Evaluating the Effectiveness of Standardized and Personally Relevant Stimuli in Two Mood Induction Procedures

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EVALUATING THE EFFECTIVENESS OF STANDARDIZED AND PERSONALLY RELEVANT STIMULI IN TWO MOOD INDUCTION PROCEDURES

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ABSTRACT
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The experience of emotion is a critical component of behavior, cognition, and general human functioning. In order to better understand emotional experience, researchers have utilized mood induction procedures (MIPs) to elicit specific emotional responses. Previous studies have reviewed the effectiveness of various MIPs; however, these studies do not account for more recently developed picture datasets and are limited in their examination of the impact that personal relevance has on MIP effectiveness. The present study examined changes in emotion using four different MIPs that varied based on stimuli type (either Picture or Vignette) and relevance to the participant (Personally Relevant or Standardized). Additionally, factors related to social desirability, emotion regulation and expression, emotional functioning, and personality were evaluated to determine possible influences of MIP effectiveness. Seventy-eight undergraduates participated in the study. Results indicated no differences in the effectiveness of Picture and Vignette MIPs. However, MIPs based on personally relevant stimuli were more effective that those based on standardized stimuli. Only the Personally Relevant Positive Vignette MIP was significantly correlated with social desirability, emotional functioning, and personality variables. Generally, these results suggest that researchers may benefit from tapping into the personally relevant emotional experiences of their participants. However, given small effect sizes for the direct comparison of MIPs, researchers may also want to consider other factors (e.g., constraints of the experimental environment) when choosing which MIPs to use.

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The experience of emotion is a critical component of behavior, cognition, and general human functioning (Barrett, Mesquita, Ochsner, & Gross, 2007). A number of theories highlight the ways in which emotional experiences impact the processing of information in one's everyday life. For example, theories describing emotions as action tendencies highlight that emotions are often a response to sensory inputs from one's environment and motivate an individual toward particular behavioral responses (Adolphs, 2010). Additionally, emotional experience is often considered to be an implicit, automatic process (Adolphs, 2010) that affects various types of cognition, such as decision-making (Angie, Connelly, Waples, & Kligyke, 2011) and executive functioning (Phillips, Bull, Adams, & Fraser, 2002). Finally, understanding the experience of emotion has immense clinical relevance given that emotion dysregulation is the primary feature of many psychological disorders, such as Major Depressive Disorder and Bipolar Disorder (American Psychiatric Association [APA], 2000). Given its widespread importance, researchers have aimed to study emotion in numerous ways to better understand the internal experience of emotion as well as the effects of emotional experiences on various aspects of everyday life.

One approach to assessing emotional experience is examining individuals along points on the emotional spectrum. For example, many studies have compared healthy controls to those with depression in an attempt to better understand the experiences of negative emotions (Thompson, Berenbaum, & Bredemeier, 2011). Another approach to assessing emotion focuses on experimentally manipulating participants' mood states.

This approach is characterized by the use of mood induction procedures (MIPs) that elicit specific emotions of interest. These approaches can also be used in combination to compare the effects of MIPs in different diagnostic groups (Gruber, Oveis, Keltner, & Johnson, 2010).

The experimental manipulation of mood states is a technique that allows researchers to go beyond the examination of an individual's inherent mood state by inducing specific emotions. Especially when used in conjunction with other techniques (e.g., comparing different diagnostic groups, evaluating behavioral performance), mood induction procedures may be useful in gaining an understanding of why some individuals are more likely to experience particular mood states as well as have potential implications for treatment development and refinement (Martin, 1990). To this end, researchers can more effectively understand the implications of experiencing different emotional states through the use of MIPs. In order to maximize the utility of MIPs, however, it is critical to garner a strong understanding of the effectiveness of the different types of procedures.

Mood Induction Procedures

To date, a multitude of MIPs have been developed and utilized in emotion research. Review papers have summarized and described these procedures (e.g., Gerrards-Hesse, Spies, & Hesse, 1994; Martin, 1990; Westermann, Spies, Stahl, Hesse; 1996), identifying at least fifteen different types of MIPs. Gerrards-Hesse et al. (1994) highlighted similarities among these techniques in an evaluation of 250 studies that led to the distinction of 5 different categories of MIPs: free mental generation of emotional states (i.e., Hypnosis, Imagination); guided mental generation of emotional states (i.e., Velten, Film/Story with instructions, Music with instructions); presentation of emotion-

inducing stimuli (i.e., Film/Story, Music, Gift); presentation of need-related emotional situations (i.e., Success/Failure, Social Interaction); and generation of emotionally relevant physiological states (i.e., Drug, Facial Expression). These groupings emphasize two fundamental components that underlie many mood induction techniques: mental generation and presentation of emotional stimuli.

Though these two techniques can be applied separately, mental generation and stimuli presentation do not have to be mutually exclusive. For example, vignettes in some cases represent an intersection of both mental generation and presentation of emotional stimuli. MIPs such as Autobiographical Recall and Story MIPs often call upon participants to engage in mental generation as they imagine an emotional response to an event presented to them (Westermann et al., 1996). Both of these MIPs can be employed with or without explicit instruction to get into the particular emotional state described by the vignette (Westermann et al., 1996). According to Gerrards-Hesse et al. (1994), presenting a vignette along with explicit instructions represents guided mental generation, whereas free mental generation is characterized by the presentation of a vignette in the absence of specific instructions.

While vignettes can be used in both Autobiographical Recall and Story MIPs, the manner in which they are utilized differs for these two techniques. In Story MIPs, vignettes are used in a standardized manner in which every participant in a given study is presented with the same standardized story. In Autobiographical Recall MIPs, vignettes are specific to each individual since participants are asked to imagine a personal experience. Indeed, the use of vignettes represents a mood induction technique that can

be applied in a variety of ways to address many different types of questions related to mood induction and the experience of emotion.

More recent work in the area of emotion research has highlighted the use of pictures as emotional stimuli. The International Affective Picture System (IAPS; Lang, Bradley, & Cuthbert, 2005) is one database of over 900 pictures that has been used in a large proportion of emotion processing studies. To date, these images have been used to assess such topics as emotion perception (Tempesta et al., 2010), the impact of emotion on performance (Kissler & Koessler, 2011), and differences in emotional response patterns across diagnostic groups (Aminoff, Jensen, Lagerberg, & Andreassen, & Melle, 2011). Additionally, the IAPS images have been utilized in a variety of neuroimaging studies (Bermpohl et al., 2009; Mataix-Cols et al., 2008; Ochsner, Knierim, Ludlow, & Hanelin, 2004) and may represent a type of emotional stimuli that are particularly easy to use and effective in these difficult testing environments (e.g., functional magnetic resonance imaging, fMRI; positron emission tomography, PET).

With such an abundance of MIPs, the critical question is how effective each of the procedures is in producing the desired emotional response. In a meta-analysis, Westermann et al. (1996) found that experimental mood induction techniques can, in general, yield medium to large effect sizes, though there is indeed variation in the effectiveness of these MIPs. For example, the Film/Story with instructions MIP was significantly more effective than any other MIP examined in the meta-analysis, with a mean weighted effect size of .75. The mean weighted effect size of the Film/Story without instructions MIP was .53. Imagination MIPs, which are comparable to Autobiographical Recall MIPs, resulted in mean weighted effect sizes of .36.

Numerous other studies have directly compared the effectiveness of various types of MIPs (Brewer, Doughtie, Lubin, 1980; Chartier & Ranieri, 1989; Isen & Gorgoglione, 1983; Jallais & Gilet, 2010; Pignatiello, Camp, Elder, & Radar, 1989; Slyker & McNally, 1991; Wierzbicki, Westerholm, & McHugh, 1994). Martin (1990) emphasized that directly comparing MIPs assesses the specificity of these techniques with regard to their ability to effectively produce the emotional states they are intended to produce. These comparisons are certainly useful to understanding the relative effectiveness of various MIPs. However, it is noteworthy that many of the studies that conducted these comparisons are dated and direct comparisons of picture-based techniques (e.g., IAPS) to the MIPs evaluated in previous reviews are particularly sparse. Comparisons of these picture stimuli to previously used techniques can be used to inform decisions about what types of stimuli may be best to utilize.

Impact of Personal Relevance

While the previous section highlights the work that has been conducted to elucidate similarities and differences among various MIPs and their effectiveness, one aspect that has been under-emphasized is whether stimuli in these MIPs have personal relevance to the participant. Numerous researchers have suggested that emotion is particularly tied to the personal experiences of an individual (Adolphs, 2010; Mauss & Robinson, 2009). Among the many types of MIPs, some have been developed with a personally relevant foundation, while the basis of other MIPs is generic across individuals. For example, in the Velten MIP (Velten, 1968) participants are asked to read mood statements that are self-referent in nature (e.g., “I’ve doubted that I’m a worthwhile person”) and prompted to get into the mood suggested by the statement. Other MIPs rely

on recall of personal events, which is the primary component of solitary recollection, social recollection, and autobiographical recall MIPs (Martin, 1990). Additionally, some studies involving music have incorporated participant-selected music (Salimpoor, Benovoy, Longo, Cooperstock, & Zatorre, 2009). Alternatively, Film/Story MIPs lack personal relevance since personal experiences of the participants are not represented in the film/story. Instead, participants are encouraged to get into a particular mood state based on the experience of individuals about whom they are seeing or reading (Hewig et al., 2005). This variation in the amount of personal relevance seen within these different MIPs begs an interesting question regarding whether the effectiveness of a MIPs is dependent upon the participant's ability to relate to the emotional content of the procedure on a personal level. According to Philippot, Schaefer, and Herbette (2003), past experience is an important factor in determining the emotional meaning of a situation for most individuals.

A substantial amount of research exists to suggest that emotion and personal relevance interact in significant and meaningful ways. A recent review by Holland and Kensinger (2010) examined emotion and autobiographical recall and emphasized that autobiographical memory is characterized by an intersection of ideas about self, emotion, goals, and personal meaning. Additionally, Adolphs (2010) asserts that modern theories of emotion often aim to explain why many emotions are triggered by events that are particularly significant or relevant to the person experiencing them. A model of emotion proposed by Mauss and Robinson (2009) states that the first stage of emotional experience involves assessing the personal significance of an event or stimulus and that the subsequent emotional response is a product of that subjective experience. Under this

theory, it seems plausible that personal relevance is applied to stimuli regardless of whether they are designed to be personally relevant or generically standardized. Though a variety of MIPs that lack the component of being personally relevant have been effective (Westermann et al., 1996), it seems plausible that MIPs that do incorporate personally relevant material may be more effective if the robustness of emotional experience is increased by a personal connection to the stimuli. To this end, direct comparisons of MIPs employing personally relevant stimuli and MIPs employing standardized stimuli would be highly beneficial for understanding the possible underlying factors that contribute to the effectiveness of different types of stimuli.

Of course, there are advantages and disadvantages to consider when determining whether personally relevant or standardized stimuli should be employed in a given experiment. The use of standardized stimuli in experimental studies has historically been recognized as beneficial due to the increased ability to replicate and expand upon such studies. With the IAPS images, for example, researchers have the ability to build upon previous studies that also utilized an IAPS picture set since the same exact stimuli can be employed. This would not be possible for studies that utilize self-selected and personally relevant stimuli since those stimuli would be different for each participant. The importance of replication, therefore, represents an advantage of using standardized stimuli and a disadvantage of using personally relevant stimuli.

However, assessing the impact of personal relevance is a necessary step to take considering the previous research that has linked personal experience and emotion as well as described the significant interplay between them. If researchers aim to use MIPs to elicit the most robust emotional response possible and there is potential for personally

relevant stimuli to produce more robust responses than standardized stimuli, then it is critical to consider the possibility that some amount of standardization may need to be sacrificed in order to elicit the most robust emotional responses. Direct evaluation of the effectiveness of personally relevant and standardized stimuli would allow researcher to determine the weight of this potential benefit of using personally relevant stimuli.

Influences on MIP Effectiveness

Additional research regarding different types of MIPs has evaluated possible predictors of their effectiveness (Blackburn, Cameron, & Deary, 1990; Gomez, Cooper, Gomez, 2000; Scherrer & Dobson, 2009). In a recent study, Scherrer and Dobson (2009) asked participants to complete self-report measures of depressive symptoms, anxious symptoms, dysfunctional attitudes, self-esteem, negative life events, and social desirability in order to see if any of these scores were useful in predicting the effectiveness of a Velten MIP for negative emotionality. Results indicated that symptoms of anxiety and negative life events significantly predicated the participants' post-induction mood state (Scherrer & Dobson, 2009). Another study examining predictors of emotional response to a negative Velten MIP found that baseline depression, negative thoughts, and neuroticism were significant predictors of participant responses to the negative mood induction condition (Blackburn et al, 1990). Finally, Gomez et al. (2000) assessed predictors of both negative and positive mood states using an MIP based on monetary gains or losses related to performance on a Go/No Go task. Results indicated that anxiety, neuroticism, and the interaction between neuroticism and extroversion were predictive of negative mood induction, while extroversion and impulsivity were predictive of positive mood induction. Examining possible influences of MIP

effectiveness along with directly comparing MIPs would aid researchers in understanding how individual differences among participants are related to the effectiveness of different types of mood induction techniques.

Positive versus Negative Mood Induction

To date, many studies have examined techniques for inducing both negative (Blackburn et al., 1990; Brewer et al., 1980; Jallais & Gilet, 2000) and positive (Brewer et al., 1980; Gruber et al., 2010; Jallais & Gilet, 2000) emotions. However, according to Westermann et al. (1996), the effectiveness of previously used MIPs has generally proven to be greater in negative mood induction conditions than in positive mood induction conditions. This difference highlights a need for MIPs that are more effective within the context of positive mood induction given the potential benefits of understanding the experience of positive mood specifically. Though a great deal of previous research has focused on negative mood induction in order to better understand experiences such as depressive mood states (Clark, 1983; Rexford & Wierzbicki, 1989; Scherrer & Dobson, 2009), less attention has been directed at the usefulness, and possible clinical implications, of understanding positive mood states (Fredrickson, 2002). Research related to positive mood induction can bolster understanding of the differences between individuals who are more or less susceptible to positive mood states and potentially contribute to an explanation of why individuals prone to negative emotionality struggle to experience positive mood. Newer MIPs, such as those utilizing pictures and those that are explicitly personally relevant in nature, could potentially emerge as more effective for inducing positive mood states than previously used MIPs and aid researchers and

clinicians in garnering a better understanding of what facilitates the experience of positive mood states.

Specific Aims

The present study aimed to address three specific issues related to the study of emotion induction. The first aim was to assess differences in the effectiveness of two types of MIPs. Picture MIPs, which have not been compared in previous reviews, were compared to Vignette MIPs, which utilize commonly used instructions that prompt participants to get into the emotional state described in the vignette. We hypothesized that the Picture MIP would be more effective than the Vignette MIP. Philippot et al. (2003) highlight two models of autobiographical memory: direct retrieval and generative retrieval. Direct retrieval involves automatic activation of autobiographical memory, typically in response to certain cues. This process occurs quickly, often requiring minimal cognitive resources, and may lead to a greater emotional response. Generative retrieval, on the other hand, involves the reconstruction and re-experiencing of specific personal memories. This type of retrieval requires greater cognitive resources, and while it may result in more detailed reconstruction of the event, the emotional response may be inhibited. We believe that picture stimuli will facilitate a more direct retrieval process since pictures provide cues that allow participants to think about the events and related emotions in whatever way is most emotionally salient for them. Vignettes, however, may facilitate a retrieval process that is more generative in nature, causing participants to focus on the details of the stories and be distracted from the emotional salience. While these perspectives discussed by Philippot et al. are specific to autobiographical experiences, we believe that similar patterns of emotion elicitation will be seen across the

standardized Picture and Vignette conditions. The direct comparison of Picture and Vignette MIPs is particularly valuable given that pictures have not been systematically compared to other MIPs.

The second aim of this study was to evaluate whether stimuli with specific personal relevance are more effective at eliciting an emotional response than standardized stimuli. While different types of MIPs with various levels of personally relevant content have been evaluated previously, very few studies have directly compared personally relevant and standardized mood induction conditions. One exception is Kuo and Linehan (2009) who investigated emotion processing by comparing a personally relevant condition to a standardized condition in individuals with Borderline Personality Disorder. In this study, the personally relevant condition was imagery based and the standardized condition utilized presentation of films. To our knowledge, no study has explicitly addressed and compared personally relevant and standardized conditions within a given type of MIP in order to assess the impact of personal relevance while controlling for variation in MIP type. To address this, the present study compared a personally relevant condition and a standardized condition within the Picture and Vignette MIPs. We hypothesized that the personally relevant conditions of each MIP would be more effective than the standardized conditions of those MIPs given the previously discussed relations between personal experiences and emotional responses.

The third aim of this study was to evaluate social desirability, emotional regulation and expression, emotional functioning, and personality characteristics that may be related to the effectiveness of Picture and Vignette MIPs to elicit positive emotionality. Prior work has attempted to elucidate which characteristics of an individual

might make them more or less susceptible to the effects of MIPs (Rexford & Wierzbicki, 1989; Scherrer & Dobson, 2009); however, none of these studies have included a Picture MIP or a comparison of personally relevant and standardized conditions. We hypothesized that socially desirability would not be related to change in emotion. It was expected that a tendency to regulate one's emotions would be negatively correlated with the effectiveness of MIPs. Additionally, we hypothesized that high levels of positive attributes (e.g., life satisfaction) would be positively correlated with effective mood induction, while high levels of negative attributes (i.e., depressive symptomatology) would be negatively related to change in positive mood. Finally, it was predicted that the neuroticism personality factor would be negatively related to change in positive emotion.

Method

Participants

Participants included 78 college undergraduates who received course credit for their participation. The power analysis tool *G*Power* was used to calculate an appropriate sample size for this study based on a repeated-measures, within factors design, an effect size of .35 and power of .95. The effect size represents the effect of each MIP, which is consistent with data collected in our lab. This power analysis suggested a sample size of 35. We decided to oversample in the event that this effect size was an over estimate of that seen in direct comparisons of MIPs. Their mean age was 19 years, ranging from 18 to 38. Seventy-four percent of the sample was White and 76% was female. All procedures were approved by the Marquette University Institutional Review Board, and written informed consent was obtained from each participant.

Materials

Picture stimuli. The Picture MIPs included a Personally Relevant Positive MIP, Standardized Positive MIP, and Standardized Neutral MIP. In each of these MIPs, 10 pictures were viewed for 6 seconds each.

Personally relevant positive. In the Personally Relevant Positive Picture MIP, participants viewed 10 pictures they selected and submitted prior to arriving at the lab. Participants were asked to send in pictures that elicit a happy feeling; however, no other restrictions were placed on the type of pictures that they could submit. By allowing participants to send in any happy pictures of their choosing, we hoped to capture the factors of their personal lives that make them most happy. Examples of the types of pictures that were submitted by participants include family gatherings, celebratory events, pets, and friends. The mean rating for how positively these pictures made the participants feel was 7.32 (SD = 1.56) on a scale from 1 (not at all) to 9 (extremely). The mean arousal rating was 6.39 (SD = 1.94).

Standardized positive. In the Standardized Positive Picture MIP, participants viewed positive pictures from the International Affective Picture System (IAPS; Lang et al., 2005). Ten positively valenced pictures (images 1463, 1920, 2080, 2224, 2530, 5594, 5820, 7480, 8030, and 8461) from the IAPS database were used in this condition. The mean valence rating for these pictures was 7.48 (*SD* = 1.59) based on a scale from 1 to 9 with higher values indicating greater positive valence. The mean arousal rating was 4.80 (*SD* = 2.35) based on a scale from 1 to 9 with higher values indicating a higher level of arousal. These images depicted animals, kids, couples, a group of friends, and scenery. These pictures were chosen with two primary intentions. One goal was that they would be comparable to the pictures sent in by participants, so as to reduce systematic

differences in picture content between conditions. The second goal was to use photos used by other research groups so that we were closely evaluating typical effects of these stimuli seen in the literature. Finally, these images were used in a previous study conducted by our research group and produced significant to pre- to post-induction changes in emotional state.

Standardized neutral. In the Standardized Neutral Picture MIP, participants viewed neutral IAPS pictures. Ten neutrally valenced pictures (images 2200, 2215, 2980, 5130, 5510, 7002, 7030, 7040, 7500, and 7595) from the IAPS database were used in this condition. The mean valence rating for these pictures was 5.07 (*SD* = 1.33). The mean arousal rating for these pictures was 3.23 (*SD* = 2.04). These images depict people with neutral facial expressions, buildings, and inanimate objects. It was deemed implausible to include a personally relevant neutral condition for the Picture MIP given that participants are unlikely to have personally relevant pictures that are neutral in valence.

Vignette stimuli. The Vignette MIPs included a Personally Relevant Positive MIP, a Standardized Positive MIP, and two neutral MIPs (one that was personally relevant and one that was standardized).

Personally relevant positive. In the Personally Relevant Positive Vignette MIP, participants were asked to think of an event from their life in which they experienced happy emotions and spend up to 5 minutes writing about this experience. The average amount of time taken to write this vignette was 4.46 minutes (SD = 1.14). Participants were instructed to press the space bar after completing their story. If they did not complete their story within 5 minutes, a short tone was used to draw the participant's attention to the computer screen and a prompt appeared asking them to think about the

event and re-experience the associated emotions to the best of their ability. This mental generation phase lasted for 30 seconds.

Personally relevant neutral. The Personally Relevant Neutral Vignette MIP was identical to the Personally Relevant Positive MIP; however, participants were asked to think and write about their typical weekday routine. The average amount of time taken to write this vignette was 4.25 minutes (SD = 1.09).

Standardized positive. To create the stimuli for the standardized condition, a pilot study was conducted. In the pilot study, 38 participants read 8 positively valenced vignettes and rated their emotions after each. The four vignettes with the highest positive ratings were selected for use in the present study. Based on the pilot study, the average positive valence rating (based on the combined ratings of the words amused, excited, happy, joyful, and peaceful) across these vignettes was 6.88 (SD = 2.03) and the average arousal rating was 2.61 (SD = 2.32) on a scale from 0 (not at all) to 10 (extremely). In the Standardized Positive Vignette MIP, participants were provided a piece of paper with four positively valenced vignettes typed on it (see Appendix A). Participants were instructed to read the vignettes and press the space bar when they finished. The average amount of time taken to read these vignettes was 2.40 minutes (SD = 1.04). If they were not finished after 5 minutes, a short tone was used to draw their attention to the computer screen, which prompted them to stop reading and imagine the emotion that the individuals in the story would likely be experiencing. This mental generation phase lasted for 30 seconds. In both the pilot study and the present study, gender specific vignettes were presented to participants in such a way the gender of the characters in the vignettes matched the gender of the participants

Standardized neutral. The Standardized Neutral Vignette condition was identical to the Standardized Positive Vignette condition; except that, participants read 4 neutrally valenced vignettes (see Appendix B). Standardized neutral vignettes were also created in the pilot study described above. The four neutral vignettes with the lowest positive valence and arousal ratings were selected for the present study. Based on the pilot study, the average positive valence rating across these vignettes was 2.31 (SD = 1.49) and the average arousal rating was 1.14 (SD = 0.48) on a scale from 0 (not at all) to 10 (extremely). The average amount of time taken to read the vignettes in the present study was 2.14 minutes (SD = 0.97).

Distractor Task

To minimize carryover effects of a given mood induction condition, a cognitive distracter task based on the Stroop task (Stroop, 1935) was presented following each induction condition, lasting approximately 1 minute. Participants completed one condition of this task as practice prior to beginning the experiment to ensure their understanding of the task.

Questionnaires. The Marlowe–Crowne Social Desirability Scale (MCSDS; Crowne & Marlowe, 1960) is a 33-item self-report measure used to assess socially desirable patterns of responding. Participants provided a true or false response for each item (e.g., “It is sometimes hard for me to go on with my work if I am not encouraged”). “True” responses are coded as “1” and “False” responses are coded as “0.” A total score ranging from 0 to 33 are determined by reverse scoring 15 of the items and computing a sum of the item scores. Higher scores indicate greater social desirability. This measures takes approximately 5 minutes to complete. Internal consistency for this measure is .88

(Crowne & Marlowe, 1960).

The Toronto Alexithymia Scale (TAS-20; Bagby, Parker, Taylor, 1994) is a 20-item self-report measure used to assess the ability to identify and describe one's emotions. This measure is broken down into three subscales to assess difficulty identifying emotions, difficulty describing emotions, and externally-oriented thinking. Items are rated on a 5-point Likert-type scale ranging from 1 (strongly disagree) to 5 (strongly agree). Responses for the items that contribute to each subscale are summed to determine the two subscale scores. Score ranges vary by subscale. Higher scores indicate greater difficulty identifying and expressing emotions. This measures takes approximately 5 minutes to complete. Internal reliabilities for the three subscales within a student sample are 0.79, 0.75, 0.66, respectively.

The Emotion Regulation Questionnaire (ERQ; Gross & John, 2003) is a 10-item self-report measure used to assess emotion regulation. This measure is broken down into two subscales to assess reappraisal and suppression. Items are rated on a 7-point Likert-type scale ranging from 1 (strongly disagree) to 7 (strongly agree). Responses for the items that contribute to each subscale are summed to determine the two subscale scores. Score ranges vary by subscale. This measures takes approximately 5 minutes to complete. Internal reliabilities for the two subscales are 0.79 and 0.73, respectively.

The Temporal Satisfaction with Life Scale (TSWLS; Pavot, Diener, Suh 1998) is a 15-item self-report measure that is broken down into three subscales to assess past, present, and future global life satisfaction. Items are rated on a 7-point Likert-type scale ranging from 1 (strongly disagree) to 7 (strongly agree). Responses for the 5 items that contribute to each scale are summed to determine the three subscale scores ranging from

7 to 35. No total TSWLS score was computed. Within each subscale, higher scores indicate greater life satisfaction for that time frame. This measure takes approximately 5 minutes to complete and has been shown to have strong validity and reliability, with internal consistencies ranging from .91 to .93 (Pavot et al., 1998).

The Rosenberg Self-Esteem Scale (RSES; Rosenberg, 1965) is a 10-item self-report measure used to assess global self-esteem. Items are rated on a 4-point Likert-type scale ranging from 0 (strongly agree) to 3 (strongly disagree). A total score between 0 and 30 is determined by reverse scoring half of the items and then computing a sum of all item scores. Higher scores indicate greater self-esteem. This measure takes less than 5 minutes to complete. Sinclair et al. (2010) reported internal consistencies ranging from .89 to .92 among college student samples.

The Life Experience Survey (LES; Sarason, Johnson, Siegel, 1978) is a self-report questionnaire that addresses events that may have occurred during an individual's lifetime. The standard measure is 47 items, with 3 additional blanks for individuals to write in significant events that were not listed in the measure. The present study also included 10 additional items that are specific to students. Participants indicate if they have experienced an event and how recently it occurred by drawing a check mark in either the "0 to 6 months" column or the "7 to 12 months" column. No response is provided for events that an individual did not experience or for events that occurred more than 12 months prior to testing. For each event that did occur, individuals then rated the impact of the event on a 7-point Likert-type scale ranging from -3 (extremely negative) to 3 (extremely positive). Summing the impact ratings of the events rated as positive yields a positive impact score. Summing the impact ratings of the events rated as negative yields

a negative impact score. This measures is takes approximately 10 minutes to complete.

The Beck Depression Inventory-Second Edition (BDI-II; Beck, Steer, & Brown, 1996) is a 21-item self-report measure used to assess depressive symptomatology. Items are rated on a 4-point scale ranging from 0 to 3, with exact responses varying from item to item. A total score ranging from 0 and 63 is computed by summing each item score. Higher scores indicate greater depressive symptomatology. This measure takes approximately 5 minutes to complete. The BDI-II has been shown to have high concurrent validity and internal consistency (α = .90) within college student samples (Storch, Roberti, & Roth, 2004).

The Beck Anxiety Inventory (BAI; Beck, Epstein, Brown, & Steer, 1988) is a 21-item self-report measure used to assess anxious symptomatology. Items are rated on a 4-point Likert-type scale ranging from 0 (not at all) to 3 (severely). A total score between 0 and 63 is computed by summing each item score. Higher scores indicate greater anxious symptomatology. This measures takes approximately 5 minutes to complete. The BAI has been shown to have moderate concurrent validity and high internal consistency (α =.92; Beck et al., 1988).

The NEO Five Factor Inventory (NEO-FFI; Costa & McCrae, 1992) is a 60 item self-report measure used to assess personality. Items are rated on a 5-point Likert-type scale ranging from 1 (strongly disagree) to 5 (strongly agree). Five broad domain scores (i.e., Neuroticism, Extroversion, Openness to Experience, Agreeableness, Conscientiousness) are calculated by summing participant responses for items within each domain. This measures takes approximately 20 minutes to complete. Internal consistencies range from .75 to .83 for the five broad domains.

Procedure

After participants signed up for the study, a research assistant sent an email asking the participant to send in 10 personally relevant pictures that elicit happy feelings for them. These pictures were utilized in the Personally Relevant Positive Picture MIP for that participant. Additionally, participants were asked to complete a questionnaire about each of the pictures (e.g., how happy does the picture make them feel, is the participant in the picture).

Upon arriving at the laboratory, participants completed the informed consent followed by the questionnaires pertaining to emotional state (i.e., BDI, BAI, TSWLS). Next, their attention was directed to a computer, on which all components of the MIPs were completed, using E-Prime (Version 2) software (Psychology Software Tools, Inc.). Participants were asked to complete an initial rating of 12 emotion and arousal descriptor words (e.g., amused, happy, sad, angry, aroused) using a visual analog scale (VAS: 0-100) ranging from "not at all" to "extremely" in order assess their true baseline emotion at the start of the experimental session. After the initial emotion rating, the research assistant introduced the distracter task and the participant completed the practice condition of the task. The participants then completed the Picture and Vignette MIPs.

The order in which the MIPs were presented in the experiment was based on 3 levels of counterbalancing. First, participants were assigned to complete either the Picture or Vignette MIPs first. Second, stimuli were counterbalanced based on whether they were personally relevant or standardized. Finally, valence was pseudo-randomized with neutral conditions always flanked by positive conditions. Participants who saw the Vignette MIPs first consistently switched between positive and neutral MIPs for the duration of

the experiment. Those who completed the Picture MIPs first followed a similar pattern, though two positive conditions were presented in succession when switching to the Vignette MIPs because there was an uneven number of conditions.

Participants rated the emotion and arousal descriptors prior to and following each induction condition. Each induction condition was followed by the cognitive distracter task to minimize carryover effects. After completing the experimental paradigm, participants completed the remainder of the questionnaires.

Results

Effectiveness of Each MIP Condition

Tables 1 and 2 summarize means and standard deviations for each positive MIP condition of positive and negative emotion descriptors, respectively. To confirm that each positive MIP was effective at inducing positive emotionality (PosE), 4 2 (time) x 5 (positive emotion descriptor) repeated measures ANOVAs (rmANOVAs) were conducted to assess change in ratings of positive emotions from pre-induction to post-induction for each of the four positive induction conditions. Table 3 summarizes the significant main effects of time in all conditions, such that ratings of positive emotion descriptors increased significantly from pre-induction to post-induction Additionally, 4 2 (time) x 4 (negative emotion descriptor) rmANOVAs conducted to assess the impact of these inductions on ratings of negative emotionality (NegE). Table 4 summarizes the significant main effects of time in all conditions, such that ratings of negative emotion descriptors decreased significantly from pre-induction to post-induction. Interestingly, significant main effects of emotion and significant interactions between time and emotion were apparent for nearly all analyses, indicating differences among the 5 positive

emotion descriptors (i.e., amused, excited, happy, joyful, peaceful) as well as differences among the 4 negative emotion descriptors (i.e., angry, annoyed, anxious, sad).

To determine whether changes in emotion were due generally to viewing pictures or reading/writing vignettes, we assessed the effects of the 3 neutral conditions on PosE with 3 2 (time) x 5 (positive emotion descriptor) repeated measures ANOVAs. Tables 5 and 6 summarize means and standard deviations for each neutral MIP condition of positive and negative emotion descriptors, respectively. Table 7 summarized the significant main effects of time in all conditions. However, change was in the opposite direction of the positive inductions resulting in significant decreases in PosE from pre-induction to post-induction. Three 2 (time) x 4 (negative emotion descriptor) rmANOVAs were also conducted to assess change in NegE. Table 8 summarizes the significant increases in NegE in the Personally Relevant Vignette MIP and the Standardized Picture MIP from pre-induction to post-induction. There was no change in the standardized vignette condition. Similar to the positive induction MIPs, there were significant main effects of emotion and significant interactions between time and emotion in the neutral MIPs. Given the significant changes in PosE and NegE in these conditions and the fact that these ratings moved in opposite directions of those in the positive induction conditions, no further analyses were conducted to compare the neutral and positive MIPs.

Finally, a series of paired samples t-tests were computed to assess pre-induction to post-induction changes in arousal. Means and standard deviations of these arousal ratings are presented in Table 9. Results indicated significant increases in arousal in the

four positive MIPs and significant decreases in arousal in the three neutral MIPs, as presented in Table 10.

Direct Comparison of MIPs

In order to evaluate relative differences in the effectiveness of the four positive MIPs, pre-induction and post-induction composite scores for PosE were computed by summing the ratings of the 5 positive emotion descriptors (i.e., amused, excited, happy, joyful, peaceful) at each time point. Next, a PosE change score was computed by subtracting the pre-induction composite score from the post-induction composite score to yield a measure of the magnitude of change from pre-induction to post-induction. A NegE change score was computed in the same manner based on the 4 negative emotion descriptors (i.e., angry, annoyed, anxious, sad). Means and standard deviations of the positive and negative emotionality change scores, as well as arousal change scores, are presented in Table 11.

Pictures versus vignettes

To address the first aim of the study – are there significant differences in the effectiveness of positive Picture and Vignette MIPs - two paired t-tests were conducted based on PosE change scores. Figure 1 illustrates results from the first analysis that compared the Standardized Picture and Vignette MIPs and revealed no significant difference between these MIPs, $t(77) = .15$, $p = .88$, partial $\eta^2 = .00$. The second analysis, presented in Figure 2, compared the Personally Relevant Picture and Vignette MIPs and indicated no significant difference between these MIPs, $t(77) = -.02$, $p = .98$, partial $\eta^2 = .00$. Additional paired t-tests assessing differences the magnitude of NegE change between the Standardized Picture and Vignette MIPs, $t(77) = -1.41$, $p = .16$,

partial η^2 = .03, as well as between the Personally Relevant Picture and Vignette MIPs, $t(77) = -.70$, $p = .48$, partial η^2 = .01, also yielded non-significant results. Finally, differences in the magnitude of arousal change were non-significant between the Standardized Picture and Vignette MIPs, $t(77) = 1.53$, $p = .13$, partial η^2 = .03, and between the Personally Relevant Picture and Vignette MIPs, $t(77) = .59$, $p = .56$, partial η^2 = .01.

Standardized versus personally relevant

To address the second aim of the study - is there a significant difference in the effectiveness of positive Standardized and Personally Relevant MIPs - two paired t-tests were computed based on the PosE change scores. Figure 3 illustrates the results of the first t-test that compared the Standardized and Personally Relevant Picture MIPs and revealed a significant difference between these MIPs, $t(77) = -2.07$, $p = .04$, partial η^2 = .05, such that larger PosE change scores were evident in the Personally Relevant condition. Similarly, Figure 4 illustrates the results of the second t-test that compared the Standardized and Personally Relevant Vignette MIPs and also indicated a significant difference between these MIPs, $t(77) = -2.39$, $p = .02$, partial η^2 = .07, with the Personally Relevant MIP yielding larger PosE change scores. Additional paired t-tests assessing differences in NegE change between the Standardized and Personally Relevant Picture MIPs, $t(77) = .628$, $p = .53$, partial η^2 = .01, as well as between the Standardized and Personally Relevant Vignette MIPs, $t(77) = -1.84$, $p = .86$, partial η^2 = .00, were non-significant. Finally, differences in the magnitude of arousal change were non-significant between the Standard and Personally Relevant Picture MIPs, $t(77) = -1.03$, $p =$

.31, partial η^2 = .01, as well as between the Standardized and Personally Relevant Vignette MIPs, $t(77) = -1.84$, $p = .07$, partial η^2 = .04.

Influences on MIP Effectiveness

Consistent with the previous analyses, PosE change scores were considered to be a measure of MIP effectiveness. Given the sample size in the present study, relationships between questionnaire scores and PosE change scores for the positive MIPs were evaluated using correlation analyses. Though these correlation analyses do not indicate a predictive relationship between questionnaire scores and MIP effectiveness, they are informative with regard to relationships between these variables and provide a starting point for future analyses.

With regard to social desirability, results indicated a significant negative correlation with the PosE change score for the Personally Relevant Vignette MIP suggesting less emotional change among individuals with higher levels of social desirability. Socially desirability was not significantly correlated with the other three positive MIPs (see Table 12).

Results pertaining to emotion regulation and expression revealed that reappraisal was significantly negatively correlated with the Personally Relevant Picture MIP, the Personally Relevant Vignette MIP, and the Standardized Vignette MIP. Suppression was significantly negatively correlated with the Personally Relevant Picture MIP (see Table 13). Taken together, these correlations suggest that individuals who tend to regulate their emotions more, in terms of both reappraisal and suppression, tend to exhibit less of an emotional change in response to the MIPs mentioned above.

Analyses based on measures of emotional functioning indicate significant negative correlations between the Personally Relevant Vignette MIP and past life satisfaction, current life satisfaction, and self-esteem. Effectiveness of this MIP was significantly positively correlated with depressive symptomatology. These correlations suggest that individuals with higher levels of positive emotional functioning (e.g., life satisfaction) displayed a smaller increase in positive emotion, whereas those with high levels of negative emotional functioning (e.g., depressive symptomatology) showed a larger increase in positive emotion in response to this MIP. The remaining three positive MIPs were not significantly correlated with any measures of emotional functioning (see Table 14).

Finally, results regarding personality revealed a significant positive correlation between the Personally Relevant Vignette MIP and neuroticism as well as a significant negative correlation between this MIP and openness, indicating a larger change in positive emotion among individuals with higher levels of neuroticism and a smaller change among those with higher levels of openness. The remaining three positive MIPs were not significantly correlated with any personality subscales (see Table 15).

Evaluating Order Effects

In order to assess potential order effects, a series of rmANOVAs were conducted based on pre- and post-induction ratings of emotion.

To evaluate potential carryover effects across MIPs, a 2 x 8 mixed factorial ANOVA was computed with the positive emotion ratings for the initial baseline and the 7 pre-induction ratings as the within-subjects factor and group (Picture MIPs First group vs. Vignette MIP First group) as a between-subjects factor. Results indicated a significant

within-subjects effect across baseline and pre-induction ratings of positive emotion, $F(7,525) = 19.87$, $p < .001$, partial $\eta^2 = .21$, as well as a significant between-subjects effect, $F(1,75) = 5.55$, $p < .05$, partial $\eta^2 = .07$, suggesting differences in these ratings depending on which type of MIP was seen first. Figure 5 illustrates the baseline and pre-induction ratings of positive emotion for both groups.

A second 2 x 8 mixed factorial ANOVA was computed based on pre-induction NegE ratings. Results revealed a significant within-subjects effect across baseline and pre-induction ratings of negative emotion, $F(7,525) = 5.91$, $p < .001$, partial $\eta^2 = .07$. The between-subjects effect was not significant, $F(1,75) = 2.25$, $p = .14$, partial $\eta^2 = .03$. Figure 6 illustrates the baseline and pre-induction ratings of NegE for both groups. A third 2 x 8 mixed factorial ANOVA assessing baseline and pre-induction arousal ratings within the two groups revealed a significant within-subjects effect across the conditions, $F(7,525) = 4.52$, $p < .001$, partial $\eta^2 = .06$. There was no significant between-subjects effect, $F(1, 75) = .93$, $p = .34$, partial $\eta^2 = .01$. Figure 7 illustrates the baseline and pre-induction ratings of arousal for both groups. These results suggest the presence of carryover effects across conditions as well as differences in positive emotion ratings based on whether Pictures or Vignettes MIPs were completed first.

Also of interest was the evaluation of potential fatigue effects across the course of the experiment. To assess this, a series of mixed factorial ANOVAs were conducted to evaluate change across the four positive MIPs as well as potential differences between the Picture MIP First group and the Vignette MIP First group. The first 2 x 4 mixed factorial ANOVA included group (Picture MIPs First group vs. Vignette MIP First group) as a between-subjects factor and post-induction ratings of PosE for the 4 positive

MIPs as the within-subjects factor. Results indicated non-significant effects for both group, $F(3,228) = 1.37$, $p = .25$, partial $\eta^2 = .02$, and post-induction PosE ratings, $F(1,76) = 1.84$, $p = .18$, partial $\eta^2 = .02$. The second 2 x 4 mixed factorial ANOVA was conducted using NegE ratings. Again, results indicated non-significant effects for both group, $F(3,228) = 1.30$, $p = .27$, partial $\eta^2 = .02$, and post-induction ratings, $F(1,76) = 1.10$, $p = .30$, partial $\eta^2 = .01$. The third 2 x 4 mixed factorial ANOVA assessing post-induction arousal ratings within the Picture MIPs First and Vignette MIPs First groups also revealed non-significant between-subjects, $F(1, 76) = .00$, $p = .95$, partial $\eta^2 = .00$, and within-subjects effects, $F(2, 228) = 1.45$, $p = .23$, partial $\eta^2 = .02$. These results suggest that participants did not experience fatigue effects across the positive emotion induction conditions, regardless of whether they completed the Picture or Vignette MIPs first.

These possible fatigue effects were evaluated within the three neutral MIPs as well. A 2 x 3 mixed factorial ANOVA was conducted to evaluate group as a between-subjects factor and post-induction ratings of PosE for the 3 neutral MIPs as the within-subjects factor. Results revealed no significant between-subjects effect, $F(1, 76) = .45$, $p = .51$, partial $\eta^2 = .01$, or within-subjects effect, $F(2, 152) = .31$, $p = .73$, partial $\eta^2 = .00$. A second 2 x 3 mixed factorial ANOVA using NegE ratings also revealed no significant between-subjects effect, $F(1, 76) = .75$, $p = .39$, partial $\eta^2 = .01$, or within-subjects effect, $F(2, 152) = .80$, $p = .45$, partial $\eta^2 = .01$. A final 2 x 3 mixed factorial ANOVA assessing post-induction arousal ratings also revealed non-significant between-subjects, $F(1, 76) = .10$, $p = .75$, partial $\eta^2 = .00$, and within-subjects effects, $F(2, 152) = .611$, $p = .54$, partial $\eta^2 = .01$. Consistent with the findings regarding the positive

induction conditions, these results suggest that participants did not experience fatigue effects across the neutral induction conditions, regardless of whether they completed the Picture or Vignette MIPs first. Figure 5 illustrates the positive emotionality ratings for the four positive and three neutral MIPs based on their temporal order in the experiment.

Discussion

The present study sought to address two primary questions related to the use and effectiveness of different MIPs. Specifically, we were interested in changes in emotions based on stimuli type (either Picture or Vignette) and relevance to the participant (Personally Relevant or Standardized). Our findings suggest some subtle differences between these MIPs and highlight a number of methodological considerations for emotion induction studies.

Direct comparisons between MIP conditions assessed the relative effectiveness of pictures versus vignettes as well as the relative effectiveness of personally relevant stimuli versus standardized stimuli. The lack of significant differences between the Picture MIPs and the Vignette MIPs was not consistent with our hypothesis that Picture MIPs would be more effective than Vignette MIPs and suggests that neither of these types of MIP is superior to the other. However, the significant differences between the Personally Relevant MIPs and their corresponding Standardized MIPs confirmed our hypotheses, suggesting that stimuli with a higher level of personal relevance may enhance the effectiveness of an MIP whether it is picture-based or vignette-based. Consistent with these findings, the effect sizes for changes in positive emotionality from pre- to post-induction were largest for the two Personally Relevant MIPs. These results underscore the connections between emotion and personal experience that have been

posited by numerous researchers (Adolphs, 2010; Mauss & Robinson, 2009; Philippot, Schaefer, & Herbette, 2003). Despite the large pre- to post-induction effect sizes for each MIP individually and the significant differences between Personally Relevant and Standardized MIPs, is it noteworthy that the effect sizes for the direct comparisons of MIPs were very small.

When evaluated individually, each of the four positive MIPs was effective at increasing positive emotionality and decreasing negative emotionality. The large effect sizes that were seen in the present study for these MIPs are consistent with those discussed in previous reviews (Westermann et al., 1996). Interestingly, the three neutral MIPs also elicited significant changes in positive and negative emotionality, yet in the opposite direction. This was an unexpected finding. These results suggest that these neutral stimuli, which were chosen because they have been used in previous studies (Kuo & Linehan, 2009; Tempesta et al., 2010), are not in fact eliciting a neutral response when used in conjunction with positive emotional stimuli. This calls into question their utility as control stimuli to compare against specific emotion elicitation stimuli, which can be methodologically important for ruling out changes due to non-emotional aspects of the stimuli (i.e., seeing pictures).

An additional methodological consideration arises from the significant differences observed between ratings of specific emotional descriptors (i.e. amused, excited, happy, joyful, peaceful). Though these five emotion descriptors were evaluated together as a composite of positive emotionality in the present study, the significant differences between them suggest that researchers should be mindful of the emotional terminology they choose to utilize. Visual inspection of the present data suggests that the significant

interactions between time and emotion may have been driven by ratings of the word peaceful, which was the only low arousal positively valenced emotion descriptor. Fredrickson (2002) highlights that differences between positive emotions have been largely understudied given that positive emotions, more so than negative emotions, are often considered in emotion-general models, potentially in response to theories of emotion as action tendencies. While different negative emotions (e.g., fear, anger) involve relatively distinct action tendencies (e.g., fear to retreat, anger to attack), different positive emotions all tend to elicit similar approach or continue tendencies that are more general and underspecified. To this end, differences between positive emotions may be more nuanced, and researchers must take care to ensure that the most appropriate positive descriptors are being employed to effectively answer their specific research question.

An additional aim of the present study was to evaluate participant characteristics that may influence the effectiveness of the different types of MIPs. To this end, while the effect sizes seen for the direct comparisons of MIPs were small, researchers may benefit from having a greater understanding of how the individual differences among their participants could differentially affect the effectiveness of these various types of MIPs. Indeed, the results of these correlational analyses suggest that the Personally Relevant Positive Vignette MIP may be particularly unique compared to the other three positive MIPs evaluated in this study.

With regard to social desirability, emotional functioning, and personality, significant correlations were seen only with the Personally Relevant Positive Vignette MIP, indicating that this type of MIP may be systematically different from the other three positive MIPs (namely, Standardized Vignettes, Standardized Pictures, and Personally

Relevant Pictures. Admittedly, the significance of a negative correlation between social desirability and the magnitude of change in this MIP is unclear. Though we might expect participants who respond in socially desirably ways to show a greater change, these individuals may provide higher ratings of their positive emotional state at baseline and thus have less of a range for their positive emotionality to increase. Relationships between measures of emotional functioning and the effectiveness of the Personally Relevant Positive Vignette MIP contradicted our predictions. Though we predicted that higher levels of positive attributes and lower levels of negative attributes would be related to the effectiveness of MIPs, opposite relationships were seen in the significant correlations between past and current satisfaction with life (negative correlations), self-esteem (negative correlation), as well as depressive symptomatology (positive correlation) and the effectiveness of the Personally Relevant Positive Vignette MIP. Based on these findings, it appears that individuals with a generally more positive demeanor are less affected by this MIP, whereas individuals expressing depressive symptomatology have more room to increase and are more greatly impacted.

These results suggest that the Personally Relevant Positive Vignette MIP is most sensitive to individual differences regarding social desirability, emotional functioning, and personality. This begs the question then of whether this MIP should be considered more or less useful than the other positive MIPs evaluated here, and we would argue that this depends largely on the specific aim of the research. For example, if researchers were interested in using pre-assessed individual differences to specifically identify the participants who would be most greatly affected by an MIP, it seems that a Personally Relevant Positive Vignette MIP of this nature (more so than other positive MIPs) would

lend itself well to such an experimental design. However, if researchers aimed to utilize an MIP that is minimally sensitive to variation across participants, one of the other positive MIP types would likely be preferred.

In general, negative relationships between measures of emotion regulation and the effectiveness of three different positive MIPs confirmed our hypothesis that a tendency to regulate one's emotion would minimize the magnitude of change seen from pre-induction to post-induction. The reappraisal and suppression of emotions represent a level of control over emotional expression that limits the likelihood of MIPs having an effect on emotions. Though somewhat unexpected, the non-significant correlations between alexithymia and changes in emotionality were consistent with a recent study by Bausch et al. (2011) in which no significant differences in imagination ability or ratings of valence, arousal, or vividness were seen between healthy women with low and high levels of alexithymia.

Critical to a within-subjects study of this nature is an assessment of potential order effects. Despite the attempt to minimize carryover effects by employing a cognitive distracter task after each condition, it is apparent that baseline ratings fluctuated from one condition to the next based on the emotional valence of the preceding condition. For example, slight increases in positive emotionality were consistently seen in the pre-induction ratings following a positive MIP, whereas slight dips in positive emotionality were seen in pre-induction ratings following a neutral MIP. It is important to note, however, that the use of change scores in the direct comparisons of different MIPs controlled for these differences in pre-induction ratings.

Finally, given that this study involved a large number of MIPs, concerns regarding possible fatigue effects were addressed. These findings revealed no significant declines in positive emotionality or increases in negative emotionality across the four positive MIPs or three neutral MIPs suggesting that participants' response styles did not change over the course of the experiment.

A number of limitations of the present study as well as directions for future research should be acknowledged. First, the present study was limited in that it evaluated of differences between MIPs based on stimuli type (either Picture or Vignette) and relevance to the participant (Personally Relevant or Standardized) only in the context of positive emotion induction. Though the results of the present study provide some insight into differences between MIP types, these findings may not extend to the induction of negative emotion. It would be beneficial for future research to examine difference in the effectiveness of these MIPs in the context of emotions such as fear, sadness, and anger.

Additionally, emotion is a construct of interest within an immensely wide variety of populations, though only college students were evaluated in the present study. The variability of emotional functioning is likely different, and perhaps much more restricted, in student populations compared to others (Flett, Vredenburg, & Krames, 1997), which may have contributed to minimal relationships between emotional expression and functioning variables and the effectiveness of the MIPs. For example, the lack of significant relationships between measures of alexithymia and MIP effectiveness was surprising and may be more likely to emerge in comparable research carried out within clinical populations.

Finally, though this relatively small sample size was sufficient to answer our within-subjects questions regarding effectiveness of the various MIPs, it limited us to evaluating correlational relationships between the questionnaire measures and the effectiveness of these MIPs. Though these findings in the present study provide insight into potential influences on MIP effectiveness, it would be beneficial for future research to more critically evaluate predictive relationships between these variables in the context of a larger sample.

Limitations notwithstanding, this study elucidated interesting results regarding different methods of emotion induction. The effectiveness and large effect size of each of the four positive MIPs indicates that all of these conditions are valuable in the context of emotion induction research. The emergence of personally relevant MIPs as significantly more effective than standardized MIPs suggests that researchers may benefit from tapping into the personally relevant emotional experiences of their participants. However, considering also the minimal effect sizes seen in these comparisons, constraints of the experimental environment (e.g., neuroimaging settings) may also play a significant role in determining which type of MIP would be most effective in future research.

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Appendix A

Leslie had moved away two years ago and was very excited about traveling home for a vacation. Most of all, she was thrilled about visiting her friends who she had not seen in a quite a while. They had gone through so much together and she really missed their daily interactions. They had all decided to meet at their favorite restaurant. Leslie got there before anyone else and was filled with anticipation. As each friend arrived, they shared huge hugs, and the smiles on their faces so obviously showed how happy they were to see each other. As they ate the delicious food, they filled each other in on what had been going on in their lives. One friend had a knack for telling the funniest stories and shared her latest adventures, making the rest of the group laugh hysterically over and over. It seems they did not stop laughing and smiling for the entire meal. Leslie left with the feeling of sheer satisfaction and peace at spending time with good friends.

Lauren will always remember when she won her first tennis match. She was incredibly nervous because she had never played in an official match before. The first half-hour of the match was difficult, but playing against a tough opponent made her extremely motivated. Eventually, the score was tied and either Lauren or her opponent had to win by two points. Lauren was tired but somehow she knew she could win. Her opponent hit a powerful serve. Lauren gathered all her strength, ran to the ball, and shot it back over. Her opponent was unprepared and couldn't reach the ball in time. Lauren heard her coach yell, "excellent shot!" At that point, she was full of adrenaline. The next point was long, but when Lauren's opponent hit the ball and it landed just over the net, Lauren ran up as fast as she could, swung her racket, and hit the ball back with a force that she didn't not even know she was capable of. It was the winning shot of the game. As she walked off the court, she realized that most of her teammates had been watching the whole time. The looks of pride on their faces were unforgettable.

Last year, Allison and her family went on a trip to spend Christmas with their extended family. Everything about that Christmas was magical. When Christmas morning rolled around, there was a blanket of snow on the ground outside. Allison had never seen snow before and was very excited that she was actually experiencing a white Christmas, which she had previously only heard about in songs. Allison's grandparents had a real Christmas tree as well, which she had also never seen before. There were lots of presents under the tree. After the presents were opened, her grandmother and mother started to work on Christmas dinner while the rest of her extended family came over for drinks and to chat. The meal they had for Christmas dinner was huge, with a turkey big enough to feed an army. The food was delicious and they had leftovers for days. This was the first Christmas that Allison got to spend with her entire extended family. It was wonderful and something she surely would never forget it.

Yesterday Sarah walked into class and Chris, the guy she has had a crush on all semester, looked up at her and smiled. She could hardly believe it when he pointed to the open seat next to him and asked if she wanted to sit there. They had talked a bunch of times during class, but he had never saved her a seat before. She smiled back and walked over to sit down next to him. There were still a few minutes before class started so they chatted for a bit about a TV show they both liked that had been on a few nights before. After class, they walked out together, continuing their conversation about the TV show. As they stepped into the hallway, Chris asked Sarah if he could have her phone number. Sarah, of course, said yes and gave it to him, before heading to her next class with a big smile on her face. She was thrilled when he called her the next week to see if she wanted to come over to his house for dinner and to watch the TV show they had talked about.

Appendix B

In the morning, Kate usually wakes up to her alarm going off. She often hits snooze a few times and rolls around in bed for a bit before getting up for the day. When she gets up, she heads into the bathroom to brush her teeth and take a shower. After she gets out of the shower, she looks through her closet and picks out what clothes she wants to wear that day. Then she gets dressed. After she finishes getting ready, she heads downstairs to the kitchen to make breakfast. She usually makes a bagel or toast and eats it with butter or jelly. Once she is finished eating, she puts her dishes into the dishwasher and grabs something to take with her for lunch. Then she heads to school. She sits through classes, takes notes, sometimes goes to the library to work on her homework, and then heads home in the late afternoon. When she gets home, she relaxes for bit, makes dinner, finishes her homework, and watches some TV before going to bed.

Rebecca wakes up and starts her morning by taking a shower. When she gets out of the shower, she gets online to check what the weather will be like for the day and then picks out something to wear. After she gets dressed, she goes downstairs to the kitchen and she decides what kind of cereal she wants to eat for breakfast. She gets a bowl out the cupboard and a spoon out of the silverware drawer. Next, she goes to the refrigerator to get the milk, which she pours on her cereal and puts away before walking back upstairs to her room. She sits at her desk and gets on her computer to check her email while she eats her breakfast. Next, she gathers whatever belongings she will need for the day and puts them in her bag. She brushes her teeth before going back downstairs. She puts her cereal bowl and spoon in the kitchen sink. She double checks that she has her phone and her keys and then heads out of her apartment.

Marie works part time as an office assistant. Her job involves helping the employees who work in the office with many different types of things. She sits at the front desk and spends most of her time answering and returning phone calls, scheduling appointments clients, and directing visitors who come into the office. She also files paperwork, copies various documents, and occasionally sends faxes. Sometimes Marie is responsible for entering data from various projects that are being conducting around the office. She starts by entering the information into a spreadsheet application. She usually double checks to make sure that all of the information has been entered accurately. When the employees want charts to graphically display the data, Marie highlights the relevant columns to make bar charts, pie charts, etc. She adjusts the colors, the title, the font size, etc. to make sure that the charts look presentable.

On a typical day, Karen wakes up about an hour before she starts class or work. She has cereal and coffee for breakfast while she reads the current news online. She then gets dressed and brushes her teeth, before gathering her books and heading out. When she goes to work, she sits at the front desk and help students who come into the office. She usually gives them directions to various buildings on campus and answers questions that they have. When she goes to class, she sits and listens to the teacher while she takes notes. After class is over, she walks back to her apartment, makes dinner in the evening, sits around, and chats with her roommate before starting her homework for the night. After she finishes her homework, she usually takes a shower and then relaxes and catches up on a few TV shows. When she starts getting tired, she heads to bed. Before going to sleep, she checks her alarm to make sure that it is set for the next morning.

Table 1

Means and Standard Deviations of Positive Emotion Descriptor Ratings for the Positive MIPS

	Pre-Induction		Post-Induction	
	M	*SD*	*M*	*SD*
Personally Relevant Positive Pictures				
Amused	43.75	18.69	63.74	17.08
Excited	50.84	17.02	67.46	16.41
Happy	55.85	15.78	74.72	17.15
Joyful	51.45	17.78	71.63	16.27
Peaceful	52.57	17.73	66.76	16.61
Standardized Positive Pictures				
Amused	42.45	19.94	61.13	15.33
Excited	49.61	18.91	63.43	15.20
Happy	55.25	16.39	69.92	15.01
Joyful	50.55	15.80	67.21	15.25
Peaceful	54.21	17.91	63.46	17.25
Personally Relevant Positive Vignettes				
Amused	48.74	18.35	65.23	19.95
Excited	51.83	18.51	73.54	17.25
Happy	60.18	15.89	81.21	15.01
Joyful	53.72	17.31	75.87	15.51
Peaceful	54.81	18.06	64.48	18.81
Standardized Positive Vignettes				
Amused	45.72	20.06	59.61	18.55
Excited	50.58	18.02	66.80	19.55
Happy	50.47	18.78	72.68	17.79
Joyful	55.14	17.66	67.74	19.24
Peaceful	55.94	17.50	63.43	16.30

Note. $N = 78$.

Table 2

Means and Standard Deviations of Negative Emotion Descriptor Ratings for the Positive MIPs

	Pre-Induction		Post-Induction	
	M	*SD*	*M*	*SD*
Personally Relevant Positive Pictures				
Angry	24.52	20.81	16.37	17.93
Annoyed	40.20	24.55	21.11	18.97
Anxious	47.97	20.86	41.21	24.64
Sad	26.02	21.21	24.22	23.41
Standardized Positive Pictures				
Angry	26.22	21.85	17.31	19.64
Annoyed	40.52	24.36	25.09	20.66
Anxious	46.18	21.98	39.07	23.09
Sad	25.97	21.69	20.34	20.43
Personally Relevant Positive Vignettes				
Angry	23.47	20.95	14.50	17.43
Annoyed	38.86	22.67	17.41	18.14
Anxious	49.71	19.92	44.63	28.64
Sad	21.18	20.02	23.58	22.75
Standardized Positive Vignettes				
Angry	23.61	21.99	16.82	18.35
Annoyed	37.56	23.52	24.65	19.87
Anxious	48.41	22.34	44.48	21.66
Sad	24.79	24.56	21.86	20.06

Note. $N = 78$.

Table 3

Repeated Measures ANOVAs Evaluating Change in Positive Emotionality in the Positive MIP Conditions

	df	*F*	partial η^2
Personally Relevant Positive Pictures			
Time	1, 77	141.17***	.65
Emotion	4, 308	15.63***	.17
Time x Emotion	4, 308	2.37	.03
Standardized Positive Pictures			
Time	1, 77	76.04***	.50
Emotion	4, 308	16.15***	.17
Time x Emotion	4, 308	4.36**	.05
Personally Relevant Positive Vignettes			
Time	1, 77	104.75***	.58
Emotion	4, 308	27.52***	.26
Time x Emotion	4, 308	7.84***	.09
Standardized Positive Vignettes			
Time	1, 77	57.05***	.43
Emotion	4, 308	20.11***	.21
Time x Emotion	4, 308	4.04**	.05

Note. $N = 78$.
** $p < .01$, ***$p < .001$.

Table 4

Repeated Measures ANOVAs Evaluating Change in Negative Emotionality in the Positive MIP Conditions

	df	*F*	partial η^2
Personally Relevant Positive Pictures			
Time	1, 77	59.75***	.44
Emotion	3, 231	40.33***	.34
Time x Emotion	3, 231	14.06***	.15
Standardized Positive Pictures			
Time	1, 77	51.80***	.40
Emotion	3, 231	40.81***	.35
Time x Emotion	3, 231	7.25***	.09
Personally Relevant Positive Vignettes			
Time	1, 77	38.24***	.33
Emotion	3, 231	56.30***	.42
Time x Emotion	3, 231	13.69***	.15
Standardized Positive Vignettes			
Time	1, 77	23.01***	.23
Emotion	3, 231	58.07***	.43
Time x Emotion	3, 231	4.92**	.06

Note. $N = 78$.
** $p < .01$, ***$p < .001$.

Table 5

Means and Standard Deviations of Positive Emotion Descriptor Ratings for the Neutral MIPs

	Pre-Induction		Post-Induction	
	M	*SD*	*M*	*SD*
Standardized Neutral Pictures				
Amused	53.24	16.18	38.61	18.34
Excited	60.23	15.41	38.01	18.22
Happy	60.96	15.51	50.75	15.21
Joyful	60.15	15.65	45.24	16.17
Peaceful	59.50	17.61	52.51	15.73
Personally Relevant Neutral Vignettes				
Amused	50.60	19.19	41.54	20.35
Excited	57.35	17.16	45.45	17.64
Happy	67.26	17.29	55.36	18.24
Joyful	59.06	14.58	48.41	16.64
Peaceful	60.47	16.22	49.93	18.13
Standardized Neutral Vignettes				
Amused	49.25	17.49	42.42	18.17
Excited	58.18	17.41	41.01	19.40
Happy	62.95	15.38	55.43	15.56
Joyful	57.87	18.03	48.29	16.30
Peaceful	57.39	17.41	54.72	16.36

Note. $N = 78$.

Table 6

Means and Standard Deviations of Negative Emotion Descriptor Ratings for the Neutral MIPs

	Pre-Induction		Post-Induction	
	M	*SD*	*M*	*SD*
Standardized Neutral Pictures				
Angry	21.81	21.63	25.66	20.65
Annoyed	33.44	23.56	40.87	22.49
Anxious	47.00	19.42	42.65	21.02
Sad	24.64	22.85	30.76	22.94
Personally Relevant Neutral Vignettes				
Angry	21.12	20.89	27.31	20.78
Annoyed	34.03	21.96	44.62	23.87
Anxious	48.88	19.74	48.79	22.55
Sad	26.03	22.29	27.52	20.86
Standardized Neutral Vignettes				
Angry	21.84	20.25	24.76	20.62
Annoyed	34.31	22.88	39.77	21.22
Anxious	45.43	22.48	41.74	21.79
Sad	22.90	21.66	25.49	20.64

Note. $N = 78$.

Table 7

Repeated Measures ANOVAs Evaluating Change in Positive Emotionality in the Neutral MIP Conditions

	df	*F*	partial η^2
Standardized Neutral Pictures			
Time	1, 77	61.18***	.44
Emotion	4, 308	19.08***	.20
Time x Emotion	4, 308	13.76***	.15
Personally Relevant Neutral Vignettes			
Time	1, 77	47.78***	.38
Emotion	4, 308	26.18***	.25
Time x Emotion	4, 308	.68	.01
Standardized Neutral Vignettes			
Time	1, 77	37.01***	.33
Emotion	4, 308	24.53***	.24
Time x Emotion	4, 308	14.28***	.16

Note. $N = 78$.
***$p < .001$.

Table 8

Repeated Measures ANOVAs Evaluating Change in Negative Emotionality in the Neutral MIP Conditions

	df	*F*	partial η^2
Standardized Neutral Pictures			
Time	1, 77	6.47*	.08
Emotion	3, 231	37.23***	.32
Time x Emotion	3, 231	7.24***	.09
Personally Relevant Neutral Vignettes			
Time	1, 77	9.17**	.11
Emotion	3, 231	47.81***	.38
Time x Emotion	3, 231	6.07***	.07
Standardized Neutral Vignettes			
Time	1, 77	2.41	.03
Emotion	3, 231	47.11***	.38
Time x Emotion	3, 231	3.92**	.05

Note. $N = 78$.
* $p < .05$, ** $p < .01$, ****p* < .001.

Table 9

Means and Standard Deviations of Arousal Ratings for the All MIPs

	Pre-Induction		Post-Induction	
	M	*SD*	*M*	*SD*
Positive Conditions				
Personally Relevant Pictures	21.81	20.28	56.43	21.22
Standardized Pictures	35.91	19.18	52.39	19.93
Personally Relevant Vignettes	41.37	22.33	58.52	23.35
Standardized Vignettes	37.21	20.16	49.36	21.17
Neutral Conditions				
Standardized Pictures	45.95	19.83	34.34	18.42
Personally Relevant Vignettes	45.42	22.19	39.48	19.49
Standardized Vignettes	43.13	22.56	36.35	19.73

Note. $N = 78$.

Table 10

Paired Samples T-Tests Evaluating Pre-Induction to Post-Induction Change in Arousal in the all MIP Conditions

	df	*t*	partial η^2
Positive Conditions			
Personally Relevant Pictures	77	-8.05***	.46
Standardized Pictures	77	-7.19***	.40
Personally Relevant Vignettes	77	-6.51***	.36
Standardized Vignettes	77	-6.06***	.32
Neutral Conditions			
Standardized Pictures	77	4.84***	.23
Personally Relevant Vignettes	77	2.76**	.09
Standardized Vignettes	77	2.78**	.09

Note. $N = 78$.
** $p < .01$, ***$p < .001$.

Table 11

Means and Standard Deviations of Positive Emotionality, Negative Emotionality, and Arousal Change Scores in the Positive MIPs

	M	*SD*
Personally Relevant Pictures		
Positive Emotionality	17.97	13.36
Negative Emotionality	-8.95	10.22
Arousal	18.92	20.76
Standardized Pictures		
Positive Emotionality	13.42	14.15
Negative Emotionality	-9.27	11.38
Arousal	16.48	20.24
Personally Relevant Vignettes		
Positive Emotionality	18.01	15.54
Negative Emotionality	-7.78	11.11
Arousal	17.15	23.25
Standardized Vignettes		
Positive Emotionality	13.08	15.30
Negative Emotionality	-6.64	12.23
Arousal	12.15	17.72

Note. $N = 78$.

Table 12

Correlations Between Positive MIP Change Scores and Social Desirability

	PR Pictures	Strd Pictures	PR Vignettes	Strd Vignettes	*M*	*SD*
1. MCSDS	-.01	.01	-.32**	-.07	16.04	5.17

Note. $N = 78$. PR = Personally Relevant; Strd = Standardized; MCSDS = Marlow-Crowne Social Desirability Scale.
* $p < .05$, ** $p < .01$, ***$p < .001$.

Table 13

Correlations Between Positive MIP Change Scores and Measures of Emotional Regulation and Expression

	PR Pictures	Strd Pictures	PR Vignettes	Strd Vignettes	*M*	*SD*
1. TAS-DIF	.01	-.04	-.01	.12	13.68	4.58
2. TAS-DDF	-.11	.03	-.01	.09	12.54	4.27
3. TAS-EOT	.04	-.01	.07	.08	18.30	4.40
4. ERQ-R	-.28*	.15	-.26*	-.25*	30.74	5.34
5. ERQ-S	-.32**	-.04	-.19	-.21	12.55	4.32

Note. $N = 78$. PR = Personally Relevant; Strd = Standardized; TAS-DIF = Toronto Alexithymia Scale – Difficulty Identifying Feelings; TAS-DDF = Toronto Alexithymia Scale – Difficulty Describing Feelings, TAS-EOT = Toronto Alexithymia Scale – Externally-Oriented Thinking. ERQ-R = Emotion Regulation Questionnaire – Reappraisal; ERQ-S = Emotion Regulation Questionnaire – Suppression.
* $p < .05$, ** $p < .01$, ***$p < .001$.

Table 14

Correlations Between Positive MIP Change Scores and Measures of Emotional Functioning

	PR Pictures	Strd Pictures	PR Vignettes	Strd Vignettes	*M*	*SD*
1. TSWL-Past	.03	-.04	-.32**	.10	24.71	5.88
2. TSWL-Current	-.09	.05	-.38***	-.03	23.60	6.76
3. TSWL-Future	-.07	.02	-.12	-.09	25.46	5.24
4. RSES	-.09	-.08	-.39***	-.16	23.25	5.00
4. LES - Positive	.04	.16	-.14	.10	9.74	5.45
4. LES - Negative	.10	-.05	.07	.20	8.21	5.49
5. BDI	-.08	-.01	.26*	.15	7.78	6.42
6. BAI	.03	.01	.12	.01	8.18	5.63

Note. $N = 78$. PR = Personally Relevant; Strd = Standardized; TSWL = Temporal Satisfaction with Life; RSES = Rosenberg Self-Esteem Scale; LES = Life Experiences Scale; BDI = Beck Depression Inventory; BAI = Beck Anxiety Inventory.
* $p < .05$, ** $p < .01$, ***$p < .001$.

Table 15

Correlations Between Positive MIP Change Scores and Personality

	PR Pictures	Strd Pictures	PR Vignettes	Strd Vignettes	*M*	*SD*
1. NEO-N	.18	.08	.25*	.19	21.41	8.26
2. NEO-E	-.03	.07	-.05	-.01	33.01	5.36
3. NEO-O	-.17	-.00	-.23*	-.12	27.38	6.66
4. NEO-A	.10	.03	-.20	.03	31.95	4.84
5. NEO-C	-.04	.01	-.08	.01	34.03	6.05

Note. $N = 78$. PR = Personally Relevant; Strd = Standardized; NEO-N = Neuroticism; NEO-E = Extroversion; NEO-O = Openness; NEO-A = Agreeableness; NEO-C = Conscientiousness.

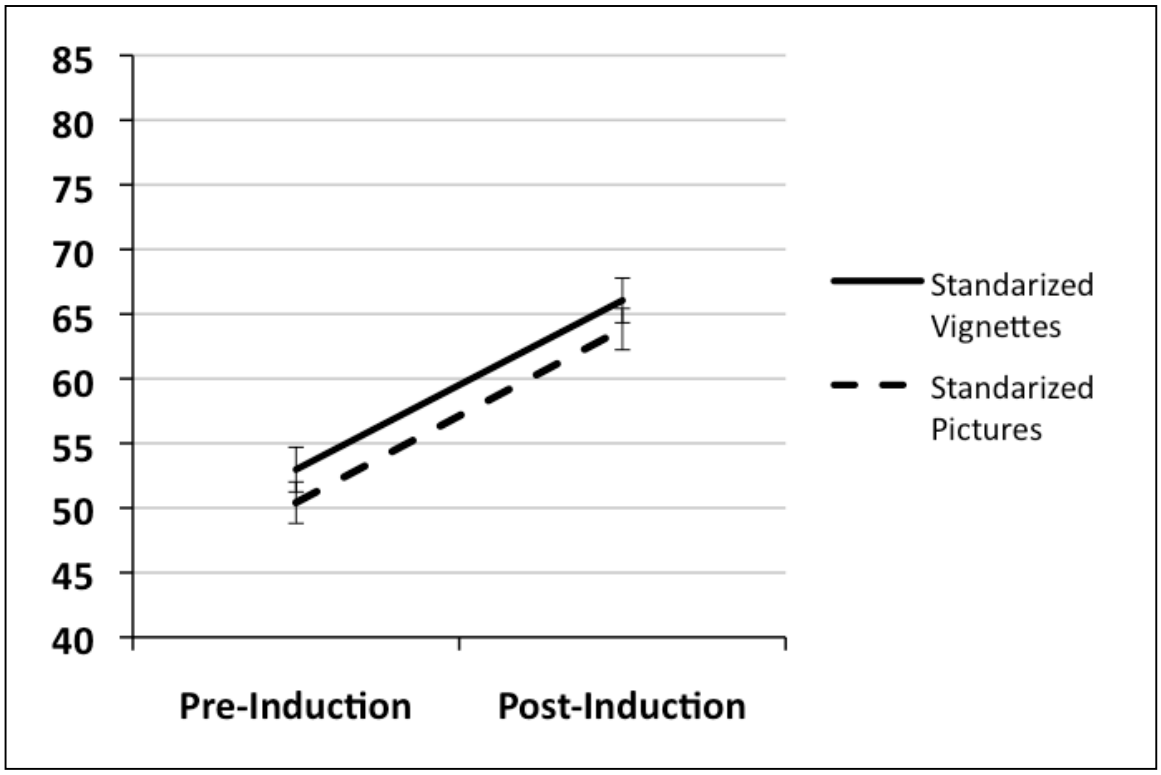

Figure 1. *Comparison of change in* mean (SEM) *positive emotionality ratings for the Standardized Positive Vignette and Picture MIPs.*

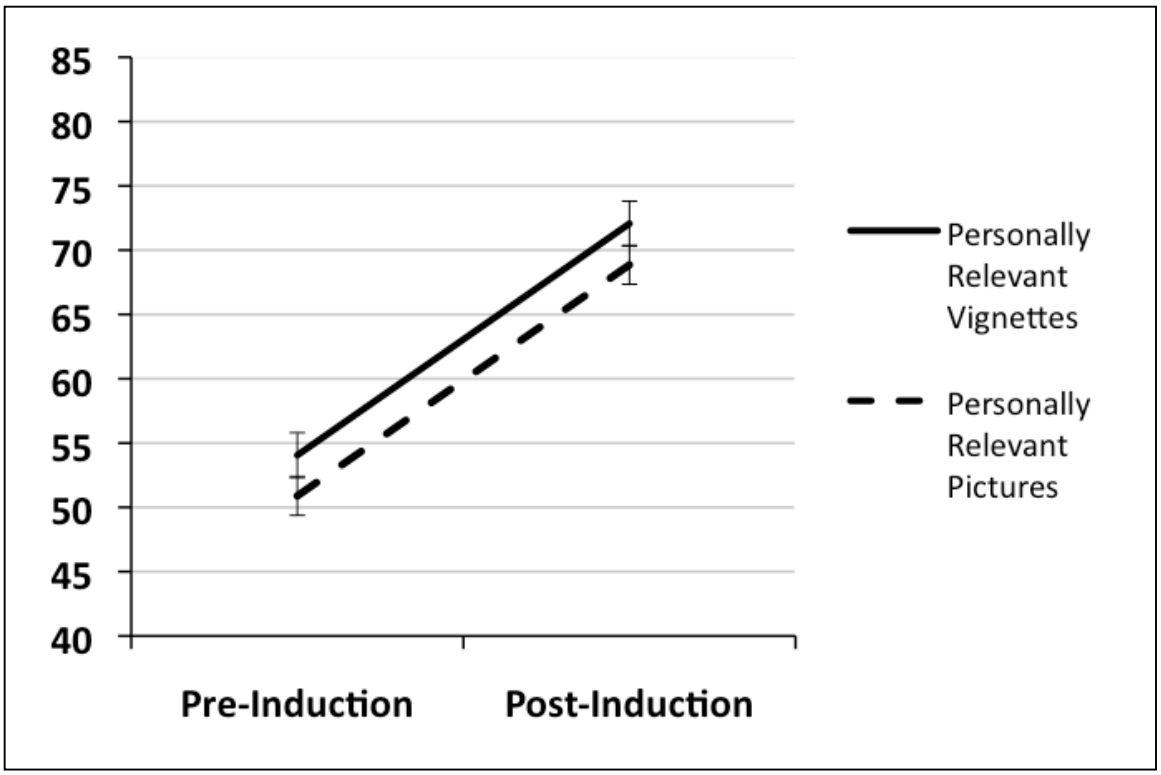

Figure 2. *Comparison of change in* mean (SEM) *positive emotionality ratings for the Personally Relevant Positive Vignette and Picture MIPs.*

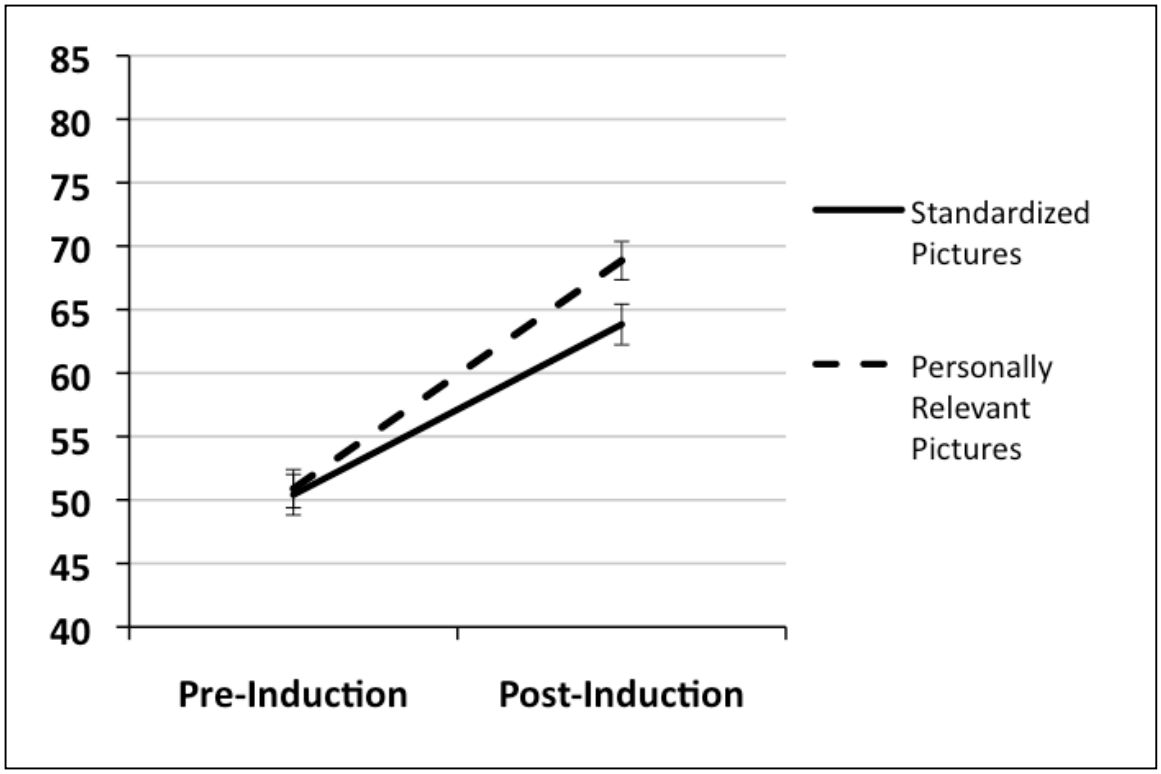

Figure 3. *Comparison of change in* mean (SEM) *positive emotionality ratings for the Standardized Positive Picture and Personally Relevant Positive Picture MIPs.*

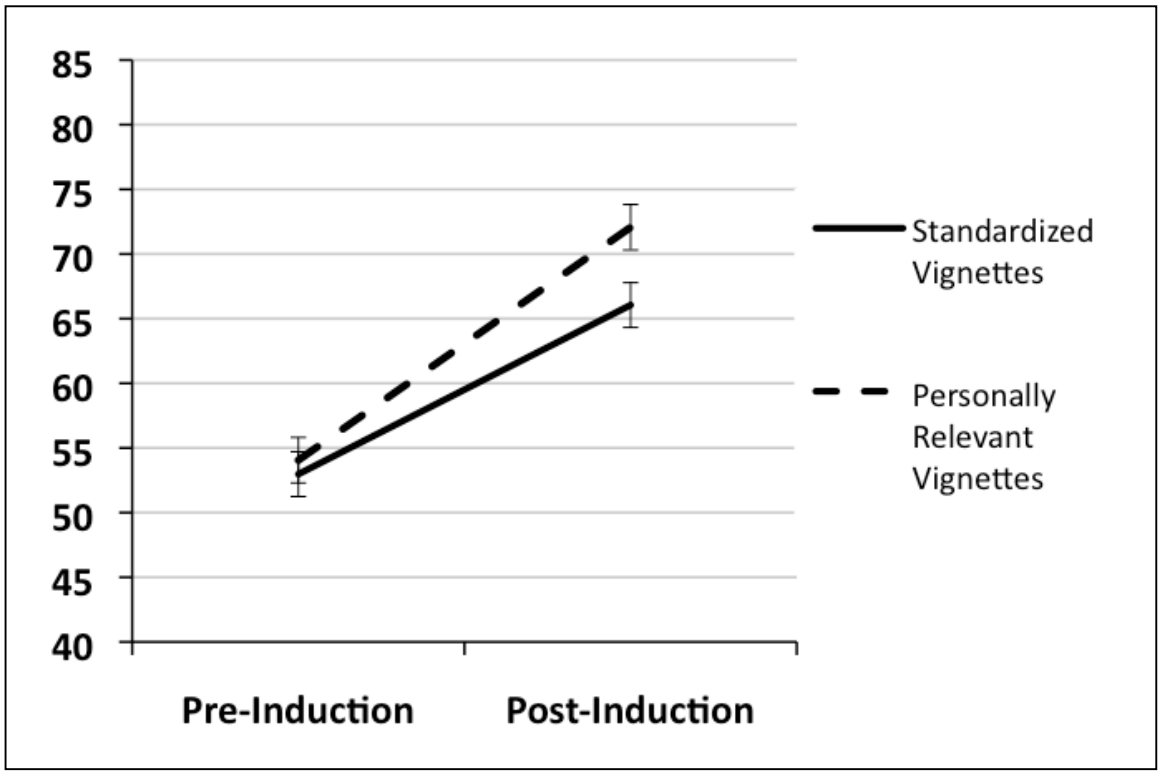

Figure 4. *Comparison of change in* mean (SEM) *positive emotionality ratings for the Standardized Positive Vignette and Personally Relevant Positive Vignette MIPs.*

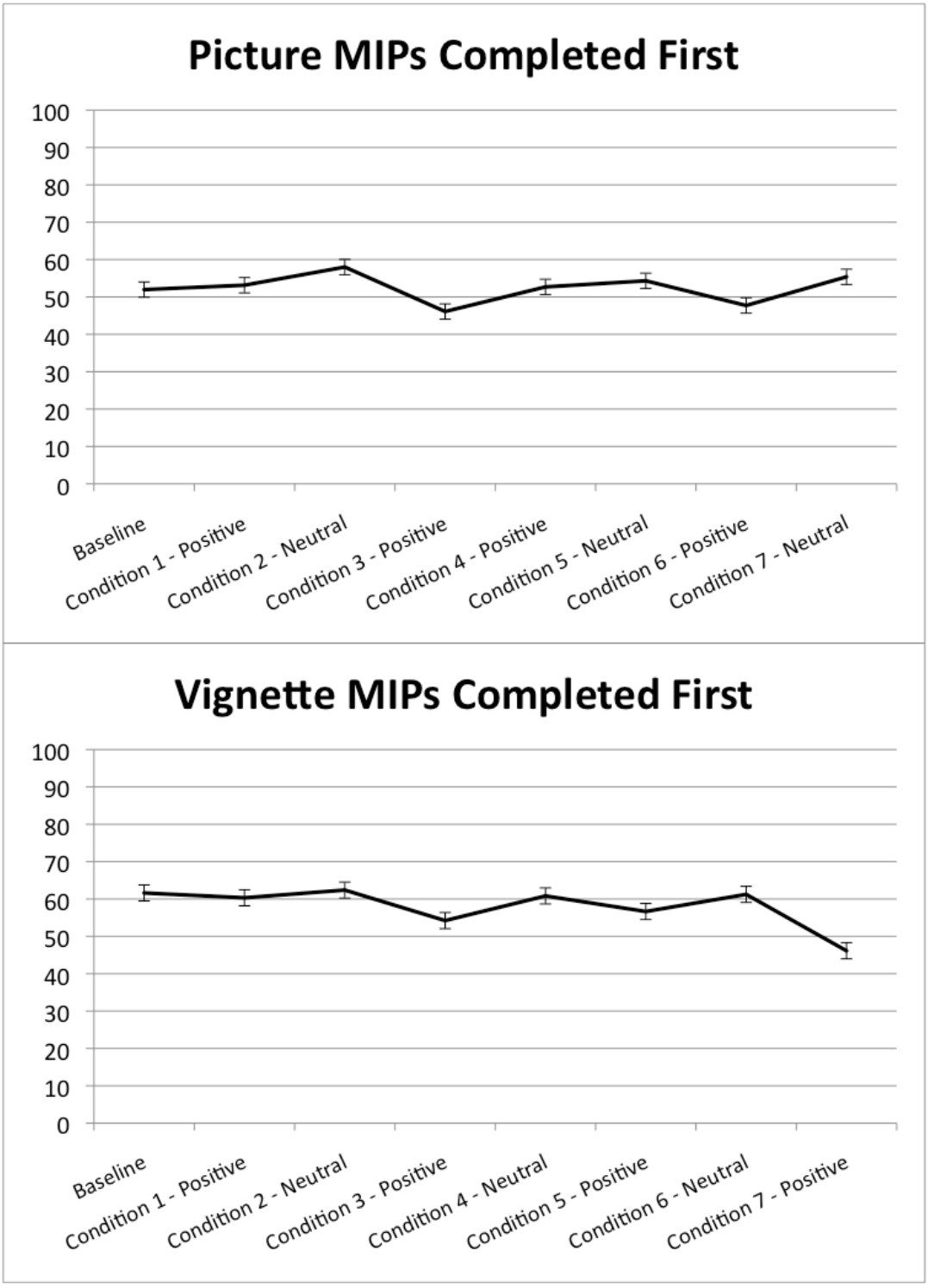

Figure 5. *Baseline and pre-induction* mean (SEM) *ratings of positive emotionality across all MIPs (split by group due to differences in the order of positive and neutral conditions).*

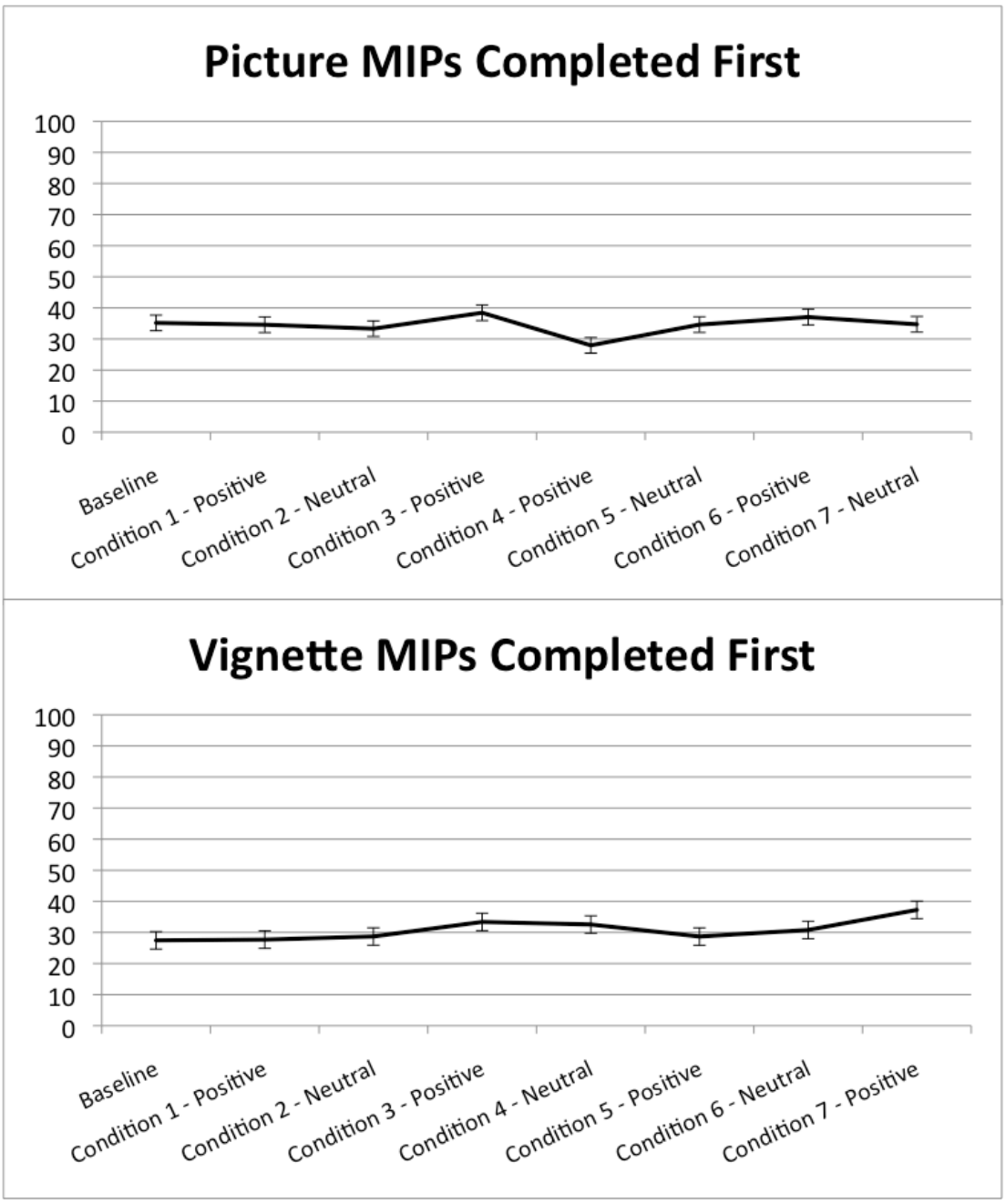

Figure 6. *Baseline and pre-induction* mean (SEM) *ratings of negative emotionality across all MIPs (split by group due to differences in the order of positive and neutral conditions).*

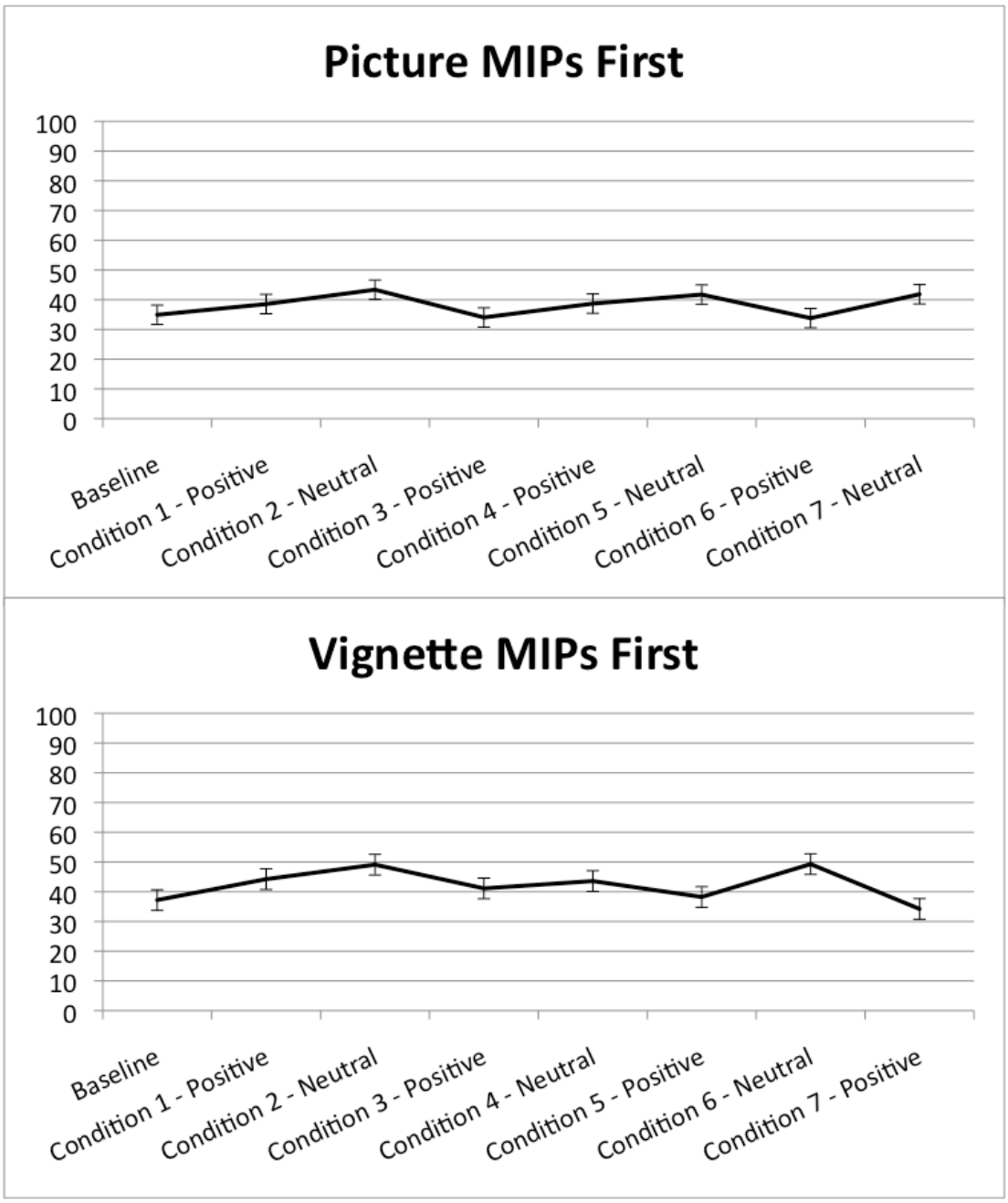

Figure 7. *Baseline and pre-induction* mean (SEM) *ratings of arousal across all MIPs (split by group due to differences in the order of positive and neutral conditions).*

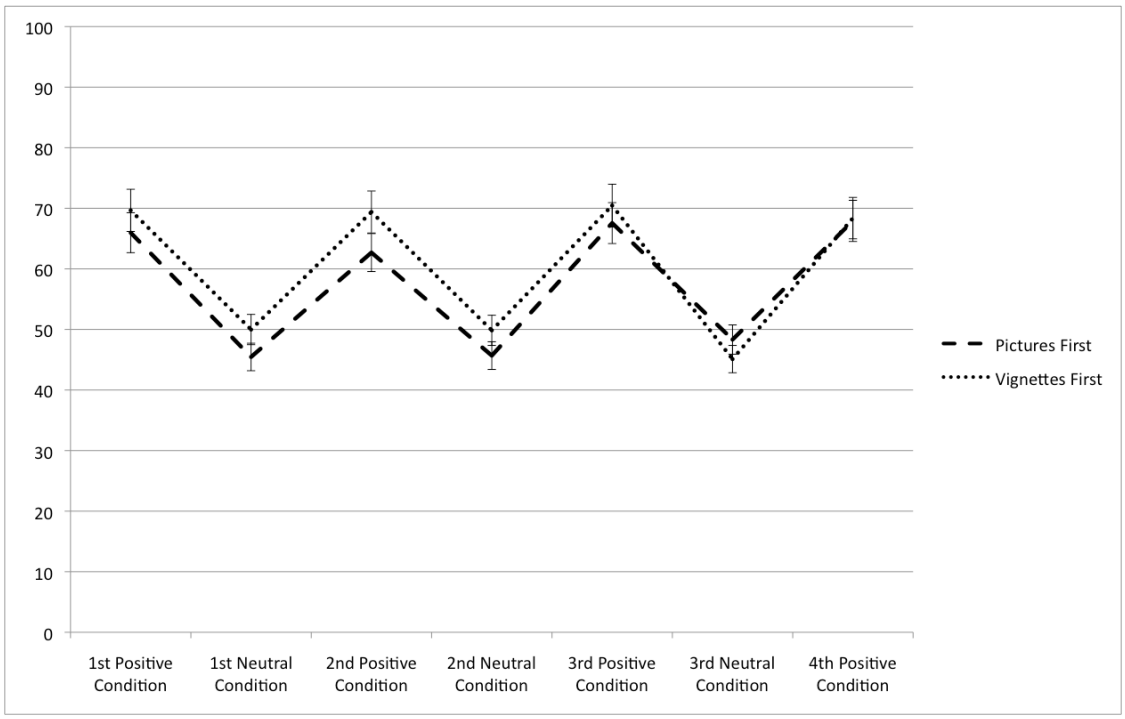

Figure 8. *Post-Induction* mean (SEM) *ratings of positive emotionality across all MIPs.*