12, d = -.48 \), indicating no difference in local approach between happy (\( M = 14.67, SD = 6.37 \)) and sad (\( M = 11.48, SD = 6.81 \)). Unexpectedly, the mean pattern reveals a tendency toward more global focus in the sad condition, which is the opposite of what anticipated.

Taken together, these analyses may suggest that the effect of the mood induction was shorter than anticipated, which resulted in significant findings on the Kimchi task immediately after mood induction, but not after a 5-6 minutes delay (i.e., the approximate duration of the previously administrated Navon-type task). The analyses also suggest a potential problem with the Navon-type task, which exhibited a slight tendency to behave in the opposite direction than expected.

**Gender effects.** Research showed that women tend to report more frequent and intense experience of emotion than men do (e.g., Bradley, Codispoti, Sabatinelli, & Lang, 2001), particularly for sadness and happiness (Lench et al., 2011). Thus, it was decided to examine the effect of gender as a moderator of mood induction in the current set of data across the sad and happy mood conditions. Series of Two-Way ANOVA were conducted with mood condition (sad vs. happy) and gender (males vs. females) as independent variables and with mean mood ratings and the other variables of interest (i.e., Kimchi Global Focus, Navon Local Focus, Global Focus-\( W\% \), Local Focus-\( Dd\% \), Synthesis-\( Sy \),
Synthesis Global Focus- WSy%, Perceptual Unusualness-Xu%, Ideational Flexibility-Content Range) as dependent variables. These analyses did not reveal a main effect of gender on any of the study variables.
Chapter Four

Discussion

The goals of this study were: (1) to replicate the findings showing a global/local bias as a function of mood state using two perceptual task requiring visual hierarchical processing (one using processing of simple geometrical figures and the other one involving processing of letters); and (2) to explore to what extent the documented effects of mood valence on visual information processing are visible on a perceptual-cognitive inkblot task (Rorschach).

As mentioned in the Results section, the hypotheses were tested ignoring the neutral mood condition, as preliminary analyses suggested that it was actually a moderately positive mood condition. Thus, it was not possible to test the linearity prediction, but instead effects of the happy and negative mood conditions were compared in the direction predicted by the affect-as-information model.

Global Focus

The hypotheses predicting a higher global focus in the happy mood condition as compared to the sad mood condition on the hierarchical processing of geometrical figures (Kimchi task) and inkblot task (Global Focus-W\%) were not supported by the data. As for the Kimchi task, the current study did not replicate the findings by Gasper (2004) and Gasper and Clore (2002), who reported more global focus in the happy mood condition than in the sad mood condition on very similar hierarchical processing tasks with samples of college students. Their estimated effect sizes were $d = .59$ and $.49$, respectively, as compared to a modest $d = .17$ in the current study. It is difficult to explain the source of these effect size discrepancies, but a very recent meta-analytic study on mood induction
by Lench et al. (2011) reports large effect sizes for self-reported experience (\(g = 1.16\)), but small effects sizes for cognitive outcome measures (as well as measures involving judgment) of mood induction (\(g = .30\)), which is more similar with the effect size obtained in the current study. This suggests that my analyses were probably underpowered to detect this small effect size. Additionally, post-hoc analyses suggested that the Kimchi task did reveal more global focus in the predicted direction when it was administered immediately after mood induction, but not after a delay (i.e., after the Navon-type task). This suggests that the mood effects in this study may have faded faster than expected (i.e., within 5-6 minutes from mood induction), which may be an explanation for the low effect size associated with the Kimchi task.

As for the Rorschach Global Focus variable (\(W\%\)), its lack of association with mood valence in this study is consistent with Kingery’s findings (2004), who did not find an association between this variable and dispositional mood. However, it is inconsistent with previous clinical research showing that hypomanic states are associated with more \(W\) responses (Schmidt & Fonda, 1954; Spielberger et al., 1966; Wagner & Heise, 1981). A possible explanation of these incongruent findings may be that the variable \(W\%\) is less sensitive to mild, temporary variations of mood induced to non-patients, but may capture the pathologically intense positive mood experienced by people experiencing mood disorders. Since, for ethical reasons, it is difficult to experimentally induce states of such magnitude in lab, it is hard to test this prediction. However, further research on patients with intense euthymic moods can clarify if the \(W\%\) variable is associated indeed with an elated mood state, as predicted by the affect-as-information model.
Local Focus

The hypothesis predicting that people in a sad mood condition would exhibit more local focus than in the happy condition was supported for the inkblot Local Focus-$Dd\%$ variable, but not for the task requiring hierarchical processing of letter patterns (Navon-type task). The Local Focus variable ($Dd\%$) was higher in the sad mood condition (consistent with the affect-as-information model). Similar findings were reported by Kingery (2004), who found that, in a non-patient sample, the Rorschach $Dd$ variable was positively correlated with negative dispositional mood and negatively correlated with positive dispositional mood. Thus, the current finding provides support for the validity of the Rorschach Local Focus ($Dd\%$) variable as a measure of analytical processing. Further research would reveal if this finding will replicate with clinical samples of patients diagnosed with depression or anxiety disorders, where analytical processing is a core feature (e.g., Andrews & Thompson, 2009).

As for the negative finding obtained with the Navon-type task, the analyses point to the likelihood that it may not be an adequate measure of the local focus. Specifically, it exhibited an unexpected negative correlation with the inkblot Local Focus-$Dd\%$ variable. Also, it tended to perform in the opposite of the expected direction when comparing the sad and happy mood conditions. Finally, and maybe most importantly, it was not correlated with the Kimchi task, even though both are supposedly tapping the same construct (i.e., visual hierarchical processing). A possible explanation for this lack of correlation is that the two tasks may significantly differ in the perceptual strategies involved in their execution. Specifically, the Kimchi task requires quick (“first impression”) judgment of the match between geometrical figures based on either global
or local aspects of the stimuli. The Navon-type task involves a deliberate and systematic search in the perceptual field to identify different levels of letters (both at global and local levels). Thus, it may require considerable more analysis of the stimuli (as compared to the Kimchi task), which can put people in an analytical problem-solving mode irrespective of their induced mood. In conclusion, even though both tasks involved hierarchical perception, they also required relatively different processing strategies, which could account for their lack of correlation.

**Perceptual Organization**

The hypothesis predicting that people in a happy mood would exhibit more perceptual organization of the inkblot task as compared to people in a sad mood was not supported by the data. There was no association between mood valence and the Rorschach variables measuring field integration (*Synthesis Global Focus-WSy%* and *Synthesis-Sy%*). This is not in line with previous studies showing that a happy mood induces more clustering of information on memory (Isen et al., 1987), categorization (Isen & Daubman, 1984; Murray et al., 1990), or visual judgment tasks (Gasper, 2004; Gasper & Clore, 2002). A possible explanation of this negative finding is that perceptual organization of the inkblots may be different in nature (and probably more complex) than spontaneously organizing memorized words around a script (like in Isen et al.’s studies), creating categories by clustering words or colors (like in Isen & Daubman and Murray et al.), or organizing local elements of geometrical shapes (like in Gasper and Gasper & Clore’s studies). Specifically, a combination of bottom-up (processing physical characteristics of the stimuli) and top-down processes (activating visual representations in long-term memory) may underlie the perceptual organization of the inkblot stimuli,
which may not be the case with the above-mentioned tasks, in which either top-down or bottom-up processing predominates. This increased complexity of the Rorschach task may include the fact that both systematic processing (prompted by a sad mood) and clustering (prompted by a happy mood) are basic components of the perceptual strategies used to organize the inkblots. Thus, both moods may have positive effects on the perceptual organization variables, which may have precluded any clear advantage for either state. In hindsight, this can suggest that the original hypothesis predicting a linear increase in perceptual organization across the three mood states may have been wrong and that a more accurate prediction would be that both happy and sad moods would promote more perceptual organization on the Rorschach as compared to a neutral mood state. A previous clinical study showed that bipolar patients in a manic phase exhibited more perceptual organization than bipolar patients in a depressive phase (Singer & Brabender, 1993). However, the authors did not find a difference in perceptual organization between the bipolar manic subgroup and unipolar (depressive) subgroup. This pattern of findings is complex or equivocal and, in hindsight, may not support the original hypothesis of an increased organization in a happy mood as compared to a sad mood. Further research with people diagnosed with mood disorders can shed more light on the relationship between perceptual organization on the Rorschach and mood.

**Perceptual Originality (Unusualness)**

The hypothesis predicting that people in a happy mood would have a higher rate of unusual percepts (as measured by $Xu\%$) on the Rorschach task than people in a sad mood was not supported by the data. The effect size was in the expected direction but small ($d = .24$), similar with the effect size associated with originality on creative tasks ($r$
= .11) reported in a meta-analytic study by Baas, De Dreu, and Nijstad (2008) for the positive-negative mood contrast. It is also very similar with the effect size reported in another meta-analytic study by Davis (2009) on the effects of mood induction on creative ideation tasks (i.e., divergent thinking, categorization and remote associations tasks), for positive vs. negative contrast \((d = .22)\). These findings suggest that the analyses were underpowered to capture these relatively small effect sizes. It is suggested that further research on the relationship between Perceptual Unusualness-\(Xu\%\) and emotions should consider only those Unusual responses that are very personal or idiosyncratic. Previous research suggest that brain regions associated with emotions (i.e., amygdala) are activated when such highly personal responses are given to the Rorschach cards (Asari, Konishi, Jimura, Chikazoe et al., 2010).

**Cognitive Flexibility**

The hypothesis predicting that cognitive flexibility (as measured by the Rorschach Content Range variable) will be higher in the happy condition than in the sad condition was supported by the data. The alpha value bordered on being statistically significant \((p = .05)\) with a moderate effect size \((d = .43)\). People in the happy mood condition tended to offer a wider range of Rorschach content categories than people in the sad mood condition (the range of contents in this study across both mood conditions ranged between 2 and 8 content categories). This positive finding is consistent with the notion that a happy mood stimulates flexibility by facilitating a decontextualized long-term memory search, as predicted by the affect-as-information model. Despite the fact that a meta-analytic study by Baas et al. (2008) reported essentially a null \((d = -.08)\) effect size under the positive-negative mood contrast associated with flexibility measures, two
previous Rorschach studies provided indirect support for the association between a negative mood and restricted content range (Berger, 1963; Porcelli & Meyer, 2002), which is consistent with the current results and with the theoretical model mentioned above. As seen, as compared to the very small effect size found by Baas et al., the effect size in this study ($d = .43$) was visibly higher. This may suggest that the variety of semantic categories of the Rorschach responses is more susceptible to be affected by a mood state than other measures of cognitive flexibility used in research (e.g., scores on the category inclusion tasks; different semantic categories on figural or verbal association tasks), which can make this variable a good candidate in creativity research. A replication of this study using a variety of cognitive flexibility measures is necessary to determine if this is the case.

**Conclusions**

In conclusion, the overarching hypothesis of this study- that mood valence affects visual information processing in the direction predicted by the affect-as-information model- received limited support from the data. The effect sizes were rather small and only two variables tended to differentiate the sad mood condition from the happy mood condition in the expected direction: one pertaining to the analytical approach of the Rorschach stimuli (reflecting a local focus on the inkblot subcomponents) and the other pertaining to the flexibility of creating semantic categories when interpreting the quasi-ambiguous inkblots. As compared to the literature, the effect sizes in the current study are generally close to the modest effect sizes reported by Lench et al. (2011) related to the effect of mood as measured by cognitive measures. This may suggest that mood effects
on visual information processing as studied in the lab may be volatile or mild, so designs with more power are necessary to capture them.

Also, there may be alternative explanations of the findings in the current study that take into account other dimensions of mood than valence. For instance, Gable and Harmon-Jones (2010) argue that not mood valence, but motivational dimension of affect (i.e., approach level) influences attention scope and cognitive categorization. Specifically, they posit that affective states of low motivational intensity (e.g., happiness, sadness) broaden cognitive processes, whereas affect of high motivational intensity (e.g., desire, fear, anger) narrows cognitive processes, irrespective of valence (see also a related discussion by Forster, Epstude & Ozelsel, 2009, on the different cognitive effects provoked by romantic love vs. sexual desire). From this perspective, both mood states manipulated in the current study (i.e., amusement and sadness) were low in approach intensity, so no significant differences are expected in terms of information processing, as both mood states would increase attention scope and flexibility. This may explain why small differences were found overall between the two mood conditions, but of course it is difficult to draw a firm conclusion as long as there were no mood conditions high in motivational intensity to compare. However, further research should explore this interesting hypothesis by designing experiments where both valence and motivational intensity would be taken into account (e.g., sadness, fear, amusement, desire).

Other researchers (de Dreu, Baas, & Nijstad, 2008) argue that it is the level of activation that influences creativity. They posit that activating (e.g., anger, fear, happiness, elation) but not deactivating (e.g., sadness, serenity, relaxation) moods stimulate fluency and originality. This affective dimension was not controlled in the
current experiment, where the two mood conditions (sadness and happiness) varied on two dimensions (valence and activating level). Thus, the increased cognitive flexibility found in the happy mood condition may be actually due to the higher level of arousal experienced by people in the happy mood condition rather than to the positive mood valence, as the affect-as-information predicts. To disentangle the effects of these two dimensions on visual information processing, experiments can be designed that would include both positive/negative and high arousal/low arousal affective states. A more integrative view on the complex issue of the effects of mood states on information processing is presented in a meta-analytic study by Baas et al. (2008) that concludes that three affective dimensions (valence, approach level, and activating level) influence creative mental flexibility and originality. Again, further research can shed more light on the interesting relationship between mood and information processing, with direct implications for the area of creativity, but also for the clinical domain.

**Limitations**

There are a series of limitations of this study. One of them is the absence of a veritable neutral mood condition that would have been necessary to test the linearity hypotheses. As mentioned in the Results section, removing the neutral mood condition from the main analyses was based on preliminary analyses suggesting that it was actually a moderately positive mood, and thus could not serve as an authentic midpoint to test the linearity hypotheses. Even though mood induction was apparently effective, a very asymmetric effect size pattern emerged, with the sad mood condition being significantly more distant from the “neutral” mood condition than the happy mood condition. This asymmetric pattern of data may be explained by the unusually high mood ratings at
baseline (as suggested by the high mean value in the baseline sample of 6.98 on a 1 to 9 scale) of the participants, which probably made more difficult to induce a significant increment in their mood. As explained in the Results sections, this pattern of data did not fit the approximately equal effect sizes reported in the meta-analytic study by Lench et al. (2011) for movie clips (g = .73 for a sad mood and g = .70 for a happy mood, both under contrasts with a neutral mood).

One can argue that the neutral condition could still be included in the analyses by assigning unequal weights for the focused contrast analyses (i.e., -2, -1, and 3) to capture an asymmetrical mood pattern (i.e., neutral mood condition closer to happy mood than to sad mood). However, this would test a curvilinear rather than a linear relationship, which would not be congruent with the original hypotheses predicting a linear increase/decrease in the dependent variables as a function of mood valence.

The absence of the neutral mood midpoint in the current study made impossible to test Hypothesis 3d predicting increased perceptual inaccuracy on the inkblot task in both sad and happy conditions as compared to the neutral condition. It also makes more equivocal the interpretation of the two positive findings in this study (i.e., Rorschach Local Focus-Dd% was higher in the sad condition than in the happy mood condition; Rorschach Cognitive Flexibility-Content Range tended to be higher in the happy mood condition as compared to the sad mood condition). Specifically, in the absence of the neutral mood midpoint, it is hard to clearly determine if the positive mood enhanced cognitive flexibility or the negative mood inhibited cognitive flexibility, or both (as compared to a neutral mood state); and if the negative mood promoted a local focus or a positive mood inhibited a local focus, or both. For instance, a hypothetical flexibility
mean pattern happy > neutral > sad would suggest that a happy mood increases flexibility and a sad mood inhibits flexibility. A mean pattern happy > neutral = sad would suggest that a happy mood increases flexibility, but a sad mood did not have any effect. And a mean pattern happy = neutral < sad would indicate that a sad mood inhibits flexibility, but a happy mood does not enhance flexibility.

As mentioned before, an issue with the current design was that it may have been underpowered to capture the small effect sizes of mood induction on cognitive measures shown by the meta-analytic study published after the data were collected (i.e., Lench et al., 2011). Thus, it is suggested that future lab research on the effects of induced mood on cognitive measures should use designs with increased power in order to test the expected effects.

Another limitation refers to the appropriateness of a dependent variable used in this study. As mentioned above, the analyses suggested that Navon-type task may not be a reliable measure of local focus.

A general but interesting issue in this study was the low heteromethod correspondence across measures. There was only one meaningful, statistically significant correlation across different measures (self-reported mood correlated with the Rorschach measure of Local Focus). No other meaningful correlations were apparent across the mood ratings, hierarchical perception measures and the inkblot measures. The absence of the intercorrelations among these heteromethod measures of visual processing is consistent with Meyer’s notion (1996, 1997) that different types of measures seemingly tapping the same construct are subject to different biases and involve different mental processes, which affects their intercorrelations (also see Campbell & Fiske, 1959; Kagan,
1988; and Borsboom et al., 2004). For instance, the concept of “hierarchical processing”, as operationalized in this study using two perceptual tasks (Kimchi and Navon-type) apparently supported this idea, since these measures did not correlate with each other, even though both of them involve processing of global/local levels of the stimuli.

Similarly, an interesting issue is if the concept of perceptual global/local focus as used in this study is consistent with the similar global/local focus as used in social psychology studies (for examples, in the persuasion studies cited in Introduction). A major difference between these two concepts may be that in social psychology it is used mainly to describe a heuristic approach of a set of ideas of arguments (i.e., focus on the general cognitive scripts or general message vs. focus on details of the argument). In this study, the global/local approach was used in reference to perceptual strategies (i.e., focus on the local vs. global visual components of the field). Thus, there may not be a strict correspondence between the two concepts.

Another issue with the current study refers to the duration of the induced mood to the participants. The post-hoc analysis of the hierarchical perception task (Kimchi) showed that it behaved as predicted when administered immediately after mood induction, but not after a 5-6 minute interval. This suggests that the mood effects in this study were quite transient, which could be a factor contributing to the generally small effect sizes obtained with all the dependent measures. A very recent study supports the idea that mood effects as induced in the lab significantly decrease over very short intervals of time (i.e., 1 second) at least on pre-attentional iconic memory tasks (Kuhbandner, Lichtenfeld, & Pekrun, 2011).
Related to the topic of mood induction, one also can argue that the demand characteristics may have affected to some extent the participants' mood ratings in the current study. Specifically, the transparent message that a particular mood induction was desired by the experimenter may have artificially inflated or decreased people's self-reports about their mood states according to their belief's about experimenter's expectations. This concern has some support in the literature. For example, the recent meta-analytical study by Lench et al. (2011) found that studies that controlled for demand characteristics (i.e., by using a cover story to hide the experimenter's intention to induce a particular mood) resulted in lower effects sizes associated with mood self-reports as compared to studies that did not control for demand characteristics ($g = .44$ vs. $.56$). However, it is also possible that the explicit intention of the experimenter to induce a particular mood may actually have helped people to get into the intended mood state by preventing interfering thoughts about the goal of the whole procedure, as suggested by Wasterman, Spies, Stahl, and Hesse (1996). Thus, instead of artificially affecting the mood ratings, the clear intention of the examiner to induce a mood state actually may have boosted the effects of the mood induction procedures.

Another limitation refers to the ecological validity of this study. Specifically, do moods induced in the lab have the same impact and personal relevance as moods experienced by people in their everyday lives? The artificial character of the experimental situation may limit the generality of the current findings to other settings. Moreover, is the mood induced in the lab (e.g., sadness or happiness) similar enough in nature with pathological mood (i.e., depression or hypomanic mood)? There may be certain variables besides magnitude that differentiate a “normal” mood state from a pathological mood.
state. For instance, a clinically depressed state may be associated with mental pain (e.g., guilt), which is usually not the case with a sad mood induced by watching a movie. The potential differences between a pathological mood state and everyday moods can limit the extrapolations of a lab study findings to the clinical area.

**Implications for Theory, Practice, and Research**

A general conclusion that may be drawn from this study is that mood effects are task-dependent. Even though one can argue that there is not enough basis for this speculation, since most results were not significant irrespective of task, it was interesting that overall the inkblot measures tended to show higher effect sizes in the predicted direction with mood ratings than either Kimchi or Navon-type tasks. In other words, a task such as the Rorschach that involves a combination of bottom-up (e.g., visual processing of the stimuli) and top-down (e.g., activating a variety of images from long-term memory) processing seemed somewhat more permeable to the mood effects than the two simpler and more structured tasks involving predominantly bottom-up processing (Kimchi and Navon-type). This might suggest that mood effects are more influential on less structured and more open-ended tasks that involve a more variety of responses and require a certain amount of creative elaborations. This is consistent with Fiedler’s argument (2001) that performance on tasks that require creative inferences or multiple solutions would be more sensitive to mood effects, whereas processing of well-structured and analytical tasks would be relatively unaffected by our moods. Thus, further research should explore more the limits of the affect-as-information model by determining the differential effect of mood on various types of cognitive tasks. This type of research can be relevant for the theories of creativity, as it can offer answers to questions regarding the
relationship between our emotional states and creative productivity. It can be also relevant for our daily life. A finding in this study was that a positive mood boosts cognitive flexibility, which suggests that to encourage multiple ways to approach an open-ended task among employees, artists, scientists, or schoolchildren, inducing a positive mood is a good idea. Similarly, inducing a mild positive mood in a therapy session can help the patient (and therapist too) have more flexible views of client’s difficulties and solutions.

However, one may not expect significant mood effects on more structured or analytical tasks (also see Subramaniam, Kounios, Parrish & Jung-Beeman, 2009). Also, as already mentioned, manipulating other mood dimensions to determine their relative effects on visual information processing would be an important next step for future research.

As for clinical assessment, an important implication of this study is that at least two inkblot variables are more susceptible to be influenced by moods - Local Focus (Dd) and Content Range, although perhaps only transient moods. This is important for the standardized administration of the Rorschach, as it suggests that extraneous variables such as examiner’s style (e.g., funny vs. dour) may affect these variables. Of course, a replication of this study with both non-patients and clinical populations is necessary to determine the stability of these findings. Considering the variable Content Range, more support for its validity as a measure of flexibility would be provided by correlating it with direct measures of verbal and figural flexibility (e.g., Torrance Test of Creative Thinking, 1974).
Finally, an interesting avenue of future research would be to determine if the relationship between induced mood and cognitive performance is moderated by personality traits that predispose people to experience predominantly positive or negative emotional states. An interesting study by Gross, Sutton, and Ketelaar (1999) showed that extraversion correlated with an increase in positive affect in response to a comedy clip, and neuroticism correlated with an increase in negative affect as induced by movie clips eliciting negative emotions. This type of research can be useful for studying the relationship between personality and cognitive styles.

Final Remarks

In summary, the main conclusions of this study are: (1) generally small effect sizes were found, suggesting that mood effects as induced in lab are volatile, mild, and task-dependent; (2) these effects may be more likely to appear on less structured rather than structured or analytical tasks; (3) at least two Rorschach inkblot variables may be sensitive to evanescent mood states: the variables pertaining to analytical processing and ideational flexibility, which were affected by mood states in the direction predicted by the affect-as-information model; (4) there was a low heteromethod correspondence across measures conceptually tapping the same construct.
References


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Appendix A

Navon-type perceptual task
Appendix B

Example of Kimchi-type task stimulus