Cognitive Consequences of Expressive Suppression: Effects of Sex and Emotional Valence

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Abstract

The present research was designed to examine whether sex and/or emotional valence play a role in the cognitive consequences (e.g., memory) of expressive suppression. Seventy-two (36 male and 36 female) undergraduates were randomly assigned to either a control or expressive suppression condition, and were asked to watch silent film clips intended to elicit amusement and disgust. While watching each film, participants listened to sixteen nonemotional words. After each film, participants were asked to answer questions about what they had seen in the film (visual memory), to recall as many words as they could (auditory recall memory), and to select from a list any words that they had heard during the previous film clip (auditory recognition memory).

With regard to the effects of expressive suppression on *visual memory*, results indicated a 3-way interaction between condition, sex and film emotion: Men performed more poorly than women on the visual memory test after watching both the amusing and disgusting films in the control condition, and when watching the amusing film in the expressive suppression condition. However, men in the expressive suppression condition performed better than women after watching the disgusting film. In terms of the effects of expressive suppression on *auditory memory* (recognition and recall), a condition x film emotion interaction indicated that there was no difference in auditory memory for the expressive suppression and control conditions when watching the amusing film, but that the expressive suppression group showed poorer auditory memory than the control group for words presented during the disgusting film. Moreover, a main effect of sex on auditory memory suggested that men recalled and recognized more words than women across conditions.

Taken together, these findings suggest that both sex and the emotional valence of films may influence the effects of expressive suppression on memory. Results will be discussed in the context of previous literature concerning the effects of expressive suppression on cognition.

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Introduction

Expressive suppression has become a popular target of contemporary research on emotion regulation. This interest likely stems from the fact that expressive suppression is one of the most commonly employed emotion regulatory strategies, and it leads to both positive and negative outcomes for multiple emotion-related systems (e.g., behavioral, experiential, physiological, cognitive) (Gross, 2002; Gross & Thompson, 2007). For instance, empirical evidence has indicated that using expressive suppression efficiently reduces emotionally expressive behavior, which is a desirable outcome in some situations (Goldin, McRae, Ramel, & Gross, 2008; Gross, 1998; Gross & Levenson, 1993, 1997; Huang & Guo, 2002). However, decreasing emotionally expressive behavior seems to have negative experiential, physiological, and cognitive (e.g., memory) consequences (Goldin et al., 2008; Gross, 1998; Gross & Levenson, 1993, 1997; Hagemann, Levenson, & Gross, 2006; Li & Lu, 2007; Richards, Butler, & Gross, 2003; Richards & Gross, 1999, 2000, 2006). The present study was designed to investigate the potential effects of sex and emotional valence on the cognitive consequences of expressive suppression, specifically memory.

Though scientists have spent a great deal of time investigating expressive suppression and its outcomes, two important limitations characterize these studies. First of all, prior research concerning the cognitive consequences of expressive suppression has examined either a single specific emotion (i.e., disgust) or general negative affective states (e.g., emotion elicited after viewing a war film or having a conversation about relationship conflicts). As a result, it remains unclear whether the cognitive consequences of expressive suppression vary across diverse emotional states. Second, the vast majority

of previous studies examining expressive suppression have only included female participants. Researchers have often justified these restricted samples by stating that women are more easily emotionally aroused than men. However, it is likely that female-only samples are also the product of convenience sampling: samples are invariably drawn from undergraduate psychology participant pools, and women comprise a much greater proportion of such groups than men. Because of the lack of male participants, investigators have not rigorously examined potential sex differences with regard to the cognitive consequences of expressive suppression.

In the following sections, I will first define emotion regulation and expressive suppression, and will present the empirical findings concerning the outcomes of expressive suppression, with an emphasis on the cognitive consequences (e.g., how expressive suppression affects memory for information when negative affect is induced). I will then review prior studies examining the influence of positive affect on cognition and sex differences in emotional responses (e.g., experience and expression of emotion). Finally, I will integrate the existing literature and propose the research questions and hypotheses to be tested in the present study.

Emotion Regulation

Definitional Issues

There are many issues related to defining emotion regulation, four of which have been identified as particularly important. These four issues include: emotions as regulating versus regulated, intrinsic versus extrinsic processes of regulation, up versus down regulation, and conscious versus unconscious regulation (Gross & Thompson, 2007). Each of these will be discussed in turn.

First, emotion regulation can refer to two different processes in terms of the target of regulation: emotions themselves are regulated (emotion as regulated), or emotions regulate something else, such as thoughts, behaviors, or physiology (emotion as regulating). In this research, the emotion regulation strategy under consideration was expressive suppression, which was enacted to reduce emotional behavior. This process might cause changes in experiential and physiological responding (Goldin et al., 2008; Gross, 1998; Gross & Levenson, 1993, 1997; Hagemann et al., 2006). In the present study, then, emotion regulation refers to the process by which emotions were themselves regulated.

Second, emotion regulation refers to intrinsic processes (people regulate their own emotions), extrinsic processes (people regulate others' emotions), or both (people regulate others' emotions for the purpose of calming themselves down). Because the current study required participants to engage in an experimental session individually, the target of emotion regulation only could be the participants themselves. Thus, only intrinsic emotion regulation was investigated in this study.

The third issue concerns whether emotions are amplified (up regulation; e.g., a person laughs out loud when his friend tells him a joke, even if the joke is not that funny) or diminished (down regulation; e.g., a scholarship winner inhibits signs of happiness from his friend who didn't get this scholarship). Expressive suppression involves minimizing facial expression and/or body movement in order to control emotions. For this reason, the present research focused only on down regulation.

Fourth, emotion regulatory processes may be automatic (people regulate emotions without awareness) or controlled (people consciously regulate emotions). Although some

researchers consider conscious and unconscious regulatory processes as two distinct categories (Masters, 1991), others have suggested that emotion regulatory processes might be better represented as a continuum ranging from conscious, effortful, and controlled to unconscious, effortless, and automatic (Gross & Thompson, 2007). Given the limitations of current research measures, it is difficult to assess automatic emotion regulation processes. The present research focused on controlled emotion regulation (i.e., participants were given instructions to regulate their emotions). However, it is possible that automatic emotion regulation also might have occurred in the experimental session, especially for participants assigned to the control condition (in which participants did not receive instructions to hide their emotions).

Two Emotion Regulatory Strategies: Cognitive reappraisal versus Expressive Suppression

There are many ways that a person can go about regulating their emotions. Cognitive reappraisal and expressive suppression are two of those many forms of emotion regulation, and they have received the most attention from researchers. Cognitive reappraisal is defined as "construing a potentially emotion-eliciting situation in nonemotional terms" (Gross, 2002, p. 283). It refers to altering the direction or intensity of potential emotions by changing how we think about the situation or how we assess our ability to accomplish tasks posed in the situation. It is usually enacted before emotional responses are initiated (Goldin et al., 2008; Gross, 1998, 2002; Gross, Richards, & John, 2006; Gross & Thompson, 2007; Mauss, Cook, Cheng, & Gross, 2007; Ray, Wilhelm, & Gross, 2008). An example of cognitive reappraisal is a medical school student reminding himself that "I am learning how to perform an operation" while observing an amputation

surgery in order to regulate feelings of disgust. In contrast to cognitive reappraisal, expressive suppression occurs after emotional responses have been triggered (Goldin et al., 2008; Gross, 1998, 2002; Gross & Levenson, 1993, 1997; Gross, Richards, et al., 2006; Gross & Thompson, 2007). It involves processes by which individuals inhibit ongoing outward emotional signs (Gross, 2002). An example of expressive suppression is a presenter who hides his embarrassment when he cannot answer an audience member's question.

Although cognitive reappraisal and expressive suppression both involve down regulation of emotion, scientists have questioned whether one strategy has more to recommend it than the other. Several studies have been conducted to address this question, the majority of which suggest that cognitive reappraisal is more adaptive than expressive suppression in terms of their outcomes (Goldin et al., 2008; Gross, 1998; Richards, Butler, et al., 2003, Richards & Gross, 2000). In the next section, I will review the literature concerning expressive suppression and contrast its consequences with those of cognitive reappraisal.

The Consequences of Expressive Suppression

In the past decade, scientists have looked at various correlates and consequences of using expressive suppression (Butler, Lee, & Gross, 2007; Goldin et al., 2008; Gross, 1998; Gross & Levenson, 1993, 1997; Hagemann et al., 2006; Matsumoto, 2008; Richards, Butler, et al., 2003; Richards & Gross, 1999, 2000, 2006; Soto, Levenson, & Ebing, 2005). Procedures in most studies include assigning participants to a expressive suppression or control condition (in some cases, researchers also include a cognitive reappraisal condition) and showing them negative and/or positive stimuli (e.g., slides,

music, or film clips). In the cognitive reappraisal condition, participants are typically asked to adopt a detached and unemotional attitude during exposure to the stimuli. In the expressive suppression condition, participants are asked to behave in such way that a person viewing or listening to them would not know that they were feeling anything at all. In the control condition, participants are simply asked to view or listen to the stimuli.

In an influential set of laboratory studies, Gross and colleagues provided considerable evidence that suppressive processes could affect behavioral, subjective, and physiological responses (Butler et al., 2007; Goldin et al., 2008; Gross, 1998; Gross & Levenson, 1993, 1997; Hagemann et al., 2006). In one representative study, Gross (1998) showed participants a disgust-eliciting film under one of three experimental conditions (cognitive reappraisal, expressive suppression, control). During the procedure, participants were videotaped, and their physiological responses were monitored. Participants were asked to use emotion-rating forms to describe their emotional experience while watching the film. Results from the videotapes indicated that both expressive suppression and cognitive reappraisal decreased expressive behavior. However, while cognitive reappraisal had no observable consequences in terms of sympathetic activation, expressive suppression increased sympathetic activation (e.g., increased skin conductance and vasoconstriction). Moreover, cognitive reappraisal decreased the experience of disgust, whereas expressive suppression did not influence the emotional experience.

These results were replicated in another study in which both negative and positive emotions were tested (Gross & Levenson, 1997). One hundred and eighty female participants were randomly assigned to one of two conditions (expressive suppression,

control). The participants were asked to watch three film clips, each of them intended to elicit one specific emotional state (amusement, neutral, sadness). Similar to the previously-described research, behavioral, subjective, and physiological data were collected. As predicted, expressive suppression diminished expressive behavior and resulted in increased sympathetic activation during each of the three films. Interestingly, expressive suppression was associated with a decrease in the experience of amusement, though it had no effect on self-reports of sadness.

It is unclear why the effects of expressive suppression on emotional experience might depend on the valence of emotion. One explanation put forward by Gross and Levenson (1997) is that, because people may have more experience regulating negative emotions than positive emotions in everyday life, they are more likely to differentiate subjective experience from outward expressions for negative emotions than for positive emotions. Consequently, when participants reported their emotional experiences during the process of expressive suppression, they may have been relying less heavily on their expressive behavior for evaluating negative emotions than they were for positive emotions. If this were the case, the reduction of expressive behavior would have a greater impact on the reports of positive emotional experience (i.e., less positive emotional experience reported in the expressive suppression condition than that in the control condition) than reports of negative emotional experience.

In general, studies reveal that expressive suppression is effective in terms of hiding actual feelings from others by decreasing expressive behavior. However, this reduction results in relatively negative outcomes with respect to physiology and the experience of positive emotions. Are there other consequences of using expressive

suppression? Despite the fact that most studies investigating expressive suppression have focused on emotional responding (i.e., behavior, experience, physiology), the cognitive consequences of expressive suppression have also received some attention. Specifically, a few studies have shown links between experimental manipulations of expressive suppression and degraded memory (Bonanno, Papa, O'Neill, Westphal, & Coifman, 2004; Richards, Butler, et al., 2003; Richards & Gross, 1999, 2000, 2006).

For example, in a study that required dating couples to discuss relationship conflicts, investigators compared the effects of cognitive reappraisal and expressive suppression on memory. They found that memory for conversation utterances was increased by cognitive reappraisal and decreased by expressive suppression (Richards, Butler, et al., 2003). The same research team replicated these results in another correlational study, in which they examined two forms of memory (i.e., memory for factual information contained in an emotional film clip, and memory for participants' own life experiences recorded in diaries). In a lab-based session, participants watched a short film clip known to evoke negative emotions. They then completed measures of habitual use of cognitive reappraisal and expressive suppression and a measure of memory for the conversations that had taken place in the film. One month after this session, participants kept a 2-week diary in which they recorded events during which they had attempted to regulate their emotions. They were then asked to come to the laboratory again, and take a free-recall test about spontaneous emotion regulation episodes described in their diaries. As expected, greater self-reported habitual use of expressive suppression was associated with poorer performance on both memory tests. An interpretation for this finding might be that participants who reported greater use of expressive suppression

were more likely to suppress emotions during the film and the conversations, even though they were not instructed to control their emotions; consequently, they had poorer memory performance. In contrast, more frequent use of cognitive reappraisal was not related to either of the two forms of memory (Richards & Gross, 2000).

One way to interpret these differing cognitive outcomes brought about by expressive suppression and cognitive reappraisal is that suppressive processes require continual self-regulatory effort throughout an emotional event. Such regulatory processes consume cognitive resources (e.g., keep reminding oneself that "I have to be calm", or "I should not show the audience my anxiety"), and thus people pay less attention to contextual information. In contrast, cognitive reappraisal is evoked early in the emotion generation process, before the emotional response tendencies are initiated. Therefore, this strategy typically does not require a continual expenditure of cognitive resources during an emotional event. As a result, cognitive reappraisal has fewer cognitive costs, leaving memory relatively intact (Gross, 2002; Richards, Butler, et al., 2003; Richards & Gross, 1999, 2000, 2006).

Experimental research has further demonstrated that expressive suppression only leads to poorer memory for auditory information (i.e., verbal memory), but does not appear to affect memory for visual information (i.e., nonverbal memory), even when both types of information are presented to participants simultaneously. Richards and Gross (2000) randomly assigned participants to one of two conditions (expressive suppression, control), and asked them to view a series of slides. These slides included images of wounded men, and were intended to call forth negative emotion. As slides were presented, participants were provided with information about each slide using an audio

recording. After viewing the slides, participants were given two memory tests (verbal and nonverbal). The nonverbal test involved presenting groups of pictures, and the participant's task was to identify the picture that they had seen in the slide-viewing phase. The verbal test required participants to write down the auditory information associated with each slide. Results showed that the expressive suppression group performed less well on the verbal memory test than did the control group, but that the two groups did not differ in their performance on the nonverbal test.

Although these findings partially supported the idea that expressive suppression was cognitively costly (since it appears to impair verbal memory), they raised another question: Why does expressive suppression only impact on verbal memory? One explanation put forward by Gross (2002) is that expressive suppression is associated with the verbal demands of self-instruction (e.g., I should not show any emotion on my face), which might detract from the process of encoding auditory information into memory (Meudell, 1972; Postle, D'Esposito, & Corkin, 2005). This verbal self-instruction might not influence the encoding processes associated with nonverbal memory (Meudell, 1972; Postle et al., 2005). If this is the case, the negative effects of expressive suppression would be observed for verbal, but not for nonverbal, memory.

Scientists have recently gone one step further in research concerning expressive suppression and memory, finding that the negative relation between expressive suppression and memory may be linear. More specifically, the harder one tries to conceal feelings during an emotional event, the worse one's memory for that event will be (Richards, Butler, et al., 2003; Richards & Gross, 2006). Support for this idea comes from a study by Richards and Gross (2006). Researchers presented participants with a

short film clip involving an arm amputation surgery, which was intended to elicit feelings of disgust. The participants were previously asked not to show any outward signs of emotion while viewing the film. After the film, they measured the extent to which participants tried to suppress their expressive behavior using a single-item scale (i.e., How much did you try to keep yourself from showing outward signs of emotion during the film clip?). The participants were also required to take an unanticipated memory test to assess their ability to recall details contained in the film. As predicted, more effort in suppressing expressions of emotion led to lower performance in remembering film details.

Potential Effects of Emotional Valence on the Cognitive Consequences of Expressive Suppression

Previous research concerning the effects of expressive suppression on cognition has only examined negative emotions. Specifically, either a single emotion (i.e., disgust) or general negative states were induced in participants in prior studies. It remains unclear whether the observed deficits would be seen when suppressing positive emotions. The findings of prior research investigating how affect influences cognition (Ashby et al., 1999; Dreisbach, 2006; Dreisbach & Goschke, 2004; Isen & Daubman, 1984; Isen, Daubman, & Nowicki, 1987; Isen, Johnson, Mertz, & Robinson, 1985; Isen & Means, 1983; Isen, Shalker, Clark, & Karp, 1978; Tice, Baumeister, Shmueli, & Muraven, 2007) suggest that the cognitive effects of suppressing positive emotions may differ from those associated with the expressive suppression of negative emotions.

Fredrickson has proposed a broaden-and-build theory of positive emotions, suggesting that positive emotions expand the scope of momentary attention and increase

the ability to integrate various materials, thus broadening one's habitual manner of thinking and acting. Moreover, these "broadened" thoughts and actions may facilitate coping with adversity. The improved coping, over time, enhances psychological strength, and builds well-being (Fredrickson, 2004). This theory has received widespread support, notably from studies reporting that positive emotions improve multiple aspects of cognition (e.g., uniqueness of word associations, creative problem solving, categorization, decision-making strategies, and memory; Isen & Daubman, 1984; Isen, Daubman, et al., 1987; Isen, Johnson, et al., 1985; Isen & Means, 1983; Isen, Shalker, et al., 1978). In these studies, a positive affect condition is contrasted with a control condition, and sometimes with a negative affect condition. Participants in the positive affect condition are typically exposed to positive emotional stimuli (e.g., refreshment offers, viewing a list of positive words, watching a comedy film clip) to induce feelings of happiness before taking cognitive tests. Participants in the control condition are asked to watch a neutral-emotion film clip, engage in some physical exercise, or are asked not to do anything. Participants in the negative affect condition are asked to watch a horror film to induce negative emotional feelings.

Although the tasks included in these studies vary according to the specific cognitive capability being measured, one robust conclusion of this program of research is that positive affect is beneficial to cognition. For example, in a study examining the influence of positive feeling states on memory (Isen, Shalker, et al., 1978), participants were asked to play a computer game twice in a laboratory setting. They received feedback about their success (positive affect condition), or failure (negative affect condition), or no feedback (control condition), after each game. Between the two games,

they were asked to remember a group of words, and after the second game, they wrote down as many of the words as they could recall on a piece of blank paper. Results indicated that participants who received the success feedback after the second game recalled more words than did participants who did not receive any feedback; however, the negative affect and the control groups did not differ with respect to their memory performance. These findings suggest that happy feelings (induced by receiving success feedback) can promote memory, more specifically, memory for words.

Contrary to expectations, the feedback provided after the first game did not lead to any difference in recall memory. Positive affect appeared to only benefit memory processes while participants were recalling words, rather than while they were learning words. One explanation for this result may be that the happy feelings triggered by positive feedback after the first game gradually diminished during the word-learning process. Consequently, the happy feelings may have contributed less to memory performance for the words than they would have if positive affect had been maintained throughout the entire learning process.

Isen and her colleagues have also investigated the influence of positive affect on decision-making processes (Isen & Means, 1983). Participants were randomly assigned to two conditions, one with "success" feedback (positive affect condition) on a perceptual motor task, and the other with no feedback (control condition). They were then provided with information about six different cars, and were asked to select the one that they would like to purchase. Although most of the participants in both conditions made the same choice, participants who were feeling happy made the decision faster than did participants in a neutrally emotional state. These findings suggest that positive affect

increases the efficiency of decision-making processes. A possible interpretation of these findings is that, compared to the control group, participants in the positive affect condition were more likely to ignore unimportant information and not repeatedly review the information that they had seen. Moreover, the positive affect group tended to use an *elimination strategy*, through which they eliminated the items that did not meet the criteria for further consideration.

Isen and her colleagues further reported that positive affect had a beneficial influence on categorization of materials (e.g., words and colors). In a study by Isen and Daubman (1984), participants were randomly assigned to one of three conditions, which included exposure to a funny film clip (positive affect condition), a neutral film clip (control condition), or a horror film clip (negative affect condition). They were then asked to sort words into four categories (vehicle, clothing, tool, weapon). For each category, there were nine exemplars (three of them were considered excellent exemplars, three were good exemplars, and three were weak exemplars), and participants rated whether each item did or did not belong to a given category. They also sorted 14 colors into categories that shared common characteristics. Participants in the positive affect condition were more likely to rate weak exemplars as category members and sorted colors into fewer categories than did participants in the control condition. However, these findings were not observed in the comparisons between the negative affect and control groups. In another study by the same research team (Isen, Johnson, et al., 1985), positive, negative, or neutral affect was induced in participants who were asked to listen to 10 target words and write down the word that they first associated with each target. Participants in the positive affect condition gave more unique associates than did

participants in the control condition. However, there was no difference between the negative affect and control conditions in the number of unique associates. Taken together, these two studies suggest that positive affect could influence how cognitive material was categorized. More specifically, people who were feeling happy were more likely to rate weak exemplars as category members, sort colors into more inclusive categories, and provide a broader range of word pair associates. These findings have provided evidence that when positive affect is induced, people tend to perceive connections and interactions among cognitive materials and process them in a more integrated manner.

Finally, Isen and her colleagues conducted several studies concerning the influence of positive affect on creative problem solving (Isen, Daubman, et al., 1987). There are two common measures assessing problem solving creativity (i.e., the candle task and the remote associates task) among these studies. During the candle task, participants were given a box of tacks, a candle, and a book of matches. They then were asked to indicate how they could attach the candle to the wall in such a way that it would burn without dripping wax on the floor beneath. The remote associates task required participants to look at three words followed by a blank space. Participants had to fill in the blank space with a word that related to the three given words. Results indicated that a) participants who watched a comedy film or received a small gift of candy (positive affect conditions) were more likely to find a creative solution than were participants who engaged in physical exercise (control condition) or participants who watched a horror film (negative affect condition); and b) the negative affect and control group did not differ in their performance. A creative problem-solving task requires the ability to see relatedness in diverse stimuli that normally seem unrelated (Mednick, 1962). Isen et al.'s

study suggests that the induction of a positive affective state results in an improved ability to see such connections among unrelated stimuli. Thus, a person who is feeling happy can solve problems more creatively than those who are not.

Overall, Isen and colleagues' program of research provides evidence suggesting the beneficial influence of positive affect on a variety of cognitive capabilities. Moreover, results from participants in the negative affect and control conditions suggest that there is something unique about the relationship between positive affect and performance on cognitive tasks, and that these findings are not simply a product of emotional arousal (Ashby et al., 1999; Isen, Daubman, et al., 1987; Isen, Johnson, et al., 1985; Isen, Shalker, et al., 1978). Based on these observations, scientists have further inquired: Why does positive affect have such unique effects on cognition?

This question has been answered from a neural constructive perspective. Specifically, Ashby, Isen, and Turken (1999) have proposed a dopaminergic theory of positive affect. They suggest that positive affect causes increased dopamine levels in the brain, which is believed to be associated with improved performance on cognitive tasks. However, increased dopamine levels alone are not sufficient to account for the advantageous effect of positive affect on cognition. Such effects depend on the size of the increase in dopamine levels, and on the specific brain regions that release dopamine. Specifically, positive affect increases dopamine levels slightly more than neutral-emotion states. In addition, the experience of positive affect is associated with dopamine being released both in the mesocorticolimbic system and in the nigrostriatal system, whereas with negative affect, dopamine is released only in the mesocoticolimbic system. These

findings may help to explain why improved cognition is observed only for positive affect, but not for neutral or negative affect.

In sum, a large body of research has indicated that positive affect can improve cognition. Increased dopamine levels in the brain may explain these relations. One main purpose of the present study was to examine whether expressive suppression of positive emotions (e.g., amusement) would impair memory processes as has been observed during the expressive suppression of negative emotions. To achieve this research goal, effects of expressive suppression on cognition were tested by contrasting memory for information presented during the induction of negative and positive emotions. Based on the previously-described research concerning cognition, I expected that although expressive suppression would direct attention from to-be-remembered information, positive emotions would facilitate the process of switching attention between the two simultaneous tasks (i.e., the expressive suppression and memorization tasks). Compared to the expressive suppression of negative emotion, people suppressing positive emotion would be better able to focus on cognitive materials, and would therefore show fewer negative consequences with regard to memory.

Potential Sex Effects on the Cognitive Consequences of Expressive Suppression

Another main purpose of the present study was to investigate sex effects on the cognitive consequences of expressive suppression. Women are usually the only sex represented in studies concerning emotion or emotion regulation. Ignoring potential sex differences is probably due in part to gender stereotypes, which suggest that women display and experience emotion more frequently and intensely than do men. In addition, from a practical perspective, it is easier to recruit female participants than male

participants from a psychological research pool in which a majority of the members are female. However, it would be premature to conclude that the expressive suppression-related findings obtained from studies using only female subjects also apply to men, given that the existing literature concerning sex differences in emotion has indeed proposed that women and men may differ in the ways of experiencing, expressing, and, furthermore, regulating their emotions (Grossman & Wood, 1993; Hess, Senecal, Kirouac, Herrera, Philippot, & Kleck, 2000; Kelly, Tyrka, Anderson, Price, & Carpenter, 2008; Kring & Gordon, 1998; Vogele, Jarrvis, & Cheeseman, 1997).

A substantial body of research has demonstrated that women display greater emotional arousal than men in most situations (Grossman & Wood, 1993; Kelly et al., 2008; Kring & Gordon, 1998). They respond to emotional events with higher levels of outward expressivity and greater levels of self-reported emotion experience. Moreover, sex differences in emotional responding are more pronounced during negative events than positive events (Hess et al., 2000; Kelly et al., 2008; Kim & Hamann, 2007; Mak et al., 2009). For example, Hess and her colleagues (2000) have conducted three studies to test sex differences in emotional expressivity. In the first study, participants heard four scenarios for each of seven basic emotions (happiness, sadness, fear, disgust, anger, shame, and guilt), and were asked to predict reactions from men and women *in general* to each situation. Participants indicated that they believed women would react with more sadness to negative emotional situations, while men would react with more happiness. The second study employed the same research materials as Study 1, but participants were asked to think about how they *themselves* would react to these situations. Female participants expected that they would react with more sadness to negative emotional

situations; in contrast, men expected that they would smile and laugh more in negative contexts. In the third study, participants gave a verbal report on a personal emotional event. Consistent with the first two studies, female participants cried and were withdrawn more while describing personal negative events, whereas male participants displayed more happy expressions. Across all three studies, no sex difference was found in expressivity during positive emotional situations.

Grossman and Wood (1993) reported similar findings in terms of sex differences in emotional expression. In their study, participants viewed three groups of pictures that were intended to elicit either positive emotion, negative emotion, or no emotion. Reports of emotional states and facial expression were measured while viewing the photos. Consistent with the findings of Hess et al. (2000), female participants displayed higher levels of negative expression than did male participants while viewing negative pictures, but no sex difference was observed in facial expression while viewing positive pictures. Moreover, women reported greater emotion experience than men for both positive and negative pictures. In a study by Kring and Gorden (1998), female undergraduates showed more facial expression than men while watching films eliciting positive emotion (happiness) and negative emotion (fear, disgust, anger). Contrary to Grossman and Wood's finding, the results of this study did not show sex differences in the reports of subjective emotional states.

Kelly and her colleagues (Kelly et al., 2008) conducted a study to evaluate sex differences in emotional reactivity to a social stress challenge. Participants completed the Trier Social Stress Test, which consisted of a 10-min preparatory period, a 5-min speech and a 5-min mental arithmetic task. Subjective experience was assessed after the stress

test. The findings demonstrated that women reported more fear, irritability, confusion and less happiness compared to men.

Overall, empirical findings reveal some consistent evidence for sex differences in responding to negative emotion-eliciting events. In particular, women appear to experience and express greater negative emotion than men in negative contexts. It remains unclear whether there are sex differences with respect to responding to positive emotional events. One explanation for the inconsistent findings concerning positive emotional responding may relate to the various emotional stimuli used in the studies. It is possible that they may have induced emotions of different intensities, and sex differences in positive emotion responding may perhaps only be observed when emotional arousal reaches a certain threshold.

Although research supports the idea that women and men differ in emotional responses with respect to expressivity and experience during affective events, it is unclear whether this sex effect would be observed during expressive suppression. Few studies have examined this issue, and most have focused on how sex influences the behavioral, experiential, and physiological consequences of expressive suppression. For example, Vögele, Jarvis and Cheeseman (1997) found that male adults reported higher levels of anger experience and felt it was more difficult to suppress this emotion than did female adults in the same annoying situation. However, this study had one important limitation – the initial emotional arousal (anger) differed between male and female participants in the given condition. Thus, it is hard to tell whether the sex effects were due to different intensities of emotional experience or to expressive suppression itself.

Recently, Mak, Hu, Zhang, Xiao, and Lee (2009) completed a study examining sex-related differences in subjective experience during emotion regulation. An equal number of undergraduates viewed a series of emotion-eliciting pictures under three conditions (regulating positive emotion, regulating negative emotion, no regulation), and self-reports of emotion experience were collected. Women reported experiencing more negative emotion than men across conditions. A sex by emotional valence interaction further revealed that female participants experienced greater negative emotions than male participants while regulating negative emotions, though this was not the case when they were simply viewing negative pictures without having to regulate emotions. There were no sex differences in reports of positive emotion in the positive emotion regulation and no regulation conditions. Moreover, women reported that it was more difficult to regulate negative emotion than to regulate positive emotion, while men perceived that it was harder to regulate positive emotion than negative emotion. These findings suggest that there are sex effects on the experiential consequences of expressive suppression and that these effects vary with regard to the valence of the emotion (positive emotion, negative emotion). However, no research to date has examined whether sex influences the cognitive processes during expressive suppression or emotion regulation in general. One of the goals of the current study was to investigate this issue.

The Present Study

The present research focused on addressing two limitations of the existing literature. First, because most research concerning the cognitive consequences of expressive suppression has examined only one specific emotion (i.e., disgust) or general negative affective states, it remains unclear whether cognitive processes vary during the

expressive suppression of other emotional states. Second, most studies on expressive suppression have included only female participants. Thus, it is unclear whether findings from female-only studies concerning the cognitive consequences of expressive suppression apply to men.

To explore these two issues, in the current study I compared the effects of suppressing positive (amusement) and negative (disgust) emotions on verbal and nonverbal memory in a group of Caucasian undergraduates. I also examined the influence of sex and emotional valence on experiential consequences of expressive suppression. Overall, three primary questions were addressed in the present research.

Do sex and emotional valence influence emotion experience during expressive suppression? Gross and Levenson (1997) found that expressive suppression reduces reported experience of positive emotions, but has no effect on experience of negative emotions. Gross and Levenson suggested that people suppress negative emotion more frequently than positive emotion in daily life, and thus their reports of emotional experience may be less influenced by the decreased facial expression while suppressing negative emotions than suppressing positive emotions. The present study attempted to replicate this finding. It was expected that *decreased emotional experience would be observed while suppressing positive emotion, but not while suppressing negative emotion.*

It also has been suggested that sex differences in emotional experience are more pronounced for negative emotions than for positive emotions. Specifically, women experience greater negative emotions than do men during exposure to negative stimuli (Grossman & Wood, 1993; Hess et al., 2000; Kelly et al., 2008; Mak et al., 2009). The findings regarding sex effects in response to positive stimuli are more limited, and are not

consistent. While some researchers reported that women experienced greater positive affect than men during positive emotional events (Grossman & Wood, 1993), others did not observe such sex differences (Hess et al., 2000; Kring & Gordon, 1998; Mak et al., 2009). Disparities in research findings may stem from the fact that the emotional stimuli differed in the intensity of positive emotion that was induced, and sex differences in emotional responses are perhaps only observed when the induced positive emotion reaches a certain threshold.

According to Gross and Thompson (2007), expressive suppression involves a process of inhibiting or reversing outward expression. Thus, it might be expected that women would feel that it was harder to suppress negative emotions, and would therefore show more expression than men during exposure to negative stimuli (Mak et al., 2009). In addition, reports of emotional experience may be associated with the amount of expression displayed at the same time (Gross & Levenson, 1997). I thus predicted a sex by emotional valence interaction with regard to reports of emotional experience. Specifically, I hypothesized that *women would report higher levels of negative emotional experience than men while suppressing negative emotions, but that there would be no sex differences in reports of positive emotion experience during expressive suppression of positive emotions.*

Do the cognitive consequences of expressive suppression with respect to memory vary across sex and different emotion states (e.g., amusement vs. disgust)? Prior research has reported that positive affect improves cognition in multiple respects (e.g., working memory capacity, cognitive organization, decision making, and creative problem solving) (Ashby et al., 1999; Isen, Daubman, 1984; Isen, Daubman, et al., 1987;

Isen, Johnson, et al., 1985; Isen & Means, 1983; Isen, Shalker, et al., 1978). Increased cognitive flexibility is believed to be an important factor that accounts for this improvement in cognition. In the present research, participants were asked to remember materials presented while they were suppressing emotion induced by film clips. This task required participants to allocate attention to a cognitive task (i.e., remembering ongoing information) despite the distraction associated with expressive suppression. It was hypothesized that, compared to negative emotion, experiencing positive emotion would facilitate the processes of shifting and allocating attention to different cognitive needs (expressive suppression, memorization). Consequently, the cognitive costs associated with expressive suppression were expected to be less pronounced for positive emotion than for negative emotion. Therefore, I predicted that *the expressive suppression of disgust, but not amusement, would result in degraded memory.*

Empirical findings suggest that women express more negative emotion than men both in daily life and in experimental settings (Grossman & Wood, 1993; Hess et al., 2000; Kring & Gordon, 1998). As such, women may have to put more effort into suppressing negative expressive behavior than men. Findings also suggest that women experience greater negative emotions than men while suppressing negative emotions (Gross & Wood, 1993; Kelly et al., 2006; Kim & Hamann, 2007; Mak et al., 2009); consequently, women may have to allocate more attention to self-monitoring processes to ensure the success of expressive suppression. Based on these findings, I expected that *women would perform more poorly than men on a memory test for information presented while they were suppressing negative emotions. Such sex differences in memory were not expected during the expressive suppression of positive emotion since there is no*

substantial evidence for sex differences in experience or expressivity with regard to positive emotion.

Is memory during expressive suppression associated with effort put forth to suppress emotion or habitual expressive suppression in everyday life? For individuals who practice expressive suppression more frequently, less effort may be required to suppress (Butler et al., 2007). Evidence also suggests that effort expended during expressive suppression is positively and linearly correlated with the cognitive costs of using that strategy (Richards & Gross, 2006). Therefore, I predicted that *memory during expressive suppression would be negatively correlated with effort expended to suppress during the study, and positively related to an individual's habitual use of expressive suppression.*

Method

Pilot Test One

Purpose.

The pilot test was designed to develop a series of short film clips that elicited either discrete emotional states (amusement, disgust) or no emotion (neutral). Ideally, participants would rate the emotion-inducing films as being high on the target emotion and low on other emotions. The neutral-emotion film clip was not intended to induce any emotional states.

Participants.

Twelve male and 12 female Caucasian university students, whose primary language was English, took part in the study. The experiment took approximately 45 min.

As compensation, participants received one hour of research participation toward a psychology course.

Film stimuli.

The film clips tested in this study included those intended to elicit one of the two target emotions (amusement, disgust) as well as clips intended to elicit a neutral emotional state. There were three candidate film clips for each of these three emotion states. Each film clip was about two and an half minutes in length, and was played with no sound. The amusing film clips were developed from a TV show (*America's Funniest Home Videos)*, and included videos of wedding day mishaps (e.g., a crying groom, and a teetering bridesmaid), and parenting videos (e.g., a snorting baby, a mischievous father, triplets watching a moving toy, and a little girl who gradually drops newspapers). Two of the disgusting clips showed medical procedures (i.e., removal of ingrown toenail; treatment for a spider bite). The third disgusting clip was a commercial movie trailer that showed a finger gradually being cut off. One neutral clip contained segments of "Travel Videos of Africa" featuring sightseeing, travelogues, and guides. The other two neutral clips were computer screen savers, depicting natural scenes of Western Australia and the Sonoran Desert.

Measures and Procedure.

The pilot test was undertaken in a laboratory. Upon arriving at the appointed place, participants were informed about the purpose of the study and were then given a general description of the procedure. After signing a consent form, participants sat down on a comfortable chair facing a 13-inch notebook computer monitor positioned about a half metre away. Prior to watching the films, participants filled out a questionnaire assessing

their current emotional state (EEQ; adapted from Rottenberg, Ray & Gross, 2005; see Appendix A). This measure consisted of 12 emotion terms (amusement, anger, confusion, disgust, embarrassment, fear, happiness, interest, sadness, surprise, arousal, tension) and one dimensional term (pleasant vs. unpleasant). For the emotion terms, participants rated the extent to which they felt each emotion using a 9-point Likert scale (*1 = not at all/none, 9= extremely/ a great deal*). For the dimensional term, participants rated their current state on 9-point Likert scale (1 = *unpleasant, 9 = pleasant*).

After participants completed the questionnaire, the researcher read the following instructions: "*I will show you some short film clips in just a moment. It is important to us that you watch the film clips carefully. Please watch the clips as carefully as you can* (adapted from Gross & Levenson, 1997; Richards & Gross, 2000, 2006)." Participants then watched three film clips, one for each emotion type (neutral, amusement, disgust). Each film clip was assessed by eight subjects. The films were presented in one of three randomly chosen orders, and the orders were counterbalanced among the participants. In order to minimize distractions from the testing surroundings, participants wore headphones while watching the films.

Each film was followed by a one-minute post-film period, during which time the computer screen was black, and participants were told that there was a break between films. The purpose of this post-film period was to minimize the likelihood that participants' emotional responses while watching one film clip would influence their responses to subsequent clips. After the post-film period, participants completed the EEQ again. They were also asked to respond two additional questions: Have you seen the film before? Did you look away during the film? (see Appendix B)

Analyses and results.

In the following analyses, sex and film candidate (refers to three candidate films for each emotion, such as amusement clip 1, 2, or 3) were treated as between-subjects factors, while emotion term (refers to the 12 emotions included in the EEQ) and emotion type (refers to three target emotions: amusement, disgust, neutral) were treated as within-subjects factors.

At this stage of the project, two tasks needed to be accomplished: testing for order effects and film selection. Film selection refers to selecting one film from the three candidates for each emotion type (amusement, disgust, neutral). An ideal film would meet the these criteria: (a) mean rating on target emotion was significantly higher than all nontarget emotions; and (b) mean rating on target emotion was high relative to other candidate films. Following procedures outlined by Philippot (1993), the *intensity* and the *discreteness* of the elicited responses were used to select the most effective films. The intensity is the mean level at which the target emotion was rated, and the discreteness is the percentage of participants who responded that they had felt the target emotion more intensely (by at least one point) than any of the other emotions. These measures of intensity and discreteness were combined into a "success" index by summing two Z-scores (see Table 1). The Z-scores that corresponded to the intensity were obtained by normalizing the intensity scores for all six emotional films, and the Z-scores of discreteness were obtained by normalizing the discreteness scores for the six films. This success index was used to select the best film for each of the two target emotions (amusement, disgust). For the neutral film, the most ideal film was that which had mean emotion ratings of less than 2 points on the 9-point scale for each of the 12 emotions. The

best films were subjected to an additional analysis to examine the role of sex on participants' reported emotions. No sex effects were found for any of the three selected films.

The potential effect of film presentation order on reports of emotional experience after viewing films was also examined. As described earlier, there were three randomly chosen orders. Each participant was assigned to one of the three orders. Each type of film (across film candidates) received 16 ratings for each order. A two-way ANOVA was conducted in which order and emotion type were the independent variables and participants' emotion experience ratings were the dependent variables (averaged across candidate films). No main effect of order or interaction effects were found.

The amusement-eliciting clip selected for the main study was a video about parenting, developed from *America's Funniest Home Videos.* The disgust-eliciting clip depicted the removal of an ingrown toenail. The neutral clip was a screen saver containing photos of a landscape. All three films were 162 s in length and contained no dialogue.

Pilot Study Two

Purpose.

The second pilot study was designed to obtain six lists of 16 words, with each list containing words that were, on average, of equal memorability. According to prior research on verbal memory, 16 is the optimal number of words that can be presented at once without leading to floor or ceiling effects on subsequent memory tests. This empirical finding has been implemented in many clinical assessments of verbal learning (Delis, Kramer, Kaplan, & Ober, 1987; Elwood, 1995).

Participants.

Eighteen Caucasian undergraduates participated in the study. All of them were native English speakers. As compensation for their time, participants received one hour of research participation toward a psychology course.

Verbal Stimuli.

One hundred and ninety-two nonemotional words were tested in the study. They were selected from the MRC Psycholinguistic Database and all were: a) nouns, b) 4-to 6-letter words, c) 1- or 2-syllable words, and d) one standard deviation above the mean in the distribution of word familiarity and word concreteness ratings. The words were randomly divided into 12 lists, with each list consisting of 16 words. Participants heard all 12 lists of words.

Measures.

Recall memory test. After hearing each list of words, participants were asked to write down as many words as they could recall on a piece of blank paper.

Recognition memory test. Following every recall memory test, participants were given a sheet with a group of words that included the 16 words they had heard (*target words)* and 16 words that they had not heard (*foils)*. They were asked to circle the words that they had heard from the most recently presented list. The foils were also derived from the set of study words.

The 12 lists of words were divided into two groups, top half and bottom half of word lists. There were two general orders of presenting words. In the first order, the word lists in the top half served as target words and the word lists in the bottom half became the foils in the recognition tests. The functions of the two groups of words were

exchanged in the second order. These two orders were counterbalanced among the participants. In addition, the words in each list were read in a random order. Thus, every word served as a target word and a foil each once during the study

Procedure.

Upon arrival at the laboratory, the researcher explained to participants that the purpose of the study was to investigate memory for words. After providing informed consent, participants completed a personal background survey. Before being presented with the word lists, participants were given the following instructions:

"*In just a moment, you will hear several words from an audio recording. Please listen carefully to the words and try to remember as many of the words as you can. After the recording ends, you will be asked to take two memory tests. Overall, please listen carefully to the words, and try to remember as many as you can.*"

Participants then heard the first list of words from an audio recording. The words were presented every two seconds. Following each word list, participants completed two memory tasks (a recall test first, then a recognition test). The same procedure was used for the other 11 word lists. Finally, the researcher thanked and debriefed participants.

Analyses and Results.

A two-step analysis was conducted to obtain a memorability score for each word. First, every word received a score from each participant based on his or her performance on the memory tests, which were coded as follows: a word got a score of 0 if it was neither recalled nor recognized, a score of 1 if it was either recalled or recognized, and a score of 2 if it was both recalled and recognized. Because each word was heard by all 18

participants once, each word got 18 scores. A memorability score were computed for each word by adding the scores across the 18 participants.

Ninety-six words that received the highest memorability scores were selected for the main study and equally divided into six lists consisting of 16 words each. Each word list contained words that were, on average, equally memorable.

Main Study

Participants.

Seventy-two Caucasian undergraduates (36 men) were recruited from Brock University's psychology subject pool and from flyers distributed across campus. Each participant received two research participation hours toward one Psychology course as compensation. There was no sex difference in age (male: M=20.81 years, SD=2.19 *Range* = 10 years; female: M=20.39 years, SD=2.58, *Range* = 13 years). Of the 72 participants, 26 (36.1%) were major in Social sciences, 13 (18.1%) were in Applied health sciences, 19 (26.4) were in Business, 7 (5.6%) were in Humanities, 4 (5.6%) were in Mathematics and sciences, 1 (1.4%) was in Education, and 2 (2.8%) were in General. In terms of participant's education level, 70 participants (97.2%) were undergraduate students and two (2.8%) were graduate students.

Stimuli.

Film clips. Participants watched each of the three short film clips that were selected based on prior pilot testing (see Pilot Study One). Each film clip was played with no sound.

For each participant, the neutral film clip was always presented first. It had two main functions: a) to familiarize participants with the research procedure and the

cognitive tasks; and b) to collect baseline data regarding participants' working memory capability. The order of presentation of the two emotional films was counterbalanced to even out potential practice and fatigue effects.

Study Words. Six lists of 16 words (see Pilot Study Two) were used in the main study. While participants were watching each film clip, they also heard a list of words simultaneously. The words were equally distributed throughout the entire film; thus, they were presented every 10 seconds.

Each list of words served either as target words, which participants heard while viewing a film clip, or as foils, which were used in a recognition memory test. The order of presentation of the lists was counterbalanced across participants (see Table 2). Each order was used with an equal number of women and men.

Measures.

Demographic information. Participants reported their gender, age, and academic level, (i.e., including undergraduate or graduate), and year at school.

Daily expressive suppression. Two measures were used to assess participants' habitual use of expressive suppression. The first measure was a 4-item subscale assessing expressive suppression, taken from Gross and John's (2003) Emotion Regulation Questionnaire (ERQ; see Appendix I). An example of a expressive suppression item is, "I control my emotions by not expressing them." Responses were given on a 7-point scale ranging from 1 ("strongly disagree") to 7 ("strongly agree"). The expressive suppression subscale has proved to be a reliable and valid measure. In the study describing the development of the ERQ (Gross & John, 2003), participants were drawn from four undergraduate samples, each comprised of students from four cultural backgrounds

(African American, Asian American, European American, Latino). Across the four samples, Cronbach's alpha averaged .73 for the expressive suppression subscale, and test–retest reliability across three months was .69. Convergent and discriminant validity for this subscale were also tested in the same study. With respect to convergent validity, the expressive suppression subscale scores were (a) positively correlated with the scores of perceiving one's emotion regulation efforts as successful; (b) negatively correlated with the scores of the Inauthenticity; (c) negatively related to Coping Through Venting (a subscale of COPE; Carver, Scheier, & Weintraub, 1989); (d) negatively related to the scores of three subscales of the Meta-Mood questionnaire: Mood Repair (higher scores on this subscale indicate greater effort employed in mood repair), Attention (higher scores on this subscale indicate greater awareness about mood repair), and Clarity (higher scores on this subscale indicate higher levels of clarity about mood repair; Salovey, Golman, & Turvey, 1995), and (e) negatively correlated with the Negative Mood Regulation Scale scores (higher scores on this measure indicate more efficacy related to negative mood regulation; NMRS; Catanzaro & Mearns, 1990). As for discriminant validity, the expressive suppression subscale scores were not related to the scores of the Ego Control Scale (ECS; higher scores on this measure indicates higher levels of impulse control; Block & Kremen, 1996), the verbal and quantitative Scholastic Aptitude Test, or the Wonderlic Intelligence Test IV (Wonderlic, 1977). Both tests are believed to measure cognitive ability. The expressive suppression subscale was also unrelated to Crowne and Marlowe's (1960) measure of social desirability.

The second index of expressive suppression was a 14-item scale of Emotion Inhibition, taken from Roger and Najarian's (1989) Emotion Control Questionnaire (ECQ;

see Appendix J). The ECQ uses a 7-point scale ranging from 1 ("strongly disagree"), to 7 ("strongly agree"). For example, given the statement "If I receive bad news in front of others I usually try to hide how I feel", participants choose the number that best reflects their behavior. Roger and Najarian reported evidence of reliability and validity for the Emotional Inhibition scale. The data from 244 undergraduate students in their initial study of the ECQ indicated that Cronbach's alpha for the subscale was .77. In a follow-up study, based on a sample of 86 undergraduate students, the Emotional Inhibition subscale's test-retest reliability (assessed over a 7-week inter-test interval) was .79. With respect to the concurrent validity of the subscale, Emotion Inhibition scores were negatively associated with scores of (a) Extraversion subscale of the Eysenck Personality Questionnaire (EPQ; Eysenck & Eysenck, 1975); (b) Interpersonal Control and Sociopolitical Control subscales of the Spheres-of-Control Questionnaire (SOCQ; Paulhus, 1983); and (c) Verbal Hostility and Assaultiveness subscales of Buss-Durkee hostility inventory (Buss-Durkee; Buss & Durkee, 1957). It should be noted that the correlations between the ECQ factors and the components of EPQ and SOCQ were based on the responses of the sample of 61 undergraduates. However, the Buss-Durkee hostility inventory was completed by a sub-sample of 197 undergraduates derived from the larger sample of 244 used for testing internal reliability.

Emotion experience. Before beginning the study and after viewing each film, participants rated their emotional experience using the EEQ (Gross & Levenson, 1997; Richards & Gross, 2000, 2005; see Appendix A and B). Five positive emotions (amusement, happiness, interest, surprise, pleasant) and eight negative emotions (anger, confusion, disgust, fear, arousal, embarrassment, sadness, tension) were rated using a 9-

point Likert scale (*1 = not at all/none, 9 = extremely/a great deal*).

Effort to suppress. Two items were included in a post-film questionnaire to assess the intensity of expressive suppression engaged in during each film (see Appendix C). Using a 9-point Likert scale (*1 = not at all/none, 9 = extremely/a great deal*), participants rated the extent to which they thought their feelings were visible while watching the film, and the extent to which they were trying to avoid showing how they felt while watching the film. This task was completed after each film.

Effort to memorize material. It was believed that the amount of effort involved in the process of memorizing materials would influence subsequent memory performance. Therefore, after viewing each film participants were asked to respond to two items assessing effort expended to memorize auditory and visual information (i.e., How hard were you trying to remember the film content? How hard were you trying to remember the list of words you heard while watching the film? see Appendix C), using a 9-point Likert scale (*1 = not at all/none, 9 = extremely/a great deal*).

Auditory memory tests. The auditory memory tests were intended to evaluate participants' memory for the word lists (see Appendix D). There were two tests: recall and recognition. The two measures were included because they are believed to differ from one another in terms of the difficulty with regard to retrieving information (Gillund & Shiffrin, 1984; Mandler, 1980). Both measures were used to avoid problems with floor or ceiling effects associated with task difficulty. The recall test was administered immediately after participants viewed each film clip. Participants were asked to write down as many of the study words as they could recall. Participants then took the recognition test, during which they were given a sheet with a list of words that included

the 16 target words they had just heard during the film clip and 16 foils. They were asked to circle any words that they recognized from the list that had been presented during the last film.

Visual memory test. This test evaluated participants' memory for film content (see Appendix E, F, and G). Participants answered 12 four-alternative, forced-choice recognition memory questions that covered the entire duration of the film clip. All of these items related to visual details from the film (e.g., the clothes worn by the characters).

Procedure.

Prior to the laboratory session, the researcher randomly assigned participants (36 male, 36 female) to either the expressive suppression or control condition. Participants assigned to the expressive suppression condition were asked to hide their emotion-expressive behavior while viewing films. Participants in the control condition were not given such instructions.

Upon arrival at the laboratory, participants were first informed that the purpose of the study was to better understand emotions that were elicited while viewing films, and that their reactions would be videotaped (the video files are not analyzed in the current study). After providing informed consent, participants completed a questionnaire packet that included demographic information and the EEQ. Participants were then provided with a general description of the procedure. They were informed that they would hear a series of words while watching film clips, and that they would be asked to complete several memory tasks about both the film content and the words that they heard.

Participants sat on a comfortable chair facing a 22-inch computer monitor positioned 1.5 meters away. One remotely controlled high-resolution video camera was hidden behind a one-way mirror in order to minimize participants' self-consciousness. Throughout the session, participants followed instructions presented on the computer screen, and the researcher watched participants carrying out the required tasks through a one-way mirror.

Participants watched three short film clips consisting of two emotion-inducing films (amusement, disgust) and one neutral-emotion film. The film clips were presented in one of the following orders: neutral, amusement, disgust; or neutral, disgust, amusement. The orders were counterbalanced among the participants. After sitting still for one minute, participants were given the instructions that were determined by the condition to which they had been assigned. The control group was instructed as follows:

"*You will see a short film clip in just a moment. You will also hear a list of words while watching the film clip. When the film is over, you will be asked to complete some memory tasks about what happened in the film and the list of words you heard. Try to remember as much as you can. Overall, then, while watching the film, you need to remember as much as you can about what happens in the film and the list of words that you will hear* (adapted from Gross & Levenson, 1997; Richards & Gross, 2000, 2005)."

The expressive suppression group received the following instructions:

"*You will see a short film clip in just a moment. If you have any feelings as you watch the film clip, please try your best not to let those feelings show -- try to behave in such a way that a person watching you would not know you are feeling anything. You will also hear a list of words while watching the film clip. When the film is over, you will be*

asked to complete some memory tasks about what happened in the film and the list of words you heard. Try to remember as much as you can. Overall, then, while watching the film, you need to behave so that someone watching you would not know that you are feeling anything at all; and you need to remember as much as you can about what happens in the film, and the list of words that you will hear (adapted from Gross & Levenson, 1997; Richards & Gross, 2000, 2005)."

Participants then pressed the space key to begin the neutral film clip. Following the film clip, they filled out the EEQ, and the questionnaire assessing effort to suppress and effort to memorize material. They were then asked to solve math problems for 5 minutes (to decrease order effects on memory and to prevent participants from thinking about the information presented during the films). Upon completion of this distracter task, participants took three memory tests in the following order: auditory recall test, auditory recognition test, and visual recognition test. Participants proceeded to the next film after they had completed all of the tests. The same procedure was followed for each of the two subsequent film clips.

After viewing all three film clips and completing all associated tasks, participants were asked to fill out a questionnaire assessing their daily use of expressive suppression (consisting of the inhibition subscale of the ECQ and expressive suppression subscale of the ERQ). Finally, the researcher thanked and debriefed participants.

Results

Analytic Strategy

Covariates in the analyses regarding reports of emotion experience. The self-ratings of emotional states completed before watching the films were viewed as an

indicator of participants' mood state at the beginning of the experiment. Mood is generally considered to have lower intensity and longer duration than emotion (Lane & Beedie, 2005). If mood is relatively stable, then it may influence people's emotional feelings when they are placed in affective situations. Therefore, in the present study, reports of emotion experience before watching the films (i.e., prefilm emotional experience) were treated as covariates in the analyses.

Covariates in the analyses regarding memory performance. It has been suggested that working memory capacity (WMC) influences the quality of suppressive practice and its associated consequences. For example, Schmeichel, Volokhov, and Demaree (2008) reported that adults higher in WMC suppressed both positive and negative emotion better than adults lower in WMC. Specifically, participants with higher WMC displayed less facial expression and experienced less emotion in affective situations than did participants with lower WMC. If this is the case, people with higher WMC may be better able to focus on to-be-remembered material while engaging in expressive suppression, and might therefore perform better on memory tests for information presented during expressive suppression than participants with lower WMC. In this study, participants in the expressive suppression and control conditions would experience little or no emotional arousal while watching the neutral film clip. Participants in the expressive suppression condition, in particular, would not have to constantly monitor their behavior to fulfill the requirement of the expressive suppression task; thus, they should be able to allocate more attention to the remembering task. Based on this reasoning, participants' memory for information presented during the neutral film reflects their ability to encode information into memory in a neutral emotional state (i.e., WMC). Two types of WMC (visual WMC

and auditory WMC) were computed to correspond to the two forms of memory (visual memory, auditory memory) tested in this study. The measure of *visual WMC* was the score on visual recognition test for the neutral film clip, and the measure of *auditory WMC* was the average of the auditory recall and recognition test scores for the neutral film clip. Measures of WMC were treated as covariates in the analyses concerning the cognitive consequences of expressive suppression.

Intensity of emotional experience and amount of effort put into memory processes were also treated as covariates in the same set of analyses. *Effort for visual memory* was computed as the average of ratings across the two emotional film clips (amusement, disgust) regarding effort expended on memorizing visual film content. *Effort for auditory memory* was computed as the average, across the two emotional films, of the ratings regarding effort expended on memorizing study words. *Intensity of positive and negative emotion* were calculated as the average ratings for positive and negative emotion experience across the two emotional films, respectively.

Therefore, in the main analyses, a) sex and study condition (control condition, expressive suppression condition) were treated as between-subjects factors; b) emotion type (amusement, disgust, neutral) was treated as a within-subjects factor; and c) prefilm emotional experience, WMC (visual WMC, auditory WMC), intensity of emotional experience (intensity of positive emotion, intensity of negative emotion), and effort to memorize material (effort for visual memory, effort for auditory memory) were treated as covariates.

Preliminary Analyses

Examining order effects

Participants watched three film clips in either of two orders: neutral, amusement, disgust; and neutral, disgust, amusement. A number of two-way ANOVAs were completed to examine order effects on various dependent measures in the study. In these analyses, the independent variables were film order and sex, and the dependent variables were self-reports of visible expression, effort put forth to suppress, emotion experience, effort to memorize material, and memory performance, respectively. No main effects of order or order-related interactions were found in the results. Thus, the data were collapsed across order for the main analyses.

Creation of composite variables

Emotional experience. Intercorrelations between emotions assessed by the EEQ indicated that amusement, happiness, interest, and pleasant were significantly correlated for all three films. A large number of intercorrelations among embarrassment, anger, fear, sadness, confusion, disgust, and tension were also significant for all three films. Therefore, the reports of amusement, happiness, interest, and pleasant were averaged to create a composite measure of positive emotional experience, while embarrassment, anger, fear, sadness, confusion, disgust, and tension were averaged to create a composite measure of negative emotional experience. The internal consistency for each composite variable is reported in Table 3. Analyses that included subjective emotional experience used these two composite scores.

Daily expressive suppression. Two measures were used to assess frequent use of expressive suppression in everyday life: the expressive suppression subscale of the ERQ and the emotion inhibition subscale of the ECQ. The correlation between these two subscales was significant (r =.70, p<.001); thus, they were averaged to create a measure

of daily expressive suppression. The internal consistency for this composite variable was .88 ($N = 72$, $M = 51.77$, $SD = 14.65$).

Manipulation check for the experimental conditions

Two mixed-model ANOVAs were conducted to examine whether participants in the expressive suppression condition experienced more expressive suppression than those in the control condition. In the first analysis, participant report of visible expression was the dependent variable, condition (expressive suppression, control) and sex were between-subjects factors, and emotion type (neutral, amusement, disgust) was a within-subjects factor. As expected, there was a main effect of condition on reports of visible expression (F (1,68) = 39.89, $p < .001$, $\eta^2 = .37$), which indicated that participants in the expressive suppression condition perceived that less emotion was visible on their faces than did participants in the control condition (see Table 4 and Figure 1). The main effect of emotion type was also significant (F (2, 136) = 60.99, $p < .001$, $\eta^2 = .47$), and indicated that participants perceived themselves as displaying more expression while watching the emotional film clips than the neutral film clip, though reports of visible expression during the amusing and disgusting clips did not differ from one another (see Table 4 and Figure 1).

These main effects were qualified by significant emotion type X condition (F (2, 136) = 7.09, $p = 0.001$; $\eta^2 = 0.09$) and emotion type X sex (F (2, 136) = 4.02, $p = .02$, $\eta^2 = 0.06$) interactions. Specifically, participants in the expressive suppression condition reported displaying less emotion than participants in the control condition while watching the amusing and disgusting films; however, this difference was not observed during the neutral film (see Table 4 and Figure 1). This finding makes sense given that there was no

emotion to suppress while watching the neutral film. The emotion X sex interaction revealed that, compared to their male counterparts, female participants reported displaying less emotion during the neutral and amusing films, but more emotion during the disgusting film (see Table 4 and Figure 1). The three-way interaction between emotion type, condition, and sex was not significant.

In a second analysis to assess the experimental manipulation, the dependent variable was the ratings of effort to suppress. The independent variables were the same: condition and sex were between-subjects factors and emotion type was a within-subjects factor. Main effects of condition (F (1, 68) = 66.71, $p < .001$, $\eta^2 = .50$) and emotion type (F (2, 136) = 47.68, $p < .001$, $\eta^2 = .19$) were significant. As expected, the expressive suppression group reported greater effort put forth to suppress than the control group (see Table 4 and Figure 1). Participants also indicated that they engaged in more expressive suppression while watching the emotional film clips (amusement, disgust) than the neutral clip (see Table 4 and Figure 1). This finding was anticipated since no emotion was elicited in the neutral film, and thus participants in both conditions had nothing to suppress. No main effect of sex or interaction effects were found.

Overall, results demonstrated that the experimental manipulation was successful: Participants in the expressive suppression condition engaged in more expressive suppression than did participants in the control condition while watching the film clips.

Main Analyses

Do sex and emotional valence influence emotion experience during expressive suppression? Two mixed-model ANCOVAs were conducted to examine the effects of emotional valence and sex on reports of positive and negative emotional experience in the

expressive suppression and control conditions. In the first analysis, the dependent variable was reported experience of positive emotion, and the independent variables were condition, sex, and emotion type (neutral, amusement, disgust). The prefilm reports of positive emotional experience were treated as covariates. In spite of the absence of main effects for all three factors (condition, sex, emotion type; each $p > .05$), there was a significant sex X emotion type interaction (F (2, 134) = 6.12, $p = .004$, $\eta^2 = .08$). This result indicated that male participants experienced greater positive emotion than female participants while watching the disgusting film (see Table 5 and Figure 2). There were no differences between women and men on reports of positive emotional experience for the neutral or amusement clips.

In the second mixed-model ANCOVA, the dependent variable was reported experience of negative emotion and the independent variables were condition, sex, and emotion type. The prefilm reports of negative emotional experience were treated as covariates. There was a main effect of emotion type (F (2, 134) = 16.98, $p < .001$, $\eta^2 = .20$). Significant differences were observed between each of the three means: Participants reported the greatest experience of negative emotion after viewing the disgusting film, followed by ratings for the neutral film and ratings for the amusement film (see Table 5 and Figure 2). No main effects of condition or sex were found. The main effect of emotion type was qualified by a significant condition X sex X emotion type interaction (F (2, 66) = 5.18, $p = .03$, $\eta^2 = .10$). To explore this interaction, separated 2-way ANCOVA were conducted in women and men respectively. In each analysis, condition and emotion type were the independent variables, and reports of negative emotional experience were the dependent variables. Again, the prefilm reports of negative

emotional experience were treated as covariates in these analyses. There were main effects of emotion type (F (2, 32) = 5.18, $p < .001$, $\eta^2 = .46$) and condition (F (1, 33) = 5.18, $p = .04$, $\eta^2 = .12$) on reports of negative experience for female participants. Women reported greater experience of negative emotion after watching the disgusting film than they did after watching the neutral and amusing films, but they reported no difference between the neutral and amusing films. In addition, women in the expressive suppression condition had lower levels of negative experience than their counterparts in the control condition during all three films (see Table 5 and Figure 2). No main or interaction effects were found for male participants in terms of negative emotional experience.

Overall, both sex and emotional valence appeared to influence emotion experience while watching the film clips. With respect to positive emotions, men reported greater positive experience than women while watching the disgusting film. Contrary to expectations, no expressive suppression-related effects were found with regard to positive emotion experience. In terms of negative emotions, women in the expressive suppression condition experienced less negative emotion than women in the control condition.

Do the cognitive consequences (i.e., auditory and visual memory) of expressive suppression vary across sex and emotion states (i.e., amusement and disgust)? In this study, each participant completed three memory tasks: an auditory recall test, an auditory recognition test, and a visual recognition test. Auditory recall and auditory recognition test scores were positively correlated for both emotional film clips; however, scores on the visual recognition test were not related to either measure of auditory memory (see Table 8). Therefore, the two auditory measures were included in one MANCOVA as dependent variables, and auditory and visual memory were examined separately.

Visual memory. Two mixed-model ANCOVAs were conducted to examine whether expressive suppression influences participants' visual and auditory memory, and whether these effects of expressive suppression vary across sex and emotional valence. In this first analysis, visual memory was the dependent variable; condition, sex, and emotion (amusement, disgust) were the independent variables. Visual WMC, intensity of positive and negative emotion, and the effort put into memorizing material (effort for film) were treated as covariates. A main effect of sex (F (1, 64) = 6.62, p = .01, η^2 = .09) indicated that women remembered more visual information than did men (see Table 6 and Figure 3).

This main effect was qualified by significant sex X emotion (F (1, 64) = 4.48, p = .04, η^2 = .06) and sex X emotion X condition (F (1, 64) = 4.96, p = .03, η^2 = .07) interactions. The sex X emotion interaction revealed that while women demonstrated better visual memory than men for the amusing film, there was no difference between men and women for the disgusting film (see Table 6 and Figure 3). To explore the three-way interaction, two-way mixed-model ANCOVAs were conducted in the expressive suppression and control groups respectively. In these analyses, visual memory was the dependent variable, and sex and emotion were the independent variables. Again, visual WMC, intensity of positive and negative emotion, and effort for film were treated as covariates. In terms of the control condition, the main effect of sex (F (1, 30) = 11.34, p < .01, η^2 = .27) indicated that men performed more poorly than women on the visual memory test when watching both the amusing and disgusting films. No interaction effect was observed in the results. With respect to the expressive suppression condition, although no main effects were shown in the results, significant sex X emotion interaction

(F (1, 30) = 13.64, $p < .01$, $\eta^2 = .31$) demonstrated that while women performed better than men on the visual memory test for the amusing film, they had poorer visual memory for the disgusting film (see Table 6 and Figure 3).

Verbal memory. In the second analysis, a mixed-model MANCOVA was conducted, in which scores on the auditory recall and recognition tests were the dependent variables, condition, sex, and emotion were the independent variables, and verbal WMC, intensity of positive and negative emotion, and effort put into memorizing words were covariates. A main effect of emotion on auditory recall performance (F (1, 64) = 6.28, $p = .02$, $\eta^2 = .09$) revealed that participants were better able to recall words presented during the amusing film than the disgusting film. The main effect of sex was also significant: Men recalled and recognized more words than women across conditions and emotional states (recall: F (1, 64) = 8.80, $p = .04$, $\eta^2 = .12$; recognition: F (1, 64) = 3.18, $p = .08$, $\eta^2 = .05$) (see Table 7 and Figure 4).

As predicted, an emotion X condition interaction was found for auditory recall (F (1, 64) = 5.52, $p = .02$, $\eta^2 = .08$) and recognition memory performance (F (1, 64) = 4.24, $p = .04$, $\eta^2 = .06$). Participants in the expressive suppression condition recalled and recognized fewer words than participants in the control condition after viewing the disgusting film; however, there was no difference between conditions for the amusing film (see Table 7 and Figure 4).

As expected, both sex and emotional valence played a role in the cognitive consequences of expressive suppression. With respect to the effects of emotional valence, expressive suppression impaired auditory memory during negative emotional events (i.e., when the disgusting film clip was being presented), but not during positive events (i.e.,

when the amusing film clip was being presented). In terms of sex effects, a) men performed better than women on auditory memory tests; and b) while women performed better on visual memory tests after suppressing positive emotions, men performed better on visual memory tests after suppressing negative emotions.

Is memory during the lab-based expressive suppression task associated with reports of effort to suppress or reports of daily expressive suppression? Two bivariate correlation tests were carried out to investigate this question. The first analysis examined the relations among daily expressive suppression, visual memory, and effort to suppress positive (induced by watching the amusing film clip) and negative emotions (induced by watching the disgusting film clip). The second tested the associations between auditory memory (recall and recognition), effort to suppress positive and negative emotions, and daily expressive suppression. Contrary to expectations, there were no significant correlations between reports of effort to suppress while watching the films, daily expressive suppression, and visual or auditory memory performance (all p's > .05; see Tables 9 and 10).

Discussion

The overall purpose of the current study was to investigate whether the cognitive and experiential consequences of expressive suppression were influenced by sex and emotional valence. Three research questions were addressed: Do sex and emotional valence influence emotional experience during expressive suppression? Do the cognitive consequences of expressive suppression (specifically, memory for verbal and visual information) vary across sex and different emotional states? Is memory during expressive suppression associated with effort put forth to suppress or daily frequency of using

expressive suppression? Results related to each of these questions will be discussed in turn.

Emotional Valence and Sex Differences in Experiential Consequences of Expressive suppression

Participants were asked to report on their emotional feelings at four points during this study: before watching the film clips (prefilm), and after watching each of the neutral, amusing, and disgusting film clips. Although participants rated their experience with respect to both negative (i.e., anger, confusion, disgust, fear, embarrassment, sadness) and positive (i.e., amusement, happiness, interest, pleasant) terms at each of the four points, the dominant affect while watching the amusing clip was positive emotion, while the non-dominant affect was negative emotion. By contrast, while watching the disgusting clip, the dominant affect was negative emotion and the non-dominant affect was positive emotion. Compared to previous research, an advantage of the current study is that analyses for both dominant and non-dominant emotion experience were included.

Positive emotion. Contrary to expectations, there were no effects of expressive suppression on reports of positive emotional experience. This result is contrary to the findings of Gross and Levenson (1997), who found that expressive suppression led to a reduction of positive emotion experience while watching an amusing film clip. However, there are important differences between the present study and Gross and Levenson's research with regard to the experimental procedure. In particular, participants in Gross and Levenson's study were not informed about the forthcoming memory tests; as a result, the researchers did not place their participants under any significant cognitive load while they were watching the films. In contrast, because the present study employed a within-

subjects design, each participant had to watch three film clips. Therefore, subjects were advised that there were forthcoming cognitive tasks after viewing each clip, including memorizing visual (i.e., film content) and auditory (i.e., lists of words) materials. These additional tasks were cognitively demanding, and these demands might have induced higher levels of psychological stress in participants. Consequently, the participants may have experienced fewer positive emotions in both conditions (control, expressive suppression). It may be the case that a condition difference (control vs. expressive suppression) with respect to positive emotional experience will only be observed in situations where the baseline experience of positive feelings reaches a particular threshold.

Although there have been several studies that have examined the experiential consequences of expressive suppression, most of them required participants to suppress negative emotions (e.g., disgust). Gross and Levenson's (1997) research is the only study in the literature that investigated emotion-related responses while suppressing positive emotions. Clearly, additional studies need to be carried out before firm conclusions can be drawn regarding the effect of expressive suppression on positive emotional experience.

In spite of the absence of a main effect of condition (control vs. expressive suppression) on positive emotional experience, a sex-related interaction was found with regard to the experience of positive emotion. Male participants reported experiencing greater positive emotions than female participants while watching the disgusting film, though there were no differences between men's and women's ratings of positive emotion for the other three periods (prefilm, neutral, amusement). These findings are

consistent with those reported by Hess et al. (2000), who found that men were likely than women to react with positive emotions to negative emotional stimuli. This phenomenon may be explained by social expectations for men: They are expected to be strong and not show weakness, even when confronted with difficult situations (Eagly, 1983; Lytton & Romney, 1991; Tamres, Janicki, & Helgeson, 2002). One consequence of internalizing such a belief system may be that men are more prone to endorsing the idea that they feel positively during negative circumstances.

Negative emotion. Contrary to expectations, there was no sex difference in the reports of negative emotional experience during expressive suppression of negative emotion (i.e., while the disgusting film was being presented). Previous research suggests that females have higher arousal of negative emotions than males during exposure to negative affect stimuli (Grossman & Wood, 1993; Hess et al., 2000; Kelly et al., 2008; Mak et al., 2009). For example, they display more expressive behavior in negative situations (Kring & Gordon, 1998). Considering Gross and Levenson's (1997) suggestion that subjective experience may rely on the amount of expression being displayed (i.e., reported emotional experience is positively associated with spontaneous emotional expressions), female participants were expected to report experiencing more negative emotion than male participants while suppressing the emotion of disgust. However, the present study did not find such sex difference, even though results indeed indicated that women themselves perceived more expressions than did men while suppressing negative emotion. This result may suggest that self-reports of emotional experience and expression are relatively independent.

Moreover, the lack of sex effects appears to contradict the findings by Mak et al. (2009), who reported that females experienced more negative emotions than males while regulating negative emotion induced by viewing negative pictures. However, it is unclear which regulatory strategy (or strategies) participants used during the study since they were not instructed to practice any specific strategy. Many researchers have proposed that different emotion regulatory strategies lead to different consequences (Dunn, Billotti, Murphy, & Dalgleish, 2009; Gross, 2002; Gross & Thompson, 2007; John & Gross, 2004). For instance, while expressive suppression does not influence negative emotional experience, cognitive reappraisal reduces emotional responding (Butler, Egloff, et al., 2003; Egloff, Schmukle, Burns, & Schwerdtfeger, 2006; Gross, 1998; Huang & Guo, 2002). Therefore, it is possible that the sex difference in reports of negative emotional experience found in Mak et al. study might be explained by the fact that women and men had used different strategies to regulate their emotions.

Surprisingly, the present research found that expressive suppression led to a decrease in negative emotional experience for women across films (neutral, amusement, disgust), though there was no such effect for men. A substantial body of research has reported that expressive suppression does not have an effect on negative emotional experience (Butler, Lee, et al., 2007; Goldin et al., 2008; Gross, 1998; Gross & Levenson, 1993, 1997; Hagemann et al., 2006; Li & Lu, 2007), and most of these studies were carried out with adult female samples. Given such robust evidence, there are no clear explanations for this finding. However, it is worth noting that the effect size of this finding is relatively small; thus, the effect of expressive suppression on negative experience may have taken place by chance.

Emotional Valence and Sex Differences in Memory during Expressive suppression

Effects of emotion valence. Consistent with previous research (Goldin et al., 2008; Gross, 1998; Gross & Levenson, 1993, 1997, Hagemann et al., 2006; Li & Lu, 2007; Richards et al., 2003; Richards & Gross, 1999, 2000, 2006), expressive suppression resulted in degraded auditory memory during exposure to negative emotion-eliciting stimuli, but did not have an impact on visual memory. Specifically, participants in the expressive suppression condition recalled and recognized fewer words after watching the disgusting film than did participants in the control condition. The two groups did not differ in memory performance for visual film content. These findings are congruent with those of Richards and Gross (2000), who have suggested that expressive suppression may involve a verbal self-monitoring process (e.g., mentally telling oneself not to show emotion) that interferes with the process of encoding auditory material into memory, but does not influence the process of relevant to encoding visual information. As a result, the cognitive costs associated with expressive suppression include poorer auditory, but not visual, memory.

There was no effect of expressive suppression on auditory or visual memory for the amusing film. Though prior research has not examined the cognitive consequences of expressive suppression in the context of positive emotion, this result was consistent with our expectations. A large body of research indicates that positive affect improves multiple aspects of cognition (e.g., decision making, problem solving creativity, cognitive organization and categorization) (Ashby et al., 1999; Isen & Daubman, 1984; Isen, Daubman, et al., 1987; Isen, Johnson, et al., 1985; Isen & Means, 1983; Isen, Shalker, et al., 1978). The increased cognitive flexibility that is associated with positive affect is

believed to be the direct cause of improvements in cognition. People who are feeling happy are more likely than those in a neutral or negative state to see additional features and characteristics of ideas and objects, perceive unusual associates and relatedness between cognitive material, and are better able to switch between multiple cognitive tasks than others (Dreisbach, 2006; Dreisbach & Goschke, 2004). In the current study, participants in the expressive suppression condition were required to allocate a certain amount of attention to expressive suppression processes while also attending to the to-be-remembered information being presented during the film. If positive affect does indeed facilitate attention switching, then perhaps participants were better able to achieve the dual goals of the cognitive (i.e., memory) and expressive suppression tasks while suppressing positive emotion than they were while suppressing negative emotion. Some support for this idea can be found by comparing memory performance in the two emotion conditions (positive vs. negative emotional states). Across the control and expressive suppression conditions, more words were recalled and recognized after the amusing film than the disgusting film.

Sex effects. Analyses from the present study revealed sex differences in auditory and visual memory. With the exception of suppressing the experience of disgust, women remembered more visual film content than did men, while men recalled and recognized more verbal content across both conditions and emotions. These results appear to contradict prior findings, which have indicated that women show better memory for auditory and visual material than men (Bleeker, Bolla-Wilson, Agnew, & Meyers, 2006; Herlitz, Airaksinen, & Nordstrom, 1999; Lewin, Wolgers, & Herlitz, 2001). However, in many of these prior studies, the auditory stimuli consisted of a series of emotion-neutral

words, and these words were the only material that participants were required to remember. In the present research, the auditory stimuli were also a group of emotionally neutral words. However, visual stimuli (i.e., visual film content) were presented to participants simultaneously, and these visual stimuli were emotion-laden.

There is some evidence suggesting that women have better memory than men for emotional events, particularly those that are presented through pictures (Bloise & Johnson, 2007; Canli, Desmond, Zhao, & Gabrieli, 2002; Cahill, Gorski, Belcher, & Huynh, 2003; Penelope, 1999; Mackiewicz, Sarinopoulos, Cleven, & Nitschke, 2006). For example, in a study by Canli et al. (2002), an equal number of female and male university students viewed a series of neutral and emotionally negative pictures. Their memory for the pictures was tested three weeks later, and results indicated that women remembered the emotional pictures better than men. Mackiewicz et al. (2006) completed a study in which participants' memory for neutral and aversive pictures was assessed directly after viewing pictures and two weeks later. Again, results indicated that women showed better memory than men for aversive over neutral pictures across the two testing periods.

In trying to explain this pattern of results, researchers found that women often feel more intense emotions than men and they tend to seek out emotional experiences (Kring & Gorden, 1998). If this were the case, women in the present study may have been apt to attend to the emotion-inducing visual content of the films than to the neutral words presented orally. Such an explanation may help to explain why women performed better than men on the visual memory tests, but less well on the auditory memory tests, even

though women are better than men at both auditory and visual memory when these tasks are run independently.

In terms of sex effects, the single exception to the general pattern of results was that, in the expressive suppression condition, women had worse visual memory than men while watching the disgusting film clip. One possible explanation for this finding emphasizes the biological basis of emotion. For example, the observed sex difference may be associated with the brain regions recruited during the regulation of negative emotion. According to Mak and his colleagues (2009), during regulation of negative emotion, men mainly recruit prefrontal regions (including the left dorsolateral, lateral orbitofrontal gyrus, and the right anterior cingulated gyrus) are implicated cognitive processes, while women mainly recruit the left medial orbitofrontal gyrus that is implicated in affective processes. The prefrontal regions are believed to assist in selecting and shifting between two cognitive tasks. In the current study, with greater activity in the prefrontal regions, men may have been better able to shift attention between viewing the film and regulatory instructions than women; as a result, men may have been better able to manage the conflict between the emotional arousal induced by the film and the goal of expressive suppression. The orbitofrontal regions recruited by women during emotion regulation are believed to be associated with emotional perspective taking, which is considered to be the ability of understanding other people's affective states (Hynes, Baird, & Grafton, 2006). With greater activity in these regions, women might have been more likely to attend to the content of people-featured films than men. This explanation is consistent with another finding in Mak et al.'s study: Female participants reported more difficulty with regulating negative emotion than their male counterparts.

Moreover, in the current study there were more women than men who reported looking away during presentation of the disgusting film clip. This behavior may have had a direct impact on the visual memory performance of the female participants in both conditions (control, expressive suppression). However, the negative influence might have been greater for the expressive suppression group than for the control group. In the expressive suppression condition, participants were instructed to not display any emotional signs. Looking away (including shielding gaze, turning away, covering eyes by hands, and eye closed) likely reflects an effort to manage the negative emotions brought about by watching the film. The female participants in the expressive suppression condition who looked away while watching the disgusting film clip knew that they were not behaving in accordance with the instructions they were given. As such, they perhaps felt more stressed than their counterparts in the control condition who did not receive the expressive suppression instructions. With greater feelings of stress, female participants in the expressive suppression condition may have been less able to memorize ongoing information, and consequently demonstrated poorer visual and verbal memory than the male expressive suppression group.

Relations between Memory Performance, Effort put forth to Suppress, and Habitual Use of Expressive suppression

Contrary to hypotheses, neither auditory nor visual memory performance was associated with participants' effort to suppress during films. These findings contradict those of Richards and Gross (2006), who reported that the effort put into expressive suppression while viewing a disgusting film was negatively correlated with the memory for film content. The inconsistent findings may have been the result of different

instructions given in Richards and Gross's study, as compared to the current research. In Richards and Gross's study, participants were asked to suppress emotion, but were not told about the forthcoming memory tests. Thus, they may have paid greater attention to overseeing suppressive processes than encoding film content into memory. In contrast, participants in the present study were informed about the memory tests before watching the films. Thus, cognitive resources were likely assigned to both tasks, and the overall cognitive processes may have involved great attention switching between the memorizing and expressive suppression tasks. Because substantial attention was allocated to cognitive material in the current study, memory performance might be influenced by effort for memorizing information more than effort put into expressive suppression. As a result, the latter factor may not have contributed as much to the performance as would have been the case in Richards and Gross's study.

Also contrary to expectations, there was no relation between memory performance in the current study and self-reports of daily expressive suppression. It had been expected that participants who used expressive suppression more frequently in everyday life would perform better on the memory tests because extensive practice with expressive suppression may have resulted in less effort and fewer cognitive resources needed to suppress during the study. The lack of an association between memory and daily expressive suppression may be related to the fact that while frequent use of expressive suppression is influenced by factors such as sex (Christophe, Leroy, & Delelis, 2008), culture (Butler, Lee, et al., 2007), social desirability, and personality traits (e.g., neuroticism, extraversion) (John & Gross, 2004), memory during expressive suppression is affected by other factors such as working memory capacity (Rosen & Engle, 1998;

Schmeichel et al., 2008), and valence of the emotion being suppressed. These other factors may be more important in terms of predicting memory performance. However, it is worthy noting that this is the first study to investigate the relation between habitual use of expressive suppression and memory. Clearly, additional research is needed before we can make firm conclusions.

Limitations and Strengths of the Current Study and Future Directions

Limitations of the present research must be acknowledged. First of all, participants in this study were Caucasian undergraduates; thus, any generalizations regarding the cognitive consequences of expressive suppression to other age or cultural groups should be made with considerable caution. With regard to age, a large body of research has demonstrated that cognitive functioning declines when people grow older (Craik & McDowd, 1987; Hultsch, Hammer, & Small, 1993; Kliegl, Smith, & Baltes, 1989; Perfect & Maylor, 2000; Salthouse, 1993, 1994). For instance, there is an age-related reduction in working memory (Salthouse, 1991). Since working memory capacity is positively associated with how well expressive suppression is activated (Rosen & Engle, 1998; Schmeichel et al., 2008), it is possible that older people may find the expressive suppression of emotion more difficult than younger people. This age difference may, in turn, influence the consequences of expressive suppression, including cognition.

In terms of culture, an emerging literature has begun to examine how culture affects the behavioral, experiential, and physiological consequences of expressive suppression (Butler, Lee, et al., 2007; Soto et al., 2005). However, little is known about whether culture has an impact on the cognitive consequences of expressive suppression

(e.g., memory for the information presented while using expressive suppression). The limited cross-cultural literature that has been published does suggest that people of various cultural backgrounds demonstrate different preferences with regard to regulating emotion. For example, research provides evidence that Chinese individuals are more practiced at using expressive suppression than Caucasians (Butler et al., 2007; Gross & John, 2003; Matsumoto, 2008), and may require less effort when using this strategy to manage emotion. Thus, it is possible that the cultural differences between these two ethnic groups may result in expressive suppression having different effects on memory.

This assumption recently received support from a cross-cultural study, which investigated the relation between habitual use of expressive suppression and the effects of expressive suppression on cognition. Participants included both Canadian and Mainland Chinese university students (Zhu, 2010). Preliminary analyses revealed that, as expected, Chinese participants indicated greater use of expressive suppression than Canadian participants. Moreover, there was a significant positive correlation between reports of habitual expressive suppression and memory for information presented during expressive suppression, regardless of cultural background. However, this relation was not found in the current study. The likelihood of observing significant correlation is dependent on the scores on the variables having a reasonable variance and/or range. The data obtained from the cross-cultural study contained greater variance than those collected in the present research.

Second, the present study was exclusively focused on amusement and disgust. It is not clear whether the effects observed in the present study would hold for other positive and negative emotional states. Future studies should attempt to test other negative

emotional states, such as anger. Many studies have reported significant sex differences in the expression and experience of anger (Hess et al., 2000; Vogele et al., 1997); thus, it would be interesting to determine whether there are sex differences in emotion-related responses during expressive suppression of anger.

Third, the present research relied on a two-item self-report measure (i.e., To what extent do you think your feelings were visible while watching the film? To what extent were you trying to avoid showing how you felt while watching the film?) to assess the quality of participants' expressive suppression of emotion. Future studies should make use of observational data such as videotapes of facial expression to assess expressive suppression. These observational data may provide more accurate information about the quality of suppressive practice, and more detailed information about various expressions (e.g., smile, laugh, frown, cry) displayed during expressive suppression. It has been reported that while describing personal negative events, men are more likely to smile and laugh, and women are more likely to cry and withdraw (Hess et al., 2000). Therefore, during expressive suppression, sex differences in emotional expressivity are perhaps shown in the degree of expressivity and/or in the types of emotions that are being displayed.

Fourth, in order to generate a broad-based measure that reflected participants' experience of emotion while watching the film clips, ratings for each of the emotional terms were collapsed into two composite variables (positive and negative emotion) in the analyses. Although there were a large number of positive intercorrelations among these emotional terms, the alpha coefficient for the scores of negative emotion while watching the amusing film was relatively low. Future studies should explore the relatedness among

various discrete emotions in depth, and map people's affective states by combining the emotions that are highly correlated.

Finally, the experimental nature of the current study places some limits on its external validity. Specifically, the emotion-inducing stimuli used in the present study were films, and participants engaged in expressive suppression because they were instructed to do so by the researcher. In reality, expressive suppression is often elicited when people are interacting with others, rather than when they are watching films. Moreover, while there are numerous motives for engaging in expressive suppression, it is not typical for adults to do so at the instruction of someone else. In future studies, researchers should consider simulating more naturalistic social situations (e.g., dyadic interaction) as a means of increasing external validity.

In spite of its limitations, this study had a number of strengths that make it an important contribution to the literature. There has been substantial evidence showing negative effects of expressive suppression on cognition (Bonanno et al., 2004; Richards, Butler, et al., 2003; Richards & Gross, 1999, 2000, 2006). However, scientists have not investigated this issue with regard to positive emotional stimuli. The current study, therefore, employed positive emotion-inducing stimuli to address this shortcoming of prior research.

In terms of research methods, memory was tested using separate verbal stimuli, in addition to testing visual content of expressive suppression. In previous studies concerning the cognitive consequences of expressive suppression, researchers have only examined how participants encoded the content of slides or film clips (contain both visual and auditory information) into memory while engaging in expressive suppression. A

major advantage of this study is that the auditory stimuli to be remembered (lists of words) were counterbalanced across all of the film clips in the study. As a result, to-be-remembered auditory information was not confounded with the film itself.

Finally, in this study, I also investigated whether there were sex differences in the cognitive consequences of expressive suppression. Although a large body of research has examined the multiple consequences of expressive suppression, little is known about sex-related differences in these outcomes. The current study filled this gap by testing both female and male participants.

Conclusion

The results of this study supported previous work that suggests that expressive suppression of negative emotion has detrimental effects on memory. However, the present research extended what is known by investigating how sex and emotional valence may impact on the cognitive consequences of expressive suppression. Results revealed that both sex and the emotional valence of films influence the effects of emotional expressive suppression on memory. With respect to the effect of emotional valence, the expressive suppression of negative, but not positive emotion, was associated with degraded memory (auditory memory in particular). In terms of sex effects, women showed both poorer visual and auditory memory while suppressing the experience of disgust, but not amusement.

Overall, the present study made an important contribution to the literature by addressing some of the shortcomings of prior research, and by raising a number of interesting questions that may be investigated in future research.

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Table 1

Results of tests for selecting the best emotion-inducing film clips

Films	Intensity	Z-intensity	Discreteness	Z-discreteness	Success
Disgust1	6.12	-0.17	0.75	0.17	0
Disgust2	6.38	0.76	0.88	1.19	1.95
Disgust3	6.00	-0.60	0.88	1.19	0.59
Amusement1	6.62	1.62	0.62	-0.85	0.77
Amusement2	6.00	-0.60	0.62	-0.85	-1.45
Amusement3	5.88	-1.03	0.62	-0.85	-1.88

Table 2

Six orders used in the study

Orders	Target 1	Foil 1	Target 2	Foil 2	Target 3	Foil 3
1	List 1	List 2	List 3	List 4	List 5	List 6
2	List 2	List 3	List 4	List 5	List 6	List 1
3	List 3	List 4	List 5	List 6	List 1	List 2
4	List 4	List 5	List 6	List 1	List 2	List 3
5	List 5	List 6	List 1	List 2	List 3	List 4
6	List 6	List 1	List 2	List 3	List 4	List 5

Table 3

Four composite variables with respect to emotional experience

Composites	N	M	SD	Cronbach's Alpha
Positive emotions during the amusing film	72	25.11	7.03	.89
Negative emotions during the amusing film	72	9.79	4.10	.66
Positive emotions during the disgusting film	72	11.46	7.23	.87
Negative emotions during the disgusting film	72	21.68	8.98	.77

Table 4

Means and standard deviations of reports of visible expression and effortful expressive suppression for all three films

Group	Visible expression						Effort to suppress					
	Neutral film		Amusing film		Disgusting film		Neutral film		Amusing film		Disgusting film	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Expressive suppression												
Women	$2.83_{1,a}$	1.15	$4.06_{2,a}$	2.51	$4.61_{2,a}$	2.06	$4.39_{1,a}$	2.93	$6.67_{2,a}$	2.35	$6.93_{2,a}$	2.38
Men	$3.11_{1,b}$	1.81	$4.17_{2,b}$	2.88	$4.06_{2,b}$	2.26	$5.67_{1,a}$	2.47	$6.78_{2,a}$	2.32	$7.00_{2,a}$	2.11
Control												
Women	$3.06_{1,a}$	1.86	$6.67_{2,c}$	2.03	$7.44_{2,c}$	2.15	$1.44_{1,b}$	1.15	$2.72_{2,b}$	2.93	$3.44_{2,b}$	3.07
Men	$3.78_{1,b}$	1.55	$7.00_{2,d}$	1.61	$6.83_{2,d}$	1.38	$2.17_{1,b}$	1.69	$2.50_{2,b}$	2.06	$2.94_{2,b}$	1.83

Note. Means in the same row with different numerical subscripts differed at $p < .05$ in the Bonferroni multiple comparisons. Means in the same column with different alphabetical subscripts differed at $p < .05$ in the Bonferroni multiple comparisons.

Table 5

Means and standard deviations of the reports of positive emotion experience (PEE) and negative emotion experience (NEE)

Group	Positive emotion experience						Negative emotion experience					
	Neutral film		Amusing film		Disgusting film		Neutral film		Amusing film		Disgusting film	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Expressive suppression												
Women	$4.65_{1,a}$	1.52	$6.56_{1,a}$	1.69	$2.51_{1,a}$	1.98	$1.33_{1,a}$	0.31	$1.17_{1,a}$	0.29	$2.90_{2,a}$	0.90
Men	$4.42_{1,a}$	1.57	$5.68_{1,a}$	2.15	$3.33_{1,b}$	1.86	$1.85_{1,b}$	0.72	$1.34_{1,b}$	0.36	$3.17_{1,a}$	1.74
Control												
Women	$4.99_{1,a}$	1.93	$6.61_{1,a}$	1.71	$2.19_{1,a}$	1.39	$1.73_{1,b}$	0.64	$1.40_{1,b}$	0.65	$3.48_{2,b}$	1.03
Men	$5.36_{1,a}$	1.06	$6.26_{1,a}$	1.38	$3.42_{1,b}$	1.76	$1.75_{1,b}$	0.55	$1.68_{1,b}$	0.81	$2.85_{1,a}$	1.31

Note. Means in the same row with different numerical subscripts differed at $p < .05$ in the Bonferroni multiple comparisons. Means in the same column with different alphabetical subscripts differed at $p < .05$ in the Bonferroni multiple comparisons.

Table 6

Means and standard deviations of visual memory performance for the amusing and disgusting film clips

	Amusing film		Disgusting film	
	M	*SD*	*M*	*SD*
Expressive suppression				
Female	$8.50_{1,a}$	1.92	$7.17_{1,a}$	1.86
Male	$6.83_{1,b}$	1.58	$7.61_{1,b}$	2.43
Control				
Female	$8.00_{1,a}$	1.33	$7.94_{1,c}$	1.59
Male	$6.72_{1,b}$	1.53	$6.78_{1,d}$	2.13

Note. Means in the same row with different numerical subscripts differed at $p < .05$ in the Bonferroni multiple comparisons. Means in the same column with different alphabetical subscripts differed at $p < .05$ in the Bonferroni multiple comparisons.

Table 7

Means and standard deviations of auditory memory performance for the amusing and disgusting film clips

	Recall memory				Recognition memory			
	Amusing film		Disgusting film		Amusing film		Disgusting film	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Expressive suppression								
Female	$3.89_{1,a}$	2.65	$2.33_{2,a}$	2.14	$9.39_{1,a}$	2.36	$7.89_{1,a}$	3.05
Male	$5.11_{1,b}$	3.48	$3.06_{2,b}$	2.51	$10.00_{1,b}$	3.36	$8.11_{1,b}$	4.27
Control								
Female	$4.11_{1,a}$	3.48	$3.39_{2,b}$	3.50	$9.17_{1,a}$	3.20	$8.28_{1,b}$	3.08
Male	$5.00_{1,b}$	3.65	$4.78_{2,c}$	3.42	$9.33_{1,a}$	3.03	$9.28_{1,c}$	3.29

Note. Means in the same row with different numerical subscripts differed at $p < .05$ in the Bonferroni multiple comparisons. Means in the same column with different alphabetical subscripts differed at $p < .05$ in the Bonferroni multiple comparisons.

Table 8

Correlations between scores on auditory and visual memory tests for the two emotional film clips

	Auditory recall memory for the amusing film	Auditory recognize memory for the amusing film	Visual memory for the amusing film	Auditory recall memory for the disgusting film	Auditory recognition memory for the disgusting film
Auditory recognize memory during the amusing film	.73**				
Visual memory for the amusing film	-.08	-.07			
Auditory recall memory during the disgusting film	.53**	.38**	-.04		
Auditory recognition memory during the disgusting film	.43**	.53**	-.07	.62**	
Visual memory for the disgusting film	-.09	.02	.32**	-.13	-.23*

* Correlation is significant at 0.05 level (two-tailed).

** Correlation is significant at 0.01 level (two-tailed).

Table 9

Correlations between reports of effortful expressive suppression during the study, daily expressive suppression, and visual memory performance for the amusing and disgusting film clips

	Visual memory for the amusing film	Visual memory for the disgusting film	Expressive suppression effort during the amusing film	Expressive suppression effort during the disgusting film
Visual memory for the disgusting film	.32*			
Expressive suppression effort during the amusing film	.09	-.12		
Expressive suppression effort during the disgusting film	.07	-.00	.73**	
Daily expressive suppression	-.16	-.04	.13	.08

* Correlation is significant at 0.05 level (two-tailed).

** Correlation is significant at 0.01 level (two-tailed).

Table 10

Correlations between reports of effortful expressive suppression during the study, daily expressive suppression, and auditory memory performances for the amusing and disgusting film clips

	Auditory recall memory	Auditory recognition memory	Effortful expressive suppression during the amusing film	Auditory recall memory	Auditory recognition memory	Effortful expressive suppression during the disgusting film
Auditory recognize memory during the amusing film	.73**					
Effortful expressive suppression during the amusing film	-.10	-.08				
Auditory recall memory during the disgusting film	.53**	.38**	-.21			
Auditory recognition memory during the disgusting film	.43**	.53**	-.10	.62**		
Effortful expressive suppression during the disgusting film	-.03	.01	.73**	-.10	-.04	

** Correlation is significant at the 0.01 level (two-tailed test).

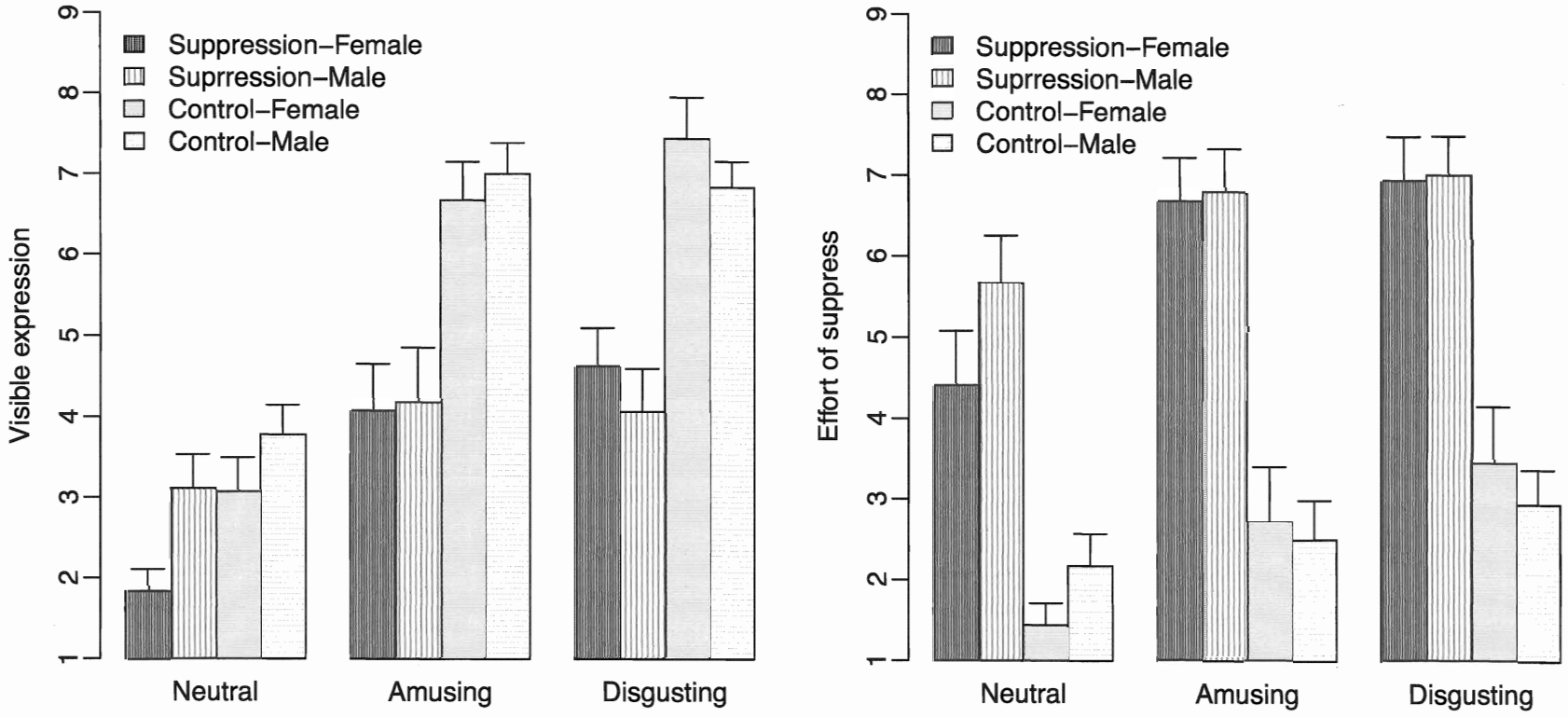

Figure1 *Means and standard deviations of reports of visible expression and effortful expressive suppression for all three films*

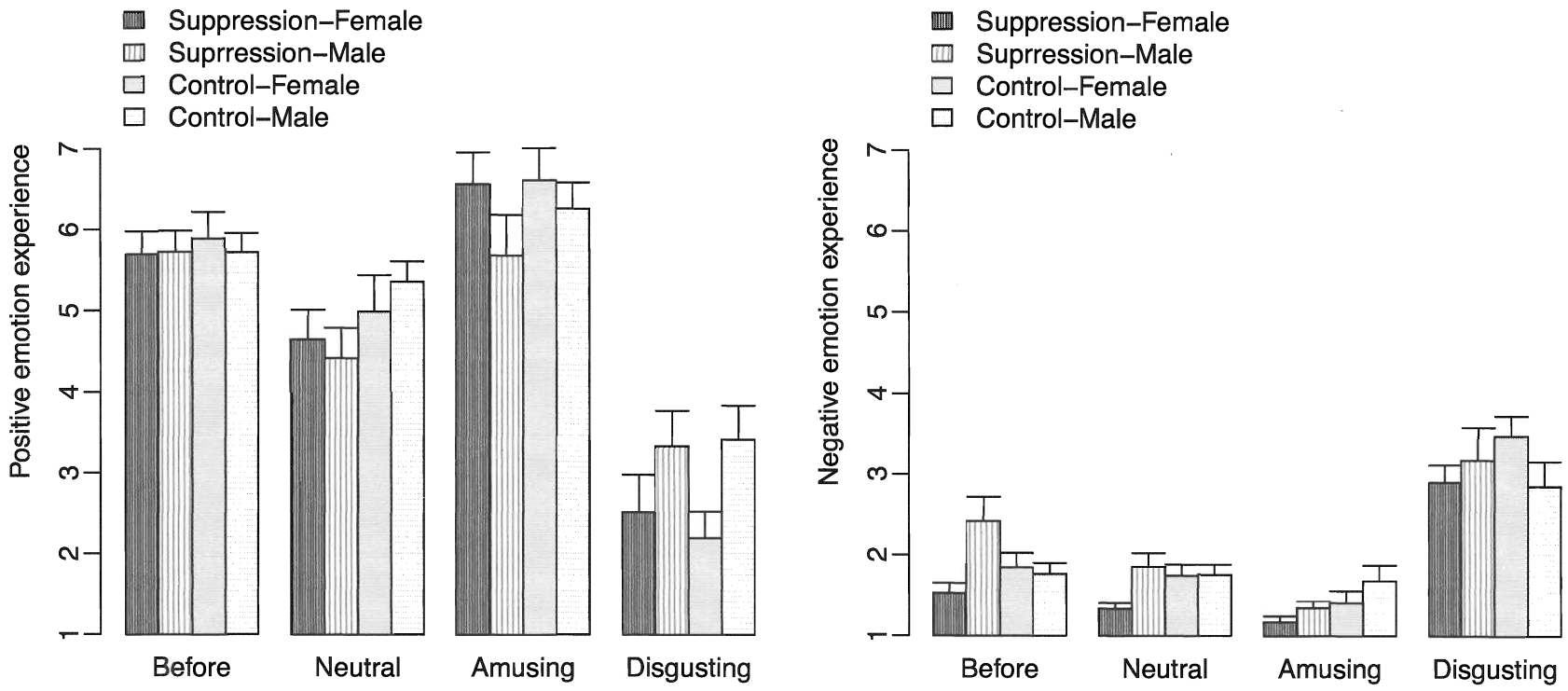

Figure 2 *Means and standard deviations of the reports of positive emotion experience (PEE) and negative emotion experience (NEE)*

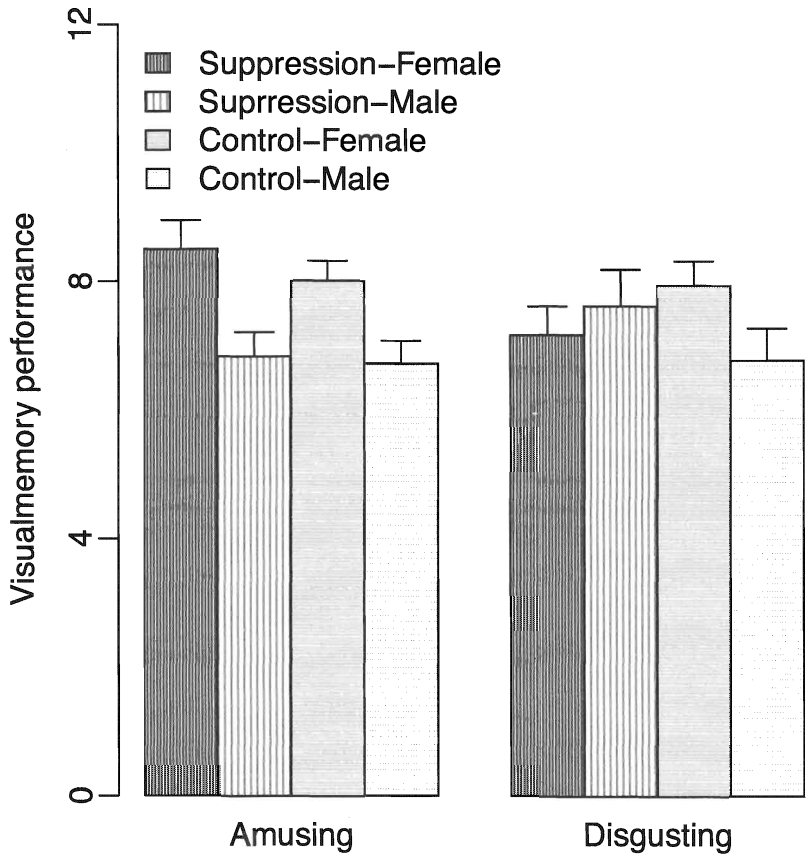

Figure 3 *Means and standard deviations of visual memory performance for the amusing and disgusting film clips*

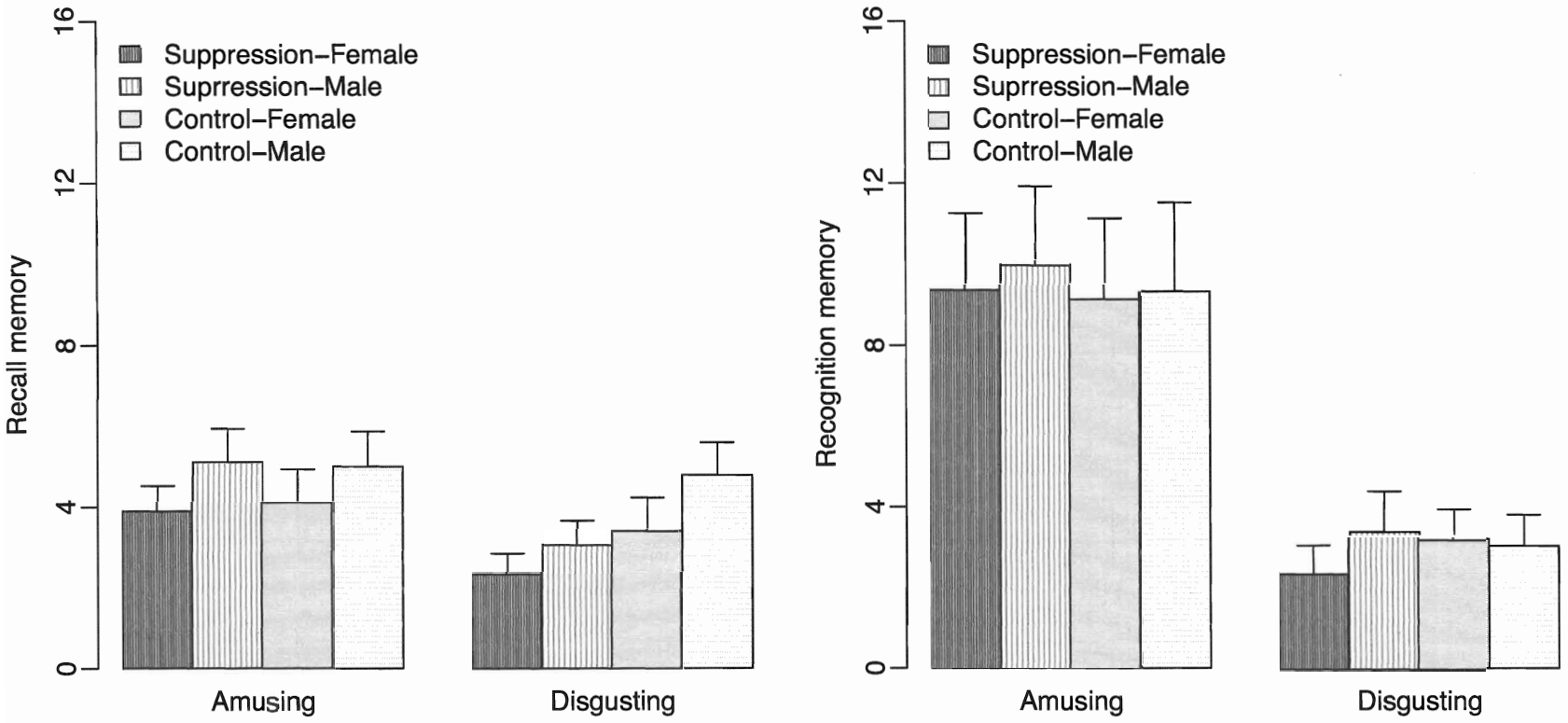

Figure 4 *Means and standard deviations of auditory memory performance for the amusing and disgusting film clips*

Appendix A

PRE-FILM QUESTIONNAIRE

Research ID: _____

The following questions refer to how you are feeling now.

Using the scale below, please indicate the extent to which you are experiencing EACH of the following emotions.

1----------2----------3----------4----------5----------6----------7----------8----------9
not at all/ none — somewhat/ some — extremely/ a great deal

_____ amusement	_____ embarrassment	_____ anger	_____fear
_____ sadness	_____ confusion	_____ happiness	_____ interest
_____ surprise	_____ disgust	_____ arousal (worked up)	_____tension

Are you feeling any other emotion? ____ No ____ Yes

If so, what is the emotion? _____

How much of this emotion are you feeling? _____(please use the scale above to indicate the greatest amount of the emotion you are feeling).

Please use the following pleasantness scale to rate your overall feelings right now. Circle your answer:

1 2 3 4 5 6 7 8 9
unpleasant — pleasant

Appendix B

POST FILM QUESTIONNAIRE

Research ID: _____

The following questions refer to how you felt while watching the film.

Using the scale below, please indicate the extent to which you were experiencing Each of the following emotions.

1	2	3	4	5	6	7	8	9
not at all/ none				somewhat/ some				extremely/ a great deal

_____ amusement _____ embarrassment _____ anger _____ fear

_____ sadness _____ confusion _____ happiness _____ interest

_____ surprise _____ disgust _____ arousal (worked up) _____ tension

Did you feel any other emotion during the film? ____ No ____ Yes

If so, what was the emotion? _____

How much of this emotion did you feel? _____(please use the scale above to indicate the extent to which you are experiencing this emotion).

Please use the following pleasantness scale to rate the feelings you had during the film. Circle your answer:

1	2	3	4	5	6	7	8	9
unpleasant								pleasant

Had you seen this film before? ____ No ____ Yes

Did you close your eyes or look away during any scenes? ____ No ____ Yes

Appendix C

Spontaneous Effort Questionnaire

Research ID: _____

Please use the following scale to indicate your response to each item. Please write down the number that corresponds to your response on the line beside each question.

1----------2----------3----------4----------5----------6----------7----------8----------9
Not at all Somewhat Extremely

____1. To what extent do you think your feelings were visible while watching the film?

____2. To what extent were you trying to avoid showing how you felt while watching the film?

____3. To what extent were you trying to remember what you saw in the film?

____4. To what extent were you trying to remember the list of words that you heard while watching the film?

Appendix D

RECALL MEMORY TEST

Research ID: _____ Word List: _____

Please think about the words that were presented during the film. Write down as many words as you can remember in the box below.

Appendix E

RECOGNITION MEMORY TEST (Sample)

Research ID: _____ Word List: __1__

Please circle any words that you heard during the film from the following list. (Please do NOT turn back to the page where you wrote down the words earlier.)

STAIR	BREAD	RAIN	PICKLE
PLANT	NECK	TEST	LIQUID
BABY	GROUND	MILK	JEEP
LIQUOR	PAGE	NOSE	FEET
CLOTH	PLUG	FIRE	TICKET
SHOP	HAIR	FOOD	CANDY
SOCK	CHAIR	SOUP	ESSAY
SNOW	ROOT	BANK	SISTER

Appendix F

Questions for the "Gradual" Video

Research ID: _____

The following questions refer to what you saw in the film. Each question has ONLY correct answer. Please circle the choice that you think is the best answer for each question.

1. How many black and white pictures are included in the film?
A. Zero
B. Two
C. Six
D. Ten

2. How many pictures present shots of cacti?
A. Zero
B. One
C. Four
D. Ten

3. What is the shape of the pink cactuses presented in one picture?
A. Flat and circular
B. Like giant sticks
C. Spherical
D. Like a fork

4. How many pictures include images of humans?
A. Six
B. Four
C. Two
D. Zero

5. How many pictures present shots of animals?
A. Ten
B. Four
C. One
D. Zero

6. How many pictures include images of water?
A. Zero
B. Three
C. Six
D. Ten

7. Which of the following scenes was NOT presented in the film?
A. Mountains
B. Waterfalls
C. Trees
D. Grass

8. How many pictures did you see the rays of sunlight?
A. Zero
B. Two
C. Four
D. Seven

9. Which of the following scenes is presented in the first picture?
A. Rocks
B. A waterfall
C. A creek
D. Flowers

10. Which of the following scenes is presented in the last picture?
A. A waterfall
B. Mountains
C. Pastures
D. Cacti

11. How many pictures depict ONLY the image of water?
A. Zero
B. One
C. Four
D. Seven

12. How many pictures were taken in the rain?
A. Seven
B. Five
C. Two
D. Zero

Appendix G

Questions for the "Child and Parent" Video

Research ID: _____

The following questions refer to what you saw in the film. Each question has ONLY correct answer. Please circle the choice that you think is the best answer for each question.

1.Recall the scene in which the baby was bouncing in the chair. Where was the baby's chair?
A. On the floor
B. On a table
C. On a bed
D. Outside on the grass

2. In this scene, what was behind the baby?
A. TV set
B. Armchair
C. Plant
D. Fireplace

3. Recall the scene in which the triplets were watching the duck. What color was the duck?
A. Blue
B. Orange
C. Yellow
D. Red

4. In this scene, what was behind the triplets?
A. TV set
B. Armchair
C. Plant
D. Fireplace

5. Recall the scene in which the boy sneezed and a bubble came out of his nose. Which toy was the boy holding?
A. Microphone
B. Teddy Bear
C. Superman action figure
D. Car

6. Recall the scene in which the young girl went to get the newspaper. What colour were her pajamas?
A. Green
B. Pink

C. Yellow
D. Blue

7. What colour was the car that was parked at the bottom of the driveway when she went out to get the newspaper?
A. Black
B. Red
C. Yellow
D. White

8. Recall the scene in which the baby was sleeping in a tub. What was sitting beside the sink?
A. Oven
B. Fridge
C. Table
D. Washer

9. In this scene, what was behind the baby?
A. Window
B. Paint
C. Curtain
D. Mirror

10. Recall the scene in which the baby was fed with milk. Where was the child sitting?
A. In a car seat
B. On the sofa
C. In a highchair
D. On his mother's knee

11. Recall the scene in which the girl put the snake in the shower with her dad. What colour were her pants?
A. Dark green
B. Reddish purple
C. Light Blue
D. Bright red

12. In this scene, what item was sitting on top of the closed toilet?
A. Bathrobe
B. Towel
C. Slippers
D. A pair of glasses

Appendix H

Questions for the "Ingrown Toenail Removal" Video

Research ID: _____

The following questions refer to what you saw in the film. Each question has ONLY correct answer. Please circle the choice that you think is the best answer for each question.

1. What color was the elastic band that the doctor put on the patient's toe?
A. Yellow
B. Blue
C. Orange
D. Green

2. Which side of the ingrown nail was removed first?
A. Left
B. Right

3. What color were the doctor's gloves?
A. Yellow
B. Orange
C. Blue
D. Green

4. Which foot was operated on?
A. Left
B. Right

5. What does the doctor do to the toe before beginning the surgery?
A. Draws a mark on the toe to indicate where to cut.
B. Squeezes fluid out from under the toe.
C. Drills a hole in the nail.
D. Wipes the toe with gauze.

6. Where did the doctor put the removed nail so that he could show it to the patient?
A. In his palm
B. On his wrist
C. On a table
D. In a medical container

7. How many times did the doctor show the removed nail to the patient?
A. Once
B. Twice

8. After he removed the nail, the doctor also cut off some skins and flesh from the toe, and put them_____.
A. in the gauze that he was holding
B. in a medical container
C. in a garbage bin
D. on a piece of glass on the table

9. Which tool below was not used during the procedure?

A B C D

10. What was the doctor wearing?
A. A tuxedo
B. A yellow long-sleeve shirt
C. A white lab coat
D. A black T-shirt

11. What colour are the doctor's pants?
A. Black
B. Blue
C. White
D. Beige

12. In what order did the doctor perform the following tasks?
A. Separate the nail, remove the ingrown nail, put on the elastic band, cut off the flesh.
B. Separate the nail, cut off the flesh, put on the elastic band, remove the ingrown nail.
C. Separate the nail, put on the elastic band, remove the ingrown nail, cut off the flesh.
D. Put on the elastic band, separate the nail, remove the ingrown nail, cut off the flesh.

Appendix I

Emotion Expressivity Questionnaire (ERQ-ESS)

Research ID: _____

We would like to ask you some questions about your emotional life, in particular, how you control (that is, regulate and manage) your emotions. The questions below involve two distinct aspects of your emotional life. One is your emotional experience, or what you feel like inside. The other is your emotional expression, or how you show your emotions in the way you talk, gesture, or behave. Although some of the following questions may seem similar to one another, they differ in important ways. For each item, please answer using the following scale:

1----------2----------3----------4----------5----------6----------7
strongly disagree **neutral** **strongly agree**

____ 1. I keep my emotions to myself.

____ 2. When I am feeling *positive* emotions, I am careful not to express them.

____ 3. I control my emotions by *not expressing them.*

____ 4. When I am feeling *negative* emotions, I make sure not to express them.

Appendix J

Emotional Expressivity Questionnaire (ECQ-EIS)

Research ID: _____

Please use the following scale to indicate how you feel about each item. If you haven't been in the situation described, please say how you feel you would behave in that situation. Write down the number that corresponds to your response beside each item.

1----------2----------3----------4----------5----------6----------7
strongly disagree **neutral** **strongly agree**

_____1. When someone upsets me, I try to hide my feelings.

_____2. People find it difficult to tell whether I'm excited about something or not.

_____3. I find it difficult to comfort people who have been upset.

_____4. When something upsets me I prefer to talk to someone about it than to bottle it up.

_____5. If I receive bad news in front of others I usually try to hide how I feel.

_____6. I seldom show how I feel about things.

_____7. If I'm pleasantly surprised, I show immediately how pleased I am.

_____8. If I get angry or upset I usually say how I feel.

_____9. I do NOT feel embarrassed about expressing my feelings.

_____10. I think people show their feelings too easily.

_____11. Expressing my feelings makes me feel very vulnerable and anxious.

_____12. I usually manage to remain outwardly calm, even though I may be churned up inside.

_____13. I CANNOT help showing how I feel, even when it isn't appropriate to do so.

_____14. Sometimes I just CANNOT control my feelings.