PSYCHOPHYSIOLOGICAL, BEHAVIORAL, AND SELF-REPORTED VALIDITY OF A VIDEO-MEDIATED MOOD INDUCTION IN A PRESCHOOL-AGED SAMPLE

by

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(Under the Direction of Cynthia Suveg)

ABSTRACT

The current study examined the validity of a script-prompted video-mediated mood induction task in a sample of 98 children aged 3-4 (*M* age = 3.48 years, 58% boys). Preschoolers viewed fear, neutral, sadness, and happiness films that lasted an average of 81 seconds (range 65 – 93 seconds). Validity of the task to induce the intended mood states was assessed via heart rate (HR), behavioral observation, and self-report. Repeated-measures Multivariate Analysis of Variance (MANOVA)'s showed that HR during the anxiety, sadness, and happiness film clips all differed significantly from baseline measure of HR. Repeated-measures MANOVA's and *Chi*-Square analyses of behavioral observation found that children were more likely to display the congruent facial emotion. *Chi*-square analyses conducted on self-reports indicated that children were more likely to report the intended emotion during the fear and happiness videos, than other emotions. Collectively, the results suggested that the anxiety and happiness clips are inducing emotions as intended. Results for the sadness video are mixed but were still supported by the psychophysiological and behavioral findings.

INDEX WORDS: Mood Induction, Psychophysiological reactivity, Preschoolers

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CHAPTER 1

INTRODUCTION

Purpose of the Study

This study examined the validity of a script-prompted video-mediated mood induction procedure in a sample of 98 children aged 3-4 and their mothers using psychophysiological change in heart rate (HR), behavioral coding of facial expressions, and the child's self-report of emotion.

How This Study is Original

The present study is original because it examined the validity of script-prompted video-mediated mood induction procedures that have not previously been validated in this age group (3-4) of children. This study was also novel because it used a multimethod assessment that included psychophysiological functioning, behavioral observations of facial expressions, and child self-report to validate the induced mood states and emotions.

Expected Results

It was expected that the video-mediated mood induction procedure would successfully elicit fear, sadness, and happiness in children aged 3-4 years. Regarding psychophysiological changes, it was expected that children would show a significant change in heart rate from baseline during the fear, sadness, and happiness videos. With respect to facial coding, it was

expected that children would show greater expressions of fear during the fear clip than during the sadness, neutral, or happiness clips. In contrast, it was expected that children would show greater expressions of sadness during the sadness clip than during the fear, neutral, or happiness clips. With regards to the happiness clip, children were expected to show greater expressions of happiness than during the fear, sadness, or neutral clips. Research has showed that preschoolers as young as age 4 have a difficult time reporting on their own emotions (Cole, Dennis, Smith-Simon, & Cohen, 2009) and thus, child self-reports were not expected to converge with heart rate changes and behavioral coding results and are expected to be approaching randomness.

CHAPTER 2

PSYCHOPHYSIOLOGICAL, BEHAVIORAL, AND SELF-REPORTED VALIDITY OF A VIDEO-MEDIATED MOOD INDUCTION IN A PRESCHOOL-AGED SAMPLE

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Abstract

The current study examined the validity of a script-prompted video-mediated mood induction task in a sample of 98 children aged 3-4 (*M* age = 3.48 years, 58% boys). Preschoolers viewed fear, neutral, sadness, and happiness films that lasted an average of 81 seconds (range 65 – 93 seconds). Validity of the task to induce the intended mood states was assessed via heart rate (HR), behavioral observation, and self-report. Repeated-measures Multivariate Analysis of Variance (MANOVA)'s showed that HR during the anxiety, sadness, and happiness film clips all differed significantly from baseline measure of HR. Repeated-measures MANOVA's and *Chi*-Square analyses of behavioral observation found that children were more likely to display the congruent facial emotion. *Chi*-square analyses conducted on self-reports indicated that children were more likely to report the intended emotion during the fear and happiness videos, than other emotions. Collectively, the results suggested that the anxiety and happiness clips are inducing emotions as intended. Results for the sadness video are mixed but were still supported by the psychophysiological and behavioral findings.

Introduction

Given the challenges of studying emotion processes in children in ecologically-valid contexts (Forgas, 2002) there is a need to develop reliable and valid experimental procedures that can be administered in the laboratory setting. Mood induction techniques have been used successfully in relatively older youth and adults, though much less is known about the effectiveness of such procedures with young preschool-age children (Blau & Klein, 2011). The current study examined the effectiveness of script-prompted video-mediated mood inductions to induce fear, sadness, and happiness in a sample of 98 children aged 3-4 (*M* age = 3.48 years old;

57 boys). The study used a multimethod approach to assess emotional responses including, change in heart rate (HR), behavioral observations of facial expression, and child self-reports of emotions.

Naturally-occurring and laboratory-induced negative affective (i.e., mood; Alpert & Rosen, 1990) states have been shown to detrimentally effect a myriad of processes including: motivation (Fabes, Eisenberg, Fultz, & Miller, 1988), goal setting behaviors (Hom & Arbuckle, 1998; Harper et al., 2010), memory (Duncan, Todd, Perlmutter, & Masters, 1985), generosity (Barnett et al., 1979), math skills, reading skills, disruptive behaviors, self-efficacy (Bryan & Bryan, 1991), social competence (Carlson & Masters, 1986), intensity of emotional experience (Ekman, Friesen, & Ancoli, 1980), creativity (Isen, Daubman, & Nowicki, 1987), aggression (Barden, Garber, Duncan, & Masters, 1981), behavioral regulation, cognitive processes, problem-solving, task persistence, delay of gratification (Silverman, 1986), and even performance on the WISC-IV (Rader & Hughes, 2005). By contrast, naturally-occurring and laboratory-induced positive affective states have been shown to serve as a protective factor for positivity of recall of autobiographical memories (Bartlett & Santrock, 1979), frustration at later disappointment (Cole, 1986), encoding of difficult learning tasks (Forgas et al., 1988), and cognitions (Blau & Klein, 2011) independently of child temperament. Lastly, even low intensity enduring mood states have been shown to have lasting impacts on social cognitions and social involvement in children (Forgas, 2002). As such, mood induction procedures provide a useful tool to research emotions within the laboratory setting, when assessment in ecologically-valid settings is not practical or possible.

The study of children's emotions and mood induction techniques has a rich history in the field of psychology dating back decades (e.g., Barnett, King, & Howard, 1979; Bartlett & Santrock, 1979; Eisenberg et al., 1988; Erber & Erber, 1994; Harper, Lemerise, & Caverly, 2010; Ridgeway & Waters, 1987). Mood induction techniques attempt to create a naturally-occurring emotion within a laboratory setting. Researchers have proposed that induced moods of happiness, sadness, and neutral emotions are acceptable analogues of naturally-occurring emotions in children (e.g., Barden et al., 1981). Although some researchers have found that induced emotions are less intense than naturally-occurring emotions, induced emotions are still substantially influential (e.g., Martin, 1990). Rader and Hughes (2005) speculated that the effects observed during mood induction in the laboratory are systematically less intense than effects related to naturally-occurring emotions, making the actual relationships stronger. Mood inductions are less effective in children as young as 6-7 and wear off more quickly than in older children (Silverman, 1986). Nonetheless, it is still very important to study emotions and mood states in younger children due to the importance of the early exploration of emotion processes (Forgas et al., 1988).

During the history of mood induction research, several different protocols have been developed. A literature review by Brenner (2000) examined several mood induction techniques in children including: self-generated imagery, experimenter behaviors, experimental instructions to feel a certain mood, emotional stories, evocative videotapes, feedback about success or failure, gifts, remembering positive or negative autobiographical memories, music, social interactions, and viewing faces. Brenner found that video-mediated mood inductions offered several advantages relative to the other procedures such as the ease of administration and lasting effects to mood states. These procedures have been effective in prior research at inducing fear, anger,

sadness, and happiness in children as young as age 4 (e.g., Eisenberg et al., 1988). Additionally, script-prompted video-mediated mood induction procedures are less susceptible to demand characteristics due to standardization of administration (Pagliaccio et al., 2012).

Validation of mood induction procedures has historically used a multimethod approach to corroborate the specific emotions (i.e., fear, sadness, happiness) and affective states. Prior research has examined the validity of a script-prompted video-mediated mood induction procedure to produce feelings of fear, sadness, and sympathy in a sample of children aged 4-7 (Eisenberg et al., 1988). This study examined change in heart rate (HR), facial coding of expressed emotions using a 5-point Likert scale, and children's self-report of emotions to confirm the induced emotions. Verbal and nonverbal indices of emotional responding were then examined for correlations. Results supported nonverbal measures (i.e., change in HR, facial coding) as more reliable predictors of the induced emotion than child self-reports. More recent work has explored the ability of a cheating confederate to induce frustration in children aged 6-9 (Harper et al., 2010). Harper and colleagues used behavioral ratings of affect and body language using a 7-point Likert scale to validate the mood induction; results supported their procedure to successfully induce anger and hostile attributions in children.

Previous research regarding mood induction techniques has found that not all emotions are equally reproducible by using current mood induction techniques. In adolescents and adults, the more basic the emotion (i.e. fear, sadness, and happiness), the easier it is to elicit with a video-mediated mood induction technique (Gross & Levenson, 1995). More recent research with youth has used audio recordings of narrative tales (Rader & Hughes, 2005), peer provocation during a session of playing video games (Hessler & Katz, 2007), and imaginal mood inductions (Harper et al., 2010), although most research in children uses video-mediated mood

inductions (e.g., Blau & Klein, 2011: Eisenberg et al., 1988). In a recent series of studies by Blau and Klein (2010; 2011), video-mediated mood induction was identified as the most appropriated mood induction procedure for use in children aged 4-5, due to its standardized and quick, reliable administration.

Script-prompted video-mediated mood inductions have the most reliable effect sizes for inducing the correct emotional response in children and adults at r = .64-.80 (Martin, 1990). During script-prompted mood inductions, researchers describe the narrative content and instructions for the procedure in a standardized way. Such prompts may be particularly important for young children given their relatively immature level of cognitive development (e.g., Pagliaccio et al., 2012). Script-prompted video-mediated mood inductions are also effective at inducing a myriad of emotional states in a variety of youth populations including: happiness and sadness in ages 4-5 (Blau & Klein, 2011), fear, happiness, sadness, and neutral emotions in ages 5-7 (e.g., Carlson & Masters, 1986; Eisenberg et al, 1988), and fear, happiness, and sadness in ages 8-10 (Forgas et al., 1988). Evocative videotapes have been used previously in several studies and can be delivered consistently and as quickly as 2-minutes (e.g., Forgas et al., 1988; Kebeck & Lohaus, 1986). Since mood induction tasks are susceptible to carryover effects from the last film and demand characteristics, counterbalancing is necessary (Barden et al., 1981). A scripted introduction to each film can help to reduce or at least standardize demand characteristics from the experimenter in adults and children (e.g., Brenner, 2000; Martin, 1990). Carlson and Masters (1986) found that the effects of positive mood inductions are more enduring than negative mood states, and should be conducted last. Additionally, due to ethical concerns, it is important that all mood induction procedures with children end with a positive mood induction to remediate the effects of any negative mood states.

As noted above, research has examined the validity of the mood inductions by monitoring psychophysiological response (e.g., Hessler & Katz, 2007), coding facial expressions (e.g., Harper et al., 2010), and by asking youth to report on their emotional experiences (e.g., Eisenberg, 1988). Psychophysiological measurements of emotional response can be monitored in a number of ways. For instance, mean HR is a measure of Autonomic Nervous System (ANS) reactivity during times of emotional distress and arousal (e.g., Berntson, Cacioppo, & Quigley, 1991). Mean HR is a measure of both the sympathetic and parasympathetic nervous systems and changes in mean HR are related to anxiety and/or frustration in children aged 8-10 (Hessler & Katz, 2007). A baseline measurement of mean HR should be collected to control for individual differences in psychophysiological responding (e.g., Ridgeway & Waters, 1987; Schwartz et al., 1987). Previous research has demonstrated the ability of video-mediated mood induction tasks to produce psychophysiological change in young adults (Schwartz et al., 1981; Hubert & Jong-Meyer, 1990). Prior research has also shown changes in HR to be correlated with fear and sadness in children aged 4-7 (Eisenberg et al., 1988). Eisenberg and colleagues found that children either exhibited an acceleration or deceleration in HR in response to the film clips. Further analyses of the relationship between the direction of HR change and facial coding revealed different patterns of psychophysiological responding correlated with the intensity of facial expressions. Children who showed an HR acceleration during the anxiety clip displayed more facial anxiety than children who's HR decelerated. Boys who exhibited an HR acceleration during the sadness film displayed more facial sadness than did boys whose HR decelerated during the sadness clip, whereas this relationship was found to be reversed in girls.

Several authors have also coded children's facial expressions during mood inductions. Duncan and colleagues (1985) recorded faces of children aged 4-5 during an imaginal mood

induction of sadness, happiness and neutral emotions, and then coded facial expressions for the presence or absence of positive and negative affect. Children displayed significantly more facial expressions of happiness during the positive affect condition and significantly more sadness during the negative affect condition. Other researchers have examined facial expressions of anxiety and sadness in children aged 4-6 during a video-mediated mood induction and found that children displayed significantly more consistent facial expressions of emotions for each film (i.e., sadness/concern in response to the sad film; Eisenberg et al., 1988). Cole (1986) recommended the use of a specifically developed and rigorous coding system for the evaluation of children's facial gestures. Such a system uses multiple coders with an overlap of ratings (Ekman et al., 1980). Additionally, such coders should be trained on the reading of both subtle and micro-expressions of emotions while remaining blind to film status (e.g. Blau & Klein, 2010).

Preschool-aged children are generally poor reporters of their own emotions (Cole et al., 2009; Eisenberg et al., 1988). For example, negative or neutral moods in children are often self-reported as happy emotional states (Bryan & Bryan, 1991). A chief concern of preschool-aged children's self-reports of emotion are that they are particularity susceptible to demand characteristics of wanting to please the experimenter with the "correct response" (Buchwald, Strack, & Coyne, 1981). As such, children under the age of six are usually unable to serve as valid reporters of their own emotions, which are very context dependent, especially when considering abstract emotions such as loneliness, fatigue, low self-esteem (Luby, Belden, Sullivan, & Spitznagel, 2007). However, children aged 4-5 have been found to be capable of

reporting on their more basic emotions accurately (Luby et al., 2007). Single question self-reports of emotions provide the most accuracy and are the least susceptible to demand characteristics, and are recommend for this age range (Brenner, 2000).

This study contributed meaningfully to the extant literature by examining the validity of a script-prompted video-mediated mood induction procedure for fear, sadness, and happiness using methodologically rigorous measures (i.e., psychophysiological, behavioral, self-report) in a previously untested age group with a sample of diverse socio-economic and ethnic backgrounds. Based on the existing literature, we hypothesized that the videos would elicit a measurable emotional reaction in preschoolers. We hypothesized that children would demonstrate psychophysiological reactivity through a significant change in mean HR between our baseline measure and the fear, sadness, and happiness video tasks. We also hypothesized that children would display observable congruent facial expressions in response to the videos. Last we hypothesized that children in this age range would be just as likely to report all emotions through self-report after each film due to demand characteristics (Brenner, 2000), the lack of requisite verbal abilities to express specific emotions (Blau & Klein, 2011), and/or their lack of emotional awareness (Cole, 1986). If the script-prompted video-mediated mood induction is supported by both psychophysiological response and coding of facial expressions, then the videos would be seen as producing the desired emotion despite children not reporting the correct emotion.

Method

Participant Characteristics

Participants consisted of 98 mother-child dyads that were recruited via flyers posted throughout the community. To ensure a range of socioeconomic and racial diversity, recruitment also targeted Head Start centers and free health clinics in the community. Children were aged 3-

4 (*M* age = 3.48 years; 58% boys). Mother-child dyads were African American (48.3%), Caucasian (35.6%), Hispanic (3.4%), and 11.5% of the sample identified as "Other." There was a wide range of average yearly income: $0 - $19,999 (36.9%), $20,000 - 39,999 (22.6%), $40.000 - $80,000 (22.7%), and more than $80,000 (17.9%). The majority of the children's parents were unmarried (52.9%); however, 56.6% of the mothers in our sample identified a co-parent. The majority of mothers in our sample (60.2%) were employed at least part time, and 70% of mothers had at least partial college training. Exclusionary criteria for the study were few: child IQ's below 80 and presence of psychotic symptoms, current maternal suicidal ideation, or other variables that may hinder participation and completion of the various tasks.

Procedures

Children viewed a series of videos designed to elicit fear, neutral, sad, and happy emotion states. These videos were first pilot tested in a smaller sample of children and their mothers. Given the relatively young age of the children, prompts were added to the beginning of each video to explain the narrative content of the film (Appendix D). This allowed the children to focus on the emotional content of the film clips rather than the narrative content. Every child was shown all four clips, with the sadness and fear clips being counter balanced in 1st and 3rd position in the viewing order. All children viewed the happiness clip last to remediate any negative effects associated with the fear and sadness films.

Participants were recruited as mother-child dyads by posting flyers in the community. For participation, the first 12 dyads were compensated $40 dollars for a two-hour lab visit. However, additional funding sources were secured to increase participation and families 13-98 were compensated $100 dollars. After an initial phone screen to determine eligibility, the

participants were sent a packet with questionnaires and directions to the research laboratory. All study procedures were approved by the university's Institutional Review Board

Evocative Video Clips

The anxiety/fear clip was a 93-second video from the movie *Poltergeist,* where a young child is enduring a very loud and scary thunderstorm. The neutral clip displayed a geometric shape floating around a silent screen and lasted 91-seconds. The sadness clip was also from the movie *Poltergeist* and showed a young girl's pet bird dying and being buried in the ground, lasting 74-seconds. Finally, the happiness clip was a 65-second video entitled "Puppy Town," where several puppies play with each other to silly music. While an adult movie, *Poltergeist* has been used by past researchers to induce emotions in young children (e.g., Eisenberg et. al., 1988). Additionally, these film segments did not contain any of the graphic material that earned the film its R rating, and the effects of mood induction have been shown to wear off rather quickly in children causing only temporary distress (Silverman, 1986).

Measures of Emotional Reactivity

Heart Rate. Mean HR was collected by placing disposable silver-silver chloride electrodes on the right collar bone, in the cleft of the throat, at the base of the 10th rib on the left and the right side of the body, upon the xiphoid process, midway down the spine, and 2 cm below the base of the skull upon the spine, following procedures outlined by Bernston, Cacioppo and Quigley (1991). Data was recorded with MindWare BioLab software (MindWare Technologies, Ltd., Gahanna, OH). Electrocardiogram (ECG) data was analyzed using MindWare Heart Rate Variability Software (MindWare Technologies, Ltd., Gahanna, OH). Berntson and colleagues' (1991, 1997) recommendations were used for analyzing HR high (.12 Hz - .4 Hz) and low (.04 Hz - .12 Hz) frequencies as well as the recommendation to use a

spectral analysis window. Individual variability in psychophysiological response pattern was determined by a 240-second baseline period that was broken into eight 30-s segments where the child was instructed not to move or speak. The change from mean baseline HR for each of the video tasks was used to examine change in mean HR while taking individual variability into account. Consistent with other research using children of this age, it took children time to warm up to the psychophysiological assessment and thus preliminary analyses examined which of the segments to include in the baseline measure (e.g., El-Sheikh, 2005).

Behavioral Coding of Child's Emotional Expression. The behavioral coding system for this study evaluated children's experience of emotion through facial expression, while the coder was blind to film condition. The coding system used a 7-point Likert scale format to rate the presence and intensity of six basic emotions (i.e., fear, sadness, happiness, anger, disgust, and surprise) displayed during each film clip (see Appendix B). Graduate and undergraduate research assistants were trained on recognizing subtle and "micro" facial expressions of emotion by reviewing tapes with strong examples of each emotion. Reliability was computed for 20% of all videos and percentage agreement among raters ranged 75% - 100% for each emotion scale within each video and ranged 92.5% - 97.5% across all videos (See Table 1). Agreement was defined as raters being within a point of each other. Finally, after coding, raters indicated which video they believed the child was viewing. Coding was completed using The Observer XT 7.0 (Noldus Information Technologies, Wageningen, Netherlands). Despite some of the low ICC values for the scales, given the face validity of the emotion tasks, the coded videos were still analyzed.

Self-Report of Emotion. Before the initial video clip was shown, the children were introduced to five faces representing different emotions (i.e., happiness, sadness, fear, anger, and neutral). A research assistant read aloud to the child "Here are some faces. This face is crying, this is a sad face. This face is smiling, this is a happy face! This face looks mad, this is an angry face. This face looks afraid, this is a scared face. This face doesn't seem to be feeling anything at all, this is a neutral face." The children were then asked to choose the face that best represented how they felt "right now" (i.e., their baseline emotion). After each video, the child was instructed "Tell me how that clip made you feel" and asked to point to the face of that emotion.

Preliminary Statistical Analyses

Preliminary analyses examined differences among 30s segments of the baseline measure of HR using repeated-measures Multivariate analysis of variance (MANOVA)'s for the HR data, with 30s segments of each video serving as the repeated measure. Change in mean HR for each film clip was computed and then compared against the mean HR obtained from the child's baseline measure. A series of repeated-measures MANOVA's were performed to compare the changes in mean HR from baseline for each video (Hessler & Katz, 2007). Partial eta-squared (η_P^2) was used as a measure of effect size, as recommended for repeated-measures analyses (e.g., Cohen, 1973; Levine & Hullet, 2002) and were interpreted as 0.01 = small; 0.06 = medium; and 0.13 = large effect (Cohen, 1988). For the four minute baseline measure, segment 1 (first thirty seconds), $F(1, 66) = 12.17$; $p \leq .001$, and segment 2 (second thirty seconds), $F(1, 66) = 13.40$; $p \leq .001$, were excluded from analyses when determining each participant's baseline mean HR, as they were significantly different from the other baseline segments likely as a result of the need to acclimate to the heart rate equipment.

Mean HR for each task was determined by averaging mean HR across all segments of the task (Table 2). Because children in this age group can demonstrate psychophysiological reactivity with either an increase or decrease in HR, absolute values were analyzed (i.e., baseline mean HR subtracted from the film clip's mean HR). Psychophysiological response patterns were also examined by age, $F(4, 61) = 1.233$; $p = .307$, sex, $F(4, 61) = .522$; $p = .720$, and film order, $F(4, 41) = 1.418$; $p = .239$; however, since they were not significant, they were excluded from further analyses.

Analyses of the behavioral coding system examined the congruence of the child's facial expressions with each of the films. Repeated-measure MANOVA's were used to compare the intensity of emotion expression during the video clips. *Chi*-Squared analyses were conducted to determine whether the raters were able to accurately guess which video they had observed (Fields, Miles, & Zoe, 2012). Child self-reported emotions were examined for concordance of their reported emotion and the film clips shown using *Chi*-Squared analyses.

Results

Psychophysiological Response. Repeated-measures MANOVA's (with film clip as the repeated measure) examined hypothesis one, that children would demonstrate psychophysiological reactivity through a significant change in mean HR from baseline to the fear, sadness, and happiness videos. The overall MANOVA for HR during film task was significant, $F(4, 72) = 10.729$; $p < .000$; $\eta_P^2 = .373$. The absolute change in mean HR for the fear, $F(1, 75) = 24.908$; $p < .000$; $\eta_P^2 = .249$, sadness, $F(1, 75) = 24.111$; $p < .000$; $\eta_P^2 = .243$, happiness, $F(1, 75) = 37.776$; $p < .000$; $\eta_P^2 = .335$, and neutral, $F(1, 75) = 10.815$; $p = .002$; $\eta_P^2 = .126$ clips were all significantly higher than mean HR from the baseline measure (Table 3). Additionally, results compared mean HR for the fear, $F(1, 77) = 5.380$; $p = .023$; $\eta_P^2 = .065$,

sadness, $F(1, 77) = 4.097$; $p = .046$; $\eta_P^2 = .051$, and happiness, $F(1, 77) = 15.947$; $p < .000$; $\eta_P^2 = .172$ videos against the neutral video and found a significant change in mean HR relative to the neutral video. Thus, hypothesis one was supported – the fear, sadness, and happiness videos had significantly larger changes in mean HR from the baseline associated with the task than the neutral video. Further, the change in mean HR was higher during the fear, sadness, and happiness videos than during the neutral videos.

Behavioral Observations. The second set of analyses used repeated-measures MANOVA's and *Chi*-Square to test hypothesis two that children would display an observable congruence of facial emotion with each video. Results from repeated-measures MANOVA's with scale (fear, sadness, happiness, disgust, surprise, and anger) serving as the repeated measure during each film clip showed that coders rated the congruent emotion highest across the fear $F(5, 73) = 22.085$; $p < .000$; $\eta_P^2 = .602$, sadness $F(5, 73) = 12.150$; $p < .000$; $\eta_P^2 = .454$, and happiness $F(5, 72) = 15.970$; $p < .000$; $\eta_P^2 = .526$ videos. *Chi*-Squared analyses of which film the raters thought they were watching supported hypothesis two, that children would display an observable facial display congruent with the content of the video. Raters correctly guessed three film conditions based on facial expression, fear $\chi^2(3, 78) = 65.692$, $p < .000$, sadness $\chi^2(3, 78) = 16.564$, $p = .001$, and happiness $\chi^2(3, 77) = 22.273$, $p < .000$. Thus, results supported hypothesis two, that children displayed observable congruent facial emotions with the fear, sadness, and happiness films. Further, face validity is supported by the coders correctly guessing which film they were viewing for the fear, sadness, and happiness films.

Self-Report of Emotions. The third set of analyses used *Chi*-Squares to examine the last hypothesis that children would be just as likely to report fear, sadness, happiness, anger and neutral emotions after each film clip as the intended emotion. Results found that children were

more likely to report fear during the fear clip than other emotions $\chi^2(4, 86) = 12.94$, $p = .012$. However, children were most likely to report feeling happy following the sadness video $\chi^2(4, 91) = 9.00$, $p = .061$. Sadness was the second most reported emotion during the sadness film; however, the difference was not significant. Results also found that children were more likely to report feeling happy after the happiness video than other emotions $\chi^2(4, 89) = 44.41$, $p < .001$. During the neutral video, children were most likely to report happiness than other emotions $\chi^2(4, 89) = 15.89$, $p = .003$. Overall, happiness was the most often reported emotion across all videos $\chi^2(4, 355) = 39.538$, $p < .000$ (Table 4).

Thus, hypothesis three was partially supported – children were statistically more likely to report the congruent emotional state for the fear and happiness videos. Results did support hypothesis three for the sadness video, where children were not more likely to report the congruent emotion at greater than chance rates. Taken as a whole, the results provide strong support the video-mediated mood induction task for inducing fear, sadness, and happiness in children aged 3-4 across psychophysiological and behavioral observations indices, and to a lesser extent for self-report measures.

Discussion

The current study examined the effectiveness of a script-prompted video-mediated mood induction for fear, sadness, and happiness in children aged 3-4. Effectiveness of the task was evaluated through psychophysiological, behavioral, and self-reported responses. Overall, results supported the effectiveness of our script-prompted video-mediated mood induction procedure for fear, sadness, and happiness in children aged 3-4. This study moved beyond previous literature

examining mood induction in children because it tested our ability to induce analogues of these emotions in younger populations than previously tested (e.g. Blau & Klein 2010) and from a more ethnically diverse background than in prior research (e.g., Eisenberg et al., 1988).

Regarding psychophysiological reactivity, children demonstrated a noticeable change in mean HR in response to the fear, sadness, happiness, and neutral film clips relative to their baseline measures, consistent with hypothesis one. Results from the child's psychophysiological response to the film tasks also supported that fear, sadness, and happiness film tasks elicited a significant change in mean HR during the tasks relative to the neutral measures of HR. The results showed that even when controlling for individual differences through the child's baseline reactivity and response to the task design through the neutral video, that children still experienced a significant change in their mean HR. Though changes in physiological functioning may be indicative of just arousal associated with participation in the study, the collective findings, and discrepancies among the emotion clips versus baseline and neutral clips, suggests the changes were most likely due to the emotional content of the videos. These findings documented that showing a video had an effect on the children's HR over and above the novelty of being connected to electrodes.

The significant difference in mean heart rate between the baseline and neutral video was surprising, and may reflect carryover effects from the fear or sadness films. Additionally, the difference found between the neutral video and baseline could reflect impact of the research assistant interacting with the child between videos. Importantly, however, children's mean HR was significantly different during the fear, sadness, and happiness videos than during the neutral film clip. This demonstrated that the emotional and narrative content of the fear, sadness, and happiness films were having an effect on child HR over a similar task with no intended

emotional loading. These findings suggest that the films elicited a noticeable psychophysiological response in the children to the film tasks and extend the findings of Eisenberg, et al. (1988) by testing this protocol in a younger age group. Thus, our script-prompted video-mediated mood induction for fear, sadness, and happiness are effective in children aged 3-4 to help assess and evaluate emotional states in research settings.

Hypothesis two, that children would display congruent facial displays of emotions for each film clip at greater than chance levels, was fully supported for the target film clips (i.e., fear, sadness, and happiness). Behavioral observations supported that the fear, sadness, and happiness videos elicited an observable and congruent emotional response with the film clip, as evidenced by coders rating the congruent emotional facial displays as the most prevalent with the fear, sadness, and happiness videos. These results supported the face validity of the video-mediated procedures, or roughly what emotions the rater believed that they were observing, to induce the congruent emotional states of fear, sadness, and happiness. Additionally, coders were able to correctly predict which film the child was viewing for the fear, sadness, and happiness videos based solely off the child's facial displays of emotion. Thus, children in our study consistently displayed readily identifiable emotional responses appropriate to the content of each film. Raters were not able to accurately predict when they were viewing the neutral video at better than chance levels. This was likely due to children not displaying a primary facial emotion for this video, causing raters to disagree on which film they had observed.

Specific results from the fear video found that children displayed fear during this video at the highest intensity as compared to other basic emotions (i.e., sadness, happiness, disgust, surprise, and anger). These results implied that the film reliably induced a behavioral response characteristic of fear or anxiety (e.g., grimaces, raised eye brows). Results from the sadness

video similarly found that children exhibited facial displays of sadness at the highest level of intensity relative to other emotions. During the happiness film, results supported that children displayed happiness at the greatest levels of intensity. Overall, these ratings supported that our video-mediated mood induction for inducing fear, sadness, and happiness was effective at producing observable behavioral changes in children that appear similar in appearance to their naturally occurring analogues. The ability to reproduce analogues of emotional states within the laboratory setting provides opportunities to better study basic emotional processes in children as young as 3 years old. Raters were also able accurately predict which film they had viewed while blind to film status, providing further evidence for the use of the videos in this age group.

Hypothesis three, that children would report emotions at chance rates, was mostly unsupported as children reported the congruent emotional state for the fear and happiness videos; however their self-reports were not matched with the sadness video. During the fear and happiness videos, children were most likely to self-report the congruent emotional state with the film task, implying that these films are eliciting analogues of these emotional states in children aged 3-4. It is surprising and meaningful that children as young as age 3 were able to express and communicate on their emotional states, fear in particular, given prior work that did not find that children were likely to accurately report on their negative emotional states (e.g., Buchwald et al., 1981; Bryan & Bryan, 1991). However, our results are in line with those of Luby et al. (2007) who found that children aged 4-5 could report on basic emotions, including fear. Overall, these results challenge prior research that posits that children are unable to serve as valid self-reporters of their own emotional states, at least with respect to fear and happiness.

Though youth reliably reported on fear and happiness, children reported happy as their primary emotion during the sadness clip, with sadness as the second most likely response. It is

possible that given the young age of our sample, that the full narrative content of a pet dying is beyond their developmental level, as death is not always fully understood by children of this age (e.g., Cole et al., 2009; Bonoti, Leondari, & Mastora, 2013). It is also noteworthy that across all film tasks, happy was the first or second most often reported emotion being reported 119 out of 359 responses. In line with previous research, due to socialization practices of which emotions are appropriate to display, it is possible that children of this age group have a tendency to want to seek approval and can report on emotional states in a positive way even if they are feeling neutral or negative (e.g., Buchwald, Strack, & Coyne, 1981). Alternatively, children may have reported happy most often simply because it is the predominant emotion that they experienced during the film clips. Regardless however, the results suggest some caution when assessing sadness in preschoolers via self-report.

Altogether, results gave clear findings for our mood induction task – script-prompted video-mediated mood induction tasks can be used in children as young as 3 years of age to induce analogues of fear/anxiety, sadness, and happiness mood states as supported by psychophysiological and behavioral response. We acknowledge that the change in mean HR during the film tasks might simply reflect attention during the task. However, it is important to consider the results collectively where our behavioral observations supported that the changes in physiology are related to the displayed emotional response. Children of this age were also able to serve as accurate self-reporters of fear and happiness emotional states, further validating our mood induction procedure. Though our study provided an extension of a research protocol into a new population, limitations are noted. Due to the nature of psychophysiological analyses, not

every child's HR data was usable. While we still had a sufficiently large sample size to answer our study questions, a larger sample would have allowed for more exploratory analyses for possible moderators and mediators on levels of response to the film tasks.

The results of this study have implications for research settings. These protocols could prove beneficial to basic research on emotional processes by allowing researchers to reproduce analogues of these emotions and extend previously found correlations into younger samples. The ability to induce fear, sadness, and happiness in children aged 3-4 also provides the opportunity to study these emotions and their possible effects as mediators or moderators on academic performance, social functioning, and overall emotional functioning in children in this age range.

Moving forward, future research could extend this protocol in a number of ways. For example, it could be useful to further extend this research protocol into more diverse populations, as our sample was mainly Caucasian and African American.

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Appendices

Appendix A: Tables

Table 1.

Facial Coding Scale Percentage Agreement Among Raters by Film Task

Emotion Scale	Fear Video	Neutral Video	Sadness Video	Happiness Video
Fear	75%	95%	100%	100%
Sadness	100%	95%	100%	95%
Happiness	95%	100%	100%	95%
Disgust	90%	95%	100%	100%
Surprise	100%	100%	90%	100%
Anger	90%	100%	100%	100%

Table 2.

Mean Heart Rate by Film Task

Video Clip	Mean HR BPM	Standard Deviation
Baseline	102.66	12.70
Fear/ Anxiety	99.93	12.83
Neutral	100.07	12.12
Sadness	98.86	11.83
Happiness	97.60	12.87

Note. HR = Heart rate; BPM = Beats per minute

Table 3.

Absolute Value of Mean Difference in Heart Rate from Baseline by Film Clip

Video Clip	Mean change in HR BPM	Standard Deviation
Fear/ Anxiety	5.22	4.82
Neutral	4.03	4.23
Sadness	5.35	4.75
Happiness	5.00	4.68

Note. HR = Heart Rate; BPM = Beats per minute

Table 4.

Frequency of Children's Self-Report of Emotions by Film Clip

Video Clip	Happiness	Sadness	Neutral	Anger	Fear	*Chi*-Square (*p)*
Fear/ Anxiety	21	12	12	13	29	12.94 (.012)
Neutral	28	11	26	15	10	15.89 (.003)
Sadness	27	22	13	16	12	9.00 (.061)
Happiness	43	12	15	16	6	44.41 (.000)

Note. *p* = Pearson's correlation coefficient

Appendix B

Child Facial Display of Fear/Anxiety

Instructions: To provide a global rating of child's facial displays of fear/anxiety after watching the entire video tape without sound and blind to film status.

This scale is meant to measure the level of fear/anxiety that the child displays with their face during each video clip (fear, neutral, sadness, and happiness), while remaining blind to film status. On the high end of the scale, the child displays several visible facial reactions that are consistent with expressions of fear, worry, anxiety, and nervousness. Nervousness/anxiety is displayed by widened alert eyes, raised eyebrows, and an agape mouth.

7. Very high display of fear/anxiety. The child is clearly very nervous and/or fearful throughout the video. There are likely to be intense displays of fear/anxiety on the child's face at some points during the film. Expressions of worry and fear/anxiety are present throughout nearly the entire film.

6. High display of fear/anxiety. The child is clearly nervous and/or fearful throughout the video, but displays of anxiety are not as pervasive as in a score of 7. Still, for a 6, there should be some fear reactions and very frequent widening of the eyes, raised eyebrows, or an open mouth.

5. Moderately high display of fear/anxiety. Fear/anxiety is more dominant here than in 4. There may be more than one period of notable fear/anxiety displayed during the film clip,

accompanied by several more mild observable segments. The child is consistently nervous during the task.

4. Moderate display of fear/anxiety. There are clear signs of fear/anxiety. Either there is one period of notable fear/anxiety or there are more sporadic periods of fear/anxiety throughout. These may be mixed with other periods where the child experiences positive feelings. Some periods of positive affect may be present, but there is no question that the child had some periods of fear/anxiety.

3. Moderately low display of fear/anxiety. There may be signs of mild fear/anxiety scattered throughout the session or one brief episode of noticeable fear/anxiety. It may be as though the fear/anxiety is displayed on occasion, but it is still not a clear or dominant theme.

2. Low display of fear/anxiety. Signs of fear/anxiety are quite rare. The child may seem to experience fear/anxiety on rare occasions, but these are brief and mild. No genuine fear/anxiety is observed.

1. Very low/no display of fear/anxiety. Essentially, this child shows no expressions of fear/anxiety during the film.

Child Facial Display of Sadness

Instructions: To provide a global rating of child's facial displays of sadness after watching the entire video tape without sound and blind to film status.

This scale is meant to measure the level of sadness that the child displays with their face during each video clip (fear, neutral, sadness, and happiness), while remaining blind to film status. On the high end of the scale, the child displays several visible facial reactions that are consistent with expressions of sadness, such as frowns, downcast eyes, eyebrows turned down at the corners, and crying.

7. Very high display of sadness. The child is clearly very sad throughout the video. There are likely to be intense displays of sadness on the child's face or crying at some points during the film. Expressions of sadness are present throughout nearly the entire film.

6. High display of sadness. The child is clearly sad throughout the video, but displays of sadness are not as pervasive as in a score of 7. Still, for a 6, there should be some sadness reactions and very frequent frowns, downcast eyes, and eyebrows turned down at the corners.

5. Moderately high display of sadness. Sadness is more dominant here than in 4. There may be more than one period of notable sadness displayed during the film clip, accompanied by several more mild observable segments. The child is consistently sad during the task.

4. Moderate display of sadness. There are clear signs of sadness. Either there is one period of notable intense sadness or there are more sporadic periods of more mild sadness throughout. These may be mixed with other periods where the child experiences positive feelings. Some periods of positive affect may be present, but there is no question that the child had some periods of sadness.

3. Moderately low display of sadness. There may be signs of mild sadness scattered throughout the session or one brief episode of noticeable sadness. It may be as though the sadness is displayed on occasion, but it is still not a clear or dominant theme.

2. Low display of sadness. Signs of sadness are quite rare. The child may seem to experience sadness on rare occasions, but these are brief and mild. No genuine sadness is observed.

1. Very low/no display of sadness. Essentially, this child shows no expressions of sadness during the film.

Child Facial Display of Happiness

Instructions: To provide a global rating of child's facial displays of happiness after watching the entire video tape without sound and blind to film status.

This scale is meant to measure the level of happiness that the child displays with their face during each video clip (fear, neutral, sadness, and happiness), while remaining blind to film status. On the high end of the scale, the child displays several visible facial reactions that are consistent with expressions of happiness, joy, excitement, or pleasure. These displays involve smiling, laughter, and movements around the eyes.

Be careful not to code "nervous" laughter or smiles as positive affect. In order to qualify as positive affect, there should be indicators that laughter/smiles are an expression of enjoyment, not nervousness or tension reduction.

7. Very high display of happiness. The child is clearly very happy throughout the video. There are likely to be intense displays of happiness on the child's face at some points during the film. Expressions of happiness are present throughout nearly the entire film.

6. High display of happiness. The child is clearly happy throughout the video, but displays of happiness are not as pervasive as in a score of 7. Still, for a 6, there should be some happiness reactions and very frequent movements around the eyes or smiles.

5. Moderately high display of happiness. Happiness is more dominant here than in 4. There may be more than one period of notable happiness displayed during the film clip, accompanied by several more mild observable segments. The child is consistently happy during the task.

4. Moderate display of happiness. There are clear signs of happiness. Either there is one period of notable intense happiness or there are more sporadic periods of happiness throughout. These may be mixed with other periods where the child experiences negative feelings. Some periods of negative affect may be present, but there is no question that the child had some periods of happiness.

3. Moderately low display of happiness. There may be signs of mild happiness scattered throughout the session or one brief episode of noticeable happiness. It may be as though the happiness is displayed on occasion, but it is still not a clear or dominant theme.

2. Low display of happiness. Signs of happiness are quite rare. The child may seem to experience happiness on rare occasions, but these are brief and mild. No genuine happiness is observed.

1. Very low/no display of happiness. Essentially, this child shows no expressions of happiness during the film.

Child Facial Display of Anger

Instructions: To provide a global rating of child's facial displays of anger after watching the entire video tape without sound and blind to film status.

This scale is meant to measure the level of anger that the child displays with their face during each video clip (fear, neutral, sadness, and happiness), while remaining blind to film status. On the high end of the scale, the child displays several visible facial reactions that are consistent with expressions of anger, such as furrowed brows, narrowed eyelids, bulging eyes, and a frown that dominates the face.

7. Very high display of anger. The child is clearly very angry throughout the video. There are likely to be intense displays of anger on the child's face or grimacing at some points during the film. Expressions of anger are present throughout nearly the entire film.

6. High display of anger. The child is clearly angry throughout the video, but displays of anger are not as pervasive as in a score of 7. Still, for a 6, there should be some anger reactions and very frequent frowns, narrowing eyelids, and a furrowed brow.

5. Moderately high display of anger. Anger is more dominant here than in 4. There may be more than one period of notable anger displayed during the film clip, accompanied by several more mild observable segments. The child is consistently angry during the task.

4. Moderate display of anger. There are clear signs of anger. Either there is one period of notable intense anger or there are more sporadic periods of more mild anger throughout. These may be mixed with other periods where the child experiences positive or other negative feelings. Some periods of positive affect may be present, but there is no question that the child had some periods of anger.

3. Moderately low display of anger. There may be signs of mild anger scattered throughout the session or one brief episode of noticeable anger. It may be as though the anger is displayed on occasion, but it is still not a clear or dominant theme.

2. Low display of anger. Signs of anger are quite rare. The child may seem to experience anger on rare occasions, but these are brief and mild. No genuine anger is observed.

1. Very low/no display of anger. Essentially, this child shows no expressions of anger during the film.

Child Facial Display of Disgust

Instructions: To provide a global rating of child's facial displays of disgust after watching the entire video tape without sound and blind to film status.

This scale is meant to measure the level of disgust that the child displays with their face during each video clip (fear, neutral, sadness, and happiness), while remaining blind to film status. On the high end of the scale, the child displays several visible facial reactions that are consistent with expressions of disgust, such as frowning, a raised upper lip, raised cheeks, and a wrinkled nose.

7. Very high display of disgust. The child is clearly very disgusted throughout the video. There are likely to be intense displays of disgust on the child's face during the film. Expressions of disgust are present throughout nearly the entire film.

6. High display of disgust. The child is clearly disgusted throughout the video, but displays of disgust are not as pervasive as in a score of 7. Still, for a 6, there should be some disgust reactions and very frequent frowns, a wrinkling of the nose, and a raised upper lip.

5. Moderately high display of disgust. Disgust is more dominant here than in 4. There may be more than one period of notable disgust displayed during the film clip, accompanied by several more mild observable segments. The child is consistently disgusted during the task.

4. Moderate display of disgust. There are clear signs of disgust. Either there is one period of notable intense disgust or there are more sporadic periods of more mild disgust throughout. These may be mixed with other periods where the child experiences positive or other negative feelings. Some periods of positive affect may be present, but there is no question that the child had some periods of disgust.

3. Moderately low display of disgust. There may be signs of mild disgust scattered throughout the session or one brief episode of noticeable disgust. It may be as though the disgust is displayed on occasion, but it is still not a clear or dominant theme.

2. Low display of disgust. Signs of disgust are quite rare. The child may seem to experience disgust on rare occasions, but these are brief and mild. No genuine disgust is observed.

1. Very low/no display of disgust. Essentially, this child shows no expressions of disgust during the film.

Child Facial Display of Surprise

Instructions: To provide a global rating of child's facial displays of surprise after watching the entire video tape without sound and blind to film status.

This scale is meant to measure the level of surprise that the child displays with their face during each video clip (fear, neutral, surprise, and happiness), while remaining blind to film status. On the high end of the scale, the child displays several visible facial reactions that are consistent with expressions of surprise, such as wide and alert eyes, an open mouth, a slightly dropped jaw, and arched brows.

7. Very high display of surprise. The child is clearly very surprised throughout the video. There are likely to be intense displays of surprise on the child's face or gasping at some points during the film. Expressions of surprise are present throughout nearly the entire film.

6. High display of surprise. The child is clearly surprised throughout the video, but displays of surprise are not as pervasive as in a score of 7. Still, for a 6, there should be some surprise reactions and very frequent widening of the eyes, a slightly dropped jaw, and arched brows.

5. Moderately high display of surprise. Surprise is more dominant here than in 4. There may be more than one period of notable surprise displayed during the film clip, accompanied by several more mild observable segments. The child is consistently surprised during the task.

4. Moderate display of surprise. There are clear signs of surprise. Either there is one period of notable intense surprise or there are more sporadic periods of more mild surprise throughout. These may be mixed with other periods where the child experiences positive or other negative feelings. Some periods of positive affect may be present, but there is no question that the child had some periods of surprise.

3. Moderately low display of surprise. There may be signs of mild surprise scattered throughout the session or one brief episode of noticeable surprise. It may be as though the surprise is displayed on occasion, but it is still not a clear or dominant theme.

2. Low display of surprise. Signs of surprise are quite rare. The child may seem to experience surprise on rare occasions, but these are brief and mild. No genuine surprise is observed.

1. Very low/no display of surprise. Essentially, this child shows no expressions of surprise during the film.

Appendix C:

Coding of Suspected Film Task

Instructions: To rate with video you believe you just watched after viewing it one time. The purpose of this code is to gauge which film (i.e., Fear, Neutral, Sadness, Happiness) you (the coder) have just viewed to judge how predictable the children's reactions are to each film.

1. **Fear**
2. **Neutral**
3. **Sadness**
4. **Happiness**

Appendix D:

Video Clips Script
Please point to each face and say the following:
"Here are some faces. This face is crying, this is a sad face. This face is smiling, this is a happy face. This face looks mad, this is an angry face. This face doesn't seem to be feeling anything at all, this is a neutral face."

After, point to each face and state if it is angry, sad, happy, scared, or neutral to make sure the child understands.

(Speaking to the child)
"Now we want you to watch a few short videos. The videos might make you feel good, bad, or even neutral [like not feeling good or bad]. After each video I will ask you to point to the face that shows how you are feeling. Your mom will be in the room with you but she is going to sit in the back. You can look away from the clip at any time if you need to. OK? Lets get started."

Fear Clip
"This video clip is about a very scary thunderstorm. Have you ever heard a very scary thunderstorm? Well, in this video you will see and hear a thunderstorm. In this movie there are loud booms and trees swaying and it's really dark outside. I want you to watch the movie and pretend that the thunderstorm is really happening!"

Sad Clip
"This video is about a little girl whose pet bird dies. The movie is really sad because the little girl loved her pet bird so much but then it dies and she doesn't have it anymore. In the movie, you will see that the little girl and her mom say good-bye to the bird and then bury it in the ground. I want you to watch the movie and pretend that it's your pet bird that is dying."

Neutral Clip
"This video clip just shows a bunch of shapes floating around the screen. This movie probably won't make you feel any particular way. So, the movie won't make you feel really happy or scared or sad."

Happy Clip
"This video clip shows a bunch of super cute fluffy puppies rolling around and playing. There is also funny music in the movie. I want you to watch the movie and think about how fun it would be to really play with these puppies."