

Relative Effectiveness of Emotion Induction Procedures and the Role of Personal Relevance in a Clinical Sample: A Comparison of Film, Images, and Music

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Abstract Qualitative differences between three types of media used for the laboratory induction of emotion (film clips, still images, and music) were explored using a clinical sample. The relative effectiveness at inducing negative emotion and the degree to which the induction elicited personally relevant experiences of emotion was examined. Nomothetic and idiographic media were included as stimuli, and comparisons were made across media types and selection type. Nomothetic and idiographic media did not significantly differ in levels of negative affect endorsed. Significant differences did emerge between media and selection types in degree of personal relevance, with nomothetic images rated lowest and idiographic music rated highest. Significant differences also emerged in ratings of *positive* affect, with greater personal relevance significantly related to greater positive affect. The qualitative differences in emotion induction procedures found in this study are discussed in relation to the potential importance of matching emotion induction procedures to specific emotion-

related processes of interest when used for the laboratory study of emotion and psychopathology.

Keywords Emotion induction · International Affective Picture System (IAPS) · Film clips · Music · Psychopathology · Anxiety disorders · Mood disorders · international affective picture scale

The explosion of interest in emotion over the past two decades in the field of clinical psychology, as well as in related fields such as affective neuroscience, has led to a substantial growth in the use of methods for inducing emotion in the laboratory in the service of studying psychopathology. Several techniques for inducing emotion in the laboratory have been developed and validated over the years, including (but not limited to) self-statements, hypnosis, scripted and unscripted social interactions, facial and body movements, re-experienced or imagined scenes, odors, images, films, and music (Coan and Allen 2007; Martin 1990; Gerrards-Hesse et al. 1994; Westermann et al. 1996). Emotion induction procedures have been used to study the role of emotional processes in symptoms of mood and anxiety (Campbell-Sills et al. 2006; Mennin et al. 2005) as well as the effect of induced emotion on other behavioral and cognitive tasks (e.g. Bitran and Hofmann 2010; Blanchette and Richards 2010; Evers et al. 2010). However, as researchers proceed to explore the relationship between emotions and psychopathology, they are faced with one immediate challenge: How does one isolate emotional experiences in order to study emotion as a variable? How does one effectively extract a sampling of an individual's emotional experience in an ecologically valid way, in order to justify conclusions about the role of emotion in everyday experience? How can we simulate real-world emotional experiences in the laboratory in a way that we can be reasonably sure we are tapping into

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the true relationship (or, at the very least, a close approximation) between emotional processing and psychopathology? Most importantly, does it matter what method is used to induce emotion, so long as emotion is induced?

Over the last several years, researchers have increasingly relied upon media-based induction of emotion for laboratory investigations of emotion and psychopathology due in large part to the ability of these stimuli to evoke more automatic, non-guided experiences of emotion. Unlike other techniques that require a relatively high cognitive load, such as reading self-statements, the use of media allows for the background induction of emotional states that can be employed concurrently with cognitive tasks. Films, images, and music are media that have all been found to be highly effective for inducing emotional states (Clark 1983; Gross and Levenson 1995; Lang et al. 1993; Westermann et al. 1996), and efforts towards developing standardized media sets have been made for films (Gross and Levenson 1995; Philippot 1993), and still photographs (Lang et al. 2005). Few studies have directly examined the relative effectiveness of these media types in inducing emotional experiences, but existing evidence suggests music, film, and images may not differ significantly in their ability to elicit emotion (Lang et al. 2005; Westermann et al. 1996). However, whereas there may be no differences in the ability of various media-based procedures to elicit emotions per se, the question remains: Are there qualitative differences in the emotional experiences elicited by these methods and, if so, would these differences confer specific advantages or disadvantages dependent upon the research question at hand?

Some researchers have begun to explore this possibility. For example, Rottenberg et al. (2007) suggest several key dimensions that potentially differentiate induction procedures and that may be particularly salient to their use and selection: 1) emotional intensity, 2) complexity, 3) levels of attentional capture, 4) demand characteristics, 5) standardization, 6) temporal considerations, and 7) ecological validity. Each of these dimensions may be more or less important depending upon the particular variable of interest. For example, films are suggested to be relatively high in the dimensions of emotional intensity and complexity, due in large part to the dynamic variations inherent in film clips, but also require a level of attentional capture, which may confer an advantage or disadvantage, depending upon the aims of a particular study (e.g. their effectiveness may be degraded when a cognitive task is superimposed upon their presentation; see Rottenberg et al. 2007). Images score high on the dimension of standardization, as they are now available as highly standardized sets [e.g. International Affective Picture System (IAPS); Lang et al. 2005]. However, as Lang and colleagues (1993) suggest, looking at pictures is an aesthetic task, which may activate appetitive and defensive motives to a lesser extent than life's "real" transactions, suggesting their personal relevance or individual ecological validity may be low. Music may potentially rival films in their

degree of intensity and complexity, as well as score high on the dimension of ecological validity through the activation of associated memories, conditioned emotional responses, and the elicitation of imagery or "daydreaming" (Juslin and Västfjäll 2008). However, as with film, music has a very low temporal resolution, making it less than ideal for the investigation of static affective responses that occur over the course of milliseconds (e.g. perceptual processing; orienting; startle).

Thus, there appear to be relative merits and limits to each of these three commonly used media-based emotion induction procedures, which may confer specific advantages or disadvantages depending upon the research question of interest. In studies exploring the role of emotional experiences in psychopathology, wherein the evocation of the complex orchestration of self-relevant memory, imagery, perception, thought, somatic experience, and behavioral processes emerging from the elicitation of emotion constitutes the variables of interest, ecological validity may be the most pertinent dimension. Each of these procedures has been deemed ecologically valid representations of human experience in general, which may be sufficient for research questions concerning emotion-related processes existing in humans as a species (such as the interaction between emotion and cognition or emotion and sensory perception). However, the question of ecological validity may require a more precise examination when considering the experience of the individual, as in studies of the effects of a specific treatment on the ability of an individual to cope with his or her own unique emotional experiences. Therefore, the extent to which a specific emotion induction procedure is able to set complex associated processes in motion becomes particularly relevant, and becomes particularly important in investigations of the effect of treatments on emotional processing in psychopathology. In other words, it may not be simply *that* an emotional experience is induced, but rather the *quality* of that experience that is important. When considered in this way, it becomes clear that the selection of a particular emotion induction strategy may be crucial to the ability to generalize findings.

The Present Study

The present study seeks to explore potential qualitative differences between three types of media increasingly used for laboratory induction of emotion in the study of anxiety and mood disorders—film clips, still photographs, and music. In addition, the effects of experimenter-selected media versus participant-selected media were also explored. The relative effects of media type and selection type on ratings of valence and arousal, positive and negative affect, and degree of personal relevance were examined and compared to a neutral condition. It was hypothesized that no significant differences would be found in affective and arousal ratings between media types and selection types, with all media types evidencing

significantly greater negative affect and arousal than neutral conditions, but that significant differences would be found between media and selection types on ratings of personal relevance. Specifically, it was hypothesized that participant-selected media would be rated higher in personal relevance overall relative to experimenter-selected media. Within the experimenter-selected media, it was hypothesized that music would elicit the highest ratings of personal relevance due to the ability of music to elicit personal memories, images and scenes without the confounds of presented nomothetic images and scenes. In the participant-selected media, it was hypothesized that images would elicit the highest ratings of personal relevance, as photographs from personal collections would likely be the most idiographic of all media selections. Further, it was hypothesized that degree of personal relevance would demonstrate a positive relationship with ratings of affect and arousal.

Methods

Participants

Twenty participants were recruited from a pool of individuals seeking treatment at the Center for Anxiety and Related Disorders at Boston University (CARD), a community outpatient clinic. All participants had undergone an initial clinical diagnostic interview at the Center using the Anxiety Disorders Interview Schedule for DSM-IV–Lifetime Version (ADIS-IV-L; Di Nardo et al. 1994) and were contacted for participation if they received a principal diagnosis of an anxiety or mood disorder (see below for a description). Individuals were excluded only if participation in a research study was contraindicated; for instance, current significant suicidal ideation, current substance dependence diagnosis, or a history of mania or a psychotic disorder. Participants were 70% female ($n=14$). The mean age was 35.4 years ($SD = 11.6$) with an age range of 21 to 57 years old. The sample was 80% Caucasian ($n=16$), 10% Asian ($n=2$), 5% African American ($n=1$) and 5% self-identified as “Other” ($n=1$). Participants primarily identified as non-Hispanic ($n=19$). Principal (most severe) diagnoses represented by the sample included generalized anxiety disorder ($n=5$), major depressive disorder ($n=4$), obsessive-compulsive disorder ($n=3$), panic disorder ($n=4$), and social phobia ($n=4$). Participants had an average of 2.44 ($SD = 1.33$) diagnoses. Comorbid diagnoses included depression, generalized anxiety disorder, hypochondriasis, obsessive-compulsive disorder, panic disorder, social phobia, and specific phobia.

Stimulus Selection

In order to further explore the effects of personal relevance on ratings of affect and arousal, stimuli included both

standardized, experimenter-selected media and participant-selected media.

Experimenter-Selected Specific experimenter-selected, nomothetic stimuli for each media type (film, music, images) were chosen from standardized stimuli whose efficacy in inducing negative emotion and mood states have been well documented (Clark 1983; Gross and Levenson 1995; Lang et al. 1993; Västfjäll 2002) and that have been frequently used in the study of emotion and psychopathology (e.g. Baumgartner et al. 2006; Eugène et al. 2003; Ochsner et al. 2002). To facilitate comparisons between media types and avoid potential confounds resulting from the induction of a range of discrete emotions, we chose to match all media conditions on the induction of only one discrete emotion category: sadness. Therefore, only media that had demonstrated efficacy in inducing sadness were chosen. Based upon these criteria, “The Champ” (Lovell and Zeffirelli 1979) was selected for the film clip; Samuel Barber’s (1936) “Adagio for Strings, String Quartet No. 1, Op. 11” was selected for the musical piece; and photographs from the International Affective Picture Scale (IAPS; Lang et al. 2005) for the still images. In addition to the target emotion, media was also matched for length such that the total trial length of each stimulus was approximately 3 min.

Participant-Selected Upon consenting to the study, each participant was instructed to identify a scene from a film and a piece of music that are personally meaningful to them and induce the target emotion of sadness or melancholy. The selected music was downloaded by the experimenter using iTunes. Selected films were located online through YouTube or through local video stores and edited into 3-min clips using Amerisoft editing software (Amerisoft 2007). For participant-selected still images, participants were instructed to bring photographs from their personal collection that induce sadness or melancholy.

Neutral Stimuli Using recommendations from Rottenberg et al. (2007), neutral stimuli consisted of 3-min film clips from the documentary “Alaska’s Wild Denali” (Hardesty 1997). Because of the difficulty identifying neutral music, neutral film clips from this documentary were used as the neutral condition for both film and music conditions. For the still photographs, neutral images were selected from the IAPS (Lang et al. 2005).

Measures

As mentioned above, initial diagnoses were obtained as part of the usual intake procedures at CARD using the Anxiety Disorders Interview Schedule for DSM-IV- Lifetime Version (ADIS-IV-L; Di Nardo et al. 1994). This semi-structured,

diagnostic clinical interview focuses on DSM-IV diagnoses of anxiety, mood, somatoform, and substance use disorders. The ADIS-IV-L has demonstrated acceptable to excellent interrater reliability for the diagnosis of anxiety and mood disorders (Brown et al. 2001).

In order to assess individual differences in baseline levels of mood, emotion regulation skills, and responses to emotion, participants completed a questionnaire packet prior to the experiment. Questionnaires in this packet included the Beck Depression Inventory-II (BDI-II; Beck et al. 1996), a measure of depressive symptoms; the Affective Control Scale (ACS; Williams et al. 1997), a measure designed to assess fear of loss of control when experiencing strong affective states; and the Berkeley Expressivity Questionnaire (BEQ; Gross and John 1997), a measure that assesses both the strength of emotional responses and the degree to which these emotional responses are expressed.

During the experiment, participants completed a packet of trial questionnaires using paper and pencil for each media selection trial presented (see [procedures](#) below). These packets included the following:

Self-Assessment Manikin (SAM; Lang 1980) The SAM is an instrument designed to assess levels of hedonic valence and arousal. It consists of a series of graphic figures ranging from smiling and happy to frowning and unhappy representing hedonic valence, and excited and wide-eyed to relaxed and sleepy for arousal. Participants mark circles underneath the graphic figure that most closely represents their experience at that moment, providing valence ratings on a scale of 1 (pleasant) to 9 (unpleasant) and arousal ratings on a scale of 1 (calm) to 9 (excited). The SAM has demonstrated good convergent validity (Bradley and Lang 1994).

Positive and Negative Affect Scale (PANAS; Watson et al. 1988) The PANAS is a brief, reliable and valid measure of positive and negative affect. It consists of 20 feeling or emotion words. Respondents rate each emotion word on a scale ranging from 1 = very slightly or not at all to 5 = extremely, indicating the extent to which they experienced that emotion or feeling. Instructions may be varied to suit a particular time frame, such as “currently”, “past week”, “past month,” or “in general”. In this study, participants are asked to rate items indicating what they are experiencing “currently.” The PANAS allows for the assessment of core negative affect as well as deficits in positive affect, with higher scores on the Negative Affect (NA) subscale reflecting higher levels of negative affect, and higher scores on the Positive Affect (PA) subscale representing higher levels of positive affect. The PANAS has shown excellent convergent and divergent validity.

Personal Relevance Scale (PRS; Ellard et al. 2009) The PRS is a measure created specifically for this study to assess

the personal relevance of the emotions elicited by each emotion induction exercise. The measure consists of four items, rated on a scale of 1 (“Not at all”) to 5 (“Very much”), and includes the following items: 1) To what extent (if any) did this exercise make you think of *current* situations or events in your own life; 2) To what extent (if any) did this exercise bring up memories of *past* situation or events from your own life; 3) To what extent (if any) could you *personally relate* to the emotions displayed or represented in this exercise; and 4) To what extent (if any) did you *personally experience* the emotions displayed or represented during this exercise? Participants were asked to complete this questionnaire based upon how the exercises *actually made them feel* as they were watching and/or listening, rather than rating the emotions portrayed by the media.

Responses to Emotions Questionnaire (REQ; Campbell-Sills et al. 2006) The REQ was designed specifically to assess use of emotion regulation strategies in an experimental mood induction paradigm, and was used in the present study as a manipulation check. While complete psychometric data is not yet available on this measure, the REQ demonstrated good reliability and validity in a recent study (Campbell-Sills et al. 2006).

Procedures

Upon arriving for the experiment, participants completed the questionnaire packets described above (BDI, ACS, BEQ). Participants were then seated at a desk in a dimly lit room, facing a computer monitor. Visual stimuli were presented upon a 17” computer screen, and audio stimuli were presented through stereo computer speakers, situated on either side of the computer monitor. Stimuli were presented using Windows Media Center on a PC laptop computer, operated by the experimenter in an adjoining room. Participants were given a series of 11 packets representing each stimulus presentation trial (music idiographic/nomothetic, image idiographic/nomothetic, film idiographic/nomothetic) and corresponding neutral trials. The order of trials was counterbalanced and randomized by participant, using a random number generator. Using paper and pencil, participants rated current levels of hedonic valence and arousal using the SAM (Lang 1980) prior to each stimulus presentation by checking the corresponding circles. Participants were instructed to make an additional SAM rating halfway through each stimulus presentation. In order to minimally disrupt participants’ ongoing emotional responses, participants were cued to make this rating by a slight dimming of the lights. Finally, a third SAM rating was made immediately following the conclusion of each stimulus presentation. Participants then completed the PANAS, rating emotions they experienced at that moment, and completed the

PRS, before moving on to the next trial. All media trials (film, music, images) were separated by a neutral trial, following the same ratings procedure above. As a further control for potential carryover effects, participants engaged in a brief cognitive task (copying a geometric figure) prior to the start of the subsequent negative emotion induction. Upon completion of all 11 trials, participants completed a brief, 8-item questionnaire assessing emotion regulation strategies used during the experiment (REQ). Participants were then debriefed and invited to view a humorous video clip to offset any negative effects of the experiment. Participants were also asked in an informal interview to share their personal impressions of the least and most effective stimuli used in the experiment for inducing sad emotions in themselves. Responses to this informal exit interview were not included in the formal data analyses.

Results

Complete descriptive statistics for all study variables are presented in Table 1. To determine whether significant differences existed between media and selection type across measures of valence, arousal, positive and negative affect, and personal relevance, an omnibus test using a 3 (film, images, music) \times 2 (idiographic, nomothetic) repeated measures multivariate analysis of variance (MANOVA) was conducted on ratings of SAM valence and arousal, PANAS positive (PA) and negative (NA) affect, and personal relevance (PR). Significant main effects were found for both media ($F=4.20$, $p=.000$, $\eta_p^2=0.41$) and selection type ($F=6.23$, $p=.004$, $\eta_p^2=0.71$). In addition, a significant media \times type interaction was found ($F=3.95$, $p=.000$, $\eta_p^2=0.40$). Contrast analyses revealed a modest but significant main effect of media for PA ($F=4.30$, $p=.02$, $\eta_p^2=0.20$), and PR ($F=4.35$, $p=.02$, $\eta_p^2=0.20$). A significant main effect of selection type was found for PA ($F=31.06$, $p=.000$, $\eta_p^2=0.65$), SAM arousal ratings ($F=4.95$, $p=.04$, $\eta_p^2=0.23$), and PR ($F=10.36$, $p=.005$, $\eta_p^2=0.38$). Significant media \times type interactions were found for NA ($F=4.42$, $p=.02$, $\eta_p^2=0.21$), and PR ($F=12.61$, $p=.000$, $\eta_p^2=0.43$).

Given the significant findings in the omnibus test, further testing was carried out on each variable of interest separately. First, to determine whether media conditions differed significantly from neutral conditions across measures, a series of repeated measures analyses of variance (ANOVAs) were conducted comparing media with a composite neutral condition consisting of average ratings from all five neutral trials (a separate repeated measures ANOVA revealed no significant differences between neutral trials; SAM valence: $p=.62$; SAM arousal: $p=.88$; NA: $p=.13$; PA: $p=.44$; PR: $p=.08$). All three media types (regardless of selection type) evidenced significantly higher valence and arousal ratings (Table 2), greater NA (Table 3), and higher ratings of personal relevance

Table 1 Descriptive statistics

Measure	Media	Nomothetic		Idiographic	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
SAM–valence	Film	7.33	1.50	7.33	1.50
	Images	7.06	1.26	5.94	2.18
	Music	6.44	1.67	6.39	2.00
	Neutral	5.00	0.94		
SAM–arousal	Film	5.83	1.75	4.44	2.06
	Images	5.39	1.60	5.67	2.03
	Music	5.89	1.62	4.83	2.26
	Neutral	2.74	1.30		
PANAS–NA	Film	18.17	6.56	21.56	8.82
	Images	21.94	7.18	18.11	8.11
	Music	16.22	4.87	18.89	8.53
	Neutral	12.23	3.61		
PANAS–PA	Film	18.17	6.56	25.44	8.24
	Images	21.94	7.18	22.94	9.21
	Music	16.22	4.87	27.50	8.22
	Neutral	11.80	2.92		
PRS	Film	12.22	4.56	13.17	4.15
	Images	10.44	2.98	15.11	4.95
	Music	12.11	4.86	15.89	3.79
	Neutral	8.52	3.51		

SAM Self Assessment Mankin; PANAS Positive and Negative Affect Schedule; PA positive affect; NA negative affect; PRS Personal Relevance Scale

(Table 4) relative to neutral conditions. However, nomothetic films and images did not significantly differ from neutral conditions on ratings of PA (Table 3). Nomothetic music and idiographic images did not significantly differ from neutral conditions on ratings of SAM valence (Table 2).

To determine overall differences between media types, a series of repeated measures ANOVAs was conducted for each variable (SAM affect, SAM arousal, PA, NA, and PR) comparing within selection type (nomothetic trials only, idiographic trials only), within media type (all film, all images, all music; referred to as “combined” trials), and comparing all media and selection types to each of the other trials (referred to as “all” trials).

Valence and Arousal Ratings

For the SAM valence and arousal ratings, midpoint ratings and post-induction ratings were not significantly different. Therefore, results are reported for post-induction SAM ratings only. A significant main effect for SAM Valence ratings was found when comparing nomothetic only ($F=3.23$, $p=.05$, $\eta_p^2=0.16$), combined trials ($F=4.66$, $p=.02$, $\eta_p^2=0.22$), and all trials ($F=2.38$, $p=.05$, $\eta_p^2=0.12$), but no

Table 2 Mean difference SAM valence and arousal scores

	Film Nom	Image Nom	Music Nom	Film Id	Image Id	Music Id	Neutral
SAM valence							
Film Nom		0.28	0.89*	0.00	1.39*	0.94	2.06**
Image Nom			0.61	-0.28	1.11	0.67	1.78***
Music Nom				-0.89	0.50	0.06	1.67
Film Id					1.39	0.94	2.06***
Image Id						-0.44	0.67
Music Id							1.11*
SAM arousal							
Film Nom		0.44	-0.06	1.39**	0.17	1.00	3.17***
Image Nom			-0.50	0.94	-0.28	0.56	-2.72**
Music Nom				1.44*	0.22	1.06	-3.22***
Film Id					1.05	0.37	3.17***
Image Id						0.83	3.00***
Music Id							2.17*

Nom nomothetic; Id idiographic
* $p < .05$. ** $p < .01$. *** $p < .001$

significant main effect was found when comparing idiographic trials ($F=2.51$; $p=.10$, $\eta_p^2=0.13$; see Fig. 1). Nomothetic films were rated as significantly more unpleasant than nomothetic music ($p=.05$) and ideographic images ($p=.05$). No significant differences were found any of the remaining comparisons (Table 2).

For SAM arousal ratings, no significant main effect was found for the nomothetic ($F=.41$, $p=.67$, $\eta_p^2=0.02$), idiographic ($F=2.45$, $p=.10$, $\eta_p^2=0.13$), combined trials ($F=0.42$, $p=.65$, $\eta_p^2=0.02$), or all trials ($F=2.03$, $p=.08$, $\eta_p^2=0.11$; see Fig. 1). Idiographic film was rated significantly less arousing than nomothetic film ($p=.00$) and nomothetic music ($p=.02$). No significant differences were found in any of the remaining comparisons (Table 2).

Negative and Positive Affect

A significant main effect on ratings of negative affect was found for the nomothetic ($F=7.37$, $p=.002$, $\eta_p^2=0.30$), or all trials ($F=2.32$, $p=.05$, $\eta_p^2=0.12$), but not in the idiographic trials ($F=1.53$, $p=.23$, $\eta_p^2=0.08$) or combined trials ($F=2.56$, $p=.09$, $\eta_p^2=0.13$; see Fig. 2). Nomothetic images resulted in significantly greater endorsement of NA than both nomothetic film ($p=.01$) and nomothetic music ($p=.001$), and ideographic films were endorsed as significantly more negative than nomothetic music ($p=.02$). No significant differences in endorsement of negative affect between media and selection types were found in any of the remaining comparisons (Table 3).

Table 3 Mean difference PANAS scores

	Film Nom	Image Nom	Music Nom	Film Id	Image Id	Music Id	Neutral
PANAS negative affect subscale							
Film Nom		-3.78**	1.94	-3.39	0.06	-0.72	5.88***
Image Nom			5.72**	0.39	3.83	3.06	9.06***
Music Nom				-5.33**	-1.89	-2.67	3.50*
Film Id					3.44	2.67	9.88**
Image Id						-0.78	6.19**
Music Id							7.13**
PANAS positive affect subscale							
Film Nom		0.89	-2.56	-5.67***	-3.17*	-7.72***	2.11
Image Nom			-3.44*	-6.56***	-4.06**	-8.61***	1.22
Music Nom				-3.11	-0.61	-5.17*	4.67*
Film Id					2.50	-2.06	7.78**
Image Id						-4.57	5.28*
Music Id							9.83**

Nom nomothetic; Id idiographic
* $p < .05$. ** $p < .01$. *** $p < .001$

Table 4 Mean difference personal relevance scores

	Film Nom	Image Nom	Music Nom	Film Id	Image Id	Music Id	Neutral
Film Nom		1.78	0.11	-0.94	-2.89*	-3.67**	5.61***
Image Nom			-1.67	-2.72*	-4.67***	-5.44***	3.83**
Music Nom				1.06	-3.00*	-3.78**	5.50***
Film Id					-1.94	-2.72*	6.56***
Image Id						-0.78	8.50***
Music Id							9.28***

Nom nomothetic; Id idiographic

* $p < .05$. ** $p < .01$. *** $p < .001$

For ratings of PA, a significant main effect was found for the combined ($F=4.30$, $p=.02$, $\eta_p^2=0.20$), and all trials ($F=6.74$, $p=.000$, $\eta_p^2=0.28$). No significant main effect was found for the comparison of nomothetic ($F=15.80$, $p=.000$, $\eta_p^2=0.48$) or ideographic trials ($F=2.33$, $p=.11$, $\eta_p^2=0.12$; see Fig. 2). Nomothetic images resulted in significantly lower endorsement of positive affect than all other media (ideographic film: $p=.000$; ideographic images: $p=.01$; ideographic music: $p=.000$; and nomothetic music: $p=.03$), with the exception of nomothetic film. Idiographic music resulted in significantly higher endorsement of positive affect than all three nomothetic comparisons (nomothetic film: $p=.000$; nomothetic images: $p=.000$; and nomothetic music: $p=.03$), but did not differ significantly from the remaining idiographic media comparisons. Idiographic film resulted in significantly higher endorsement of positive affect than nomothetic film ($p=.000$). No significant differences between media and selection type were found in any of the remaining comparisons (Table 3).

Personal Relevance

No significant main effect in the endorsement of personal relevance was found for the nomothetic ($F=1.51$, $p=.23$, $\eta_p^2=0.08$), idiographic ($F=3.00$, $p=.06$, $\eta_p^2=0.15$), or combined comparisons ($F=1.32$, $p=.28$, $\eta_p^2=0.07$). A significant main effect was found, however, across all trials ($F=6.01$,

$p=.000$, $\eta_p^2=0.26$; see Fig. 2). Idiographic music was rated as significantly more personally relevant than any other media except idiographic images (ideographic films: $p=.03$; nomothetic films: $p=.02$; nomothetic images: $p=.000$; nomothetic music: $p=.005$). Nomothetic images were rated significantly less personally relevant than all three idiographic media types (ideographic film: $p=.02$; idiographic images: $p=.000$; idiographic music: $p=.000$). By contrast, idiographic images were rated as significantly more personally relevant than all three nomothetic media types (nomothetic film $p=.05$; nomothetic images: $p=.000$; nomothetic music: $p=.04$). No significant differences between media were found in any of the remaining comparisons (Table 4).

In order to better understand the relationship between ratings of personal relevance and ratings of valence, arousal, and affect, a series of simple regressions were performed on ratings across conditions. Results of these analyses revealed a significant positive correlation between PR ratings and ratings of NA ($\beta=0.83$, $R^2=.69$, $p<.000$), PA ($\beta=0.48$, $R^2=.23$, $p<.05$), SAM arousal ($\beta=0.59$, $R^2=.34$, $p<.01$), and SAM valence ($\beta=-0.50$, $R^2=.34$, $p<.01$). To explore whether emotion regulation strategies used during the experiment predicted overall ratings, a series of regression were conducted with REQ as the predictor. There were no significant effects of REQ ratings on SAM valence and arousal and PANAS PA and NA ratings. Finally, the

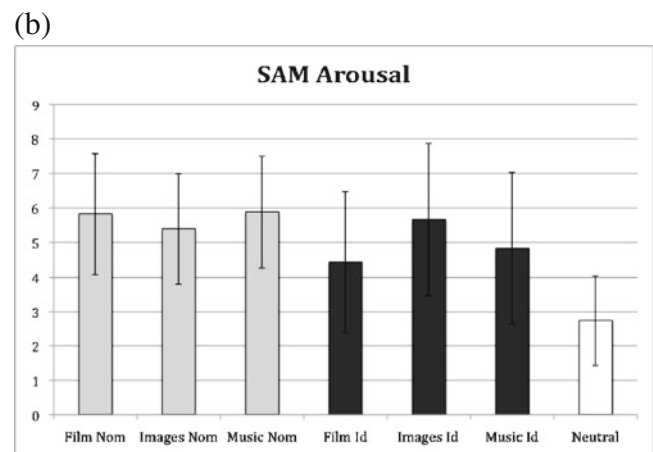
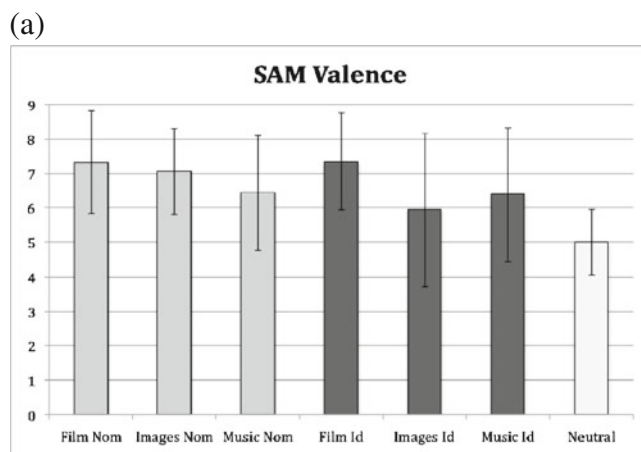


Fig. 1 Mean ratings of (a) hedonic valence, and (b) arousal for individual media and selection types. Higher ratings indicate greater degrees of unpleasantness

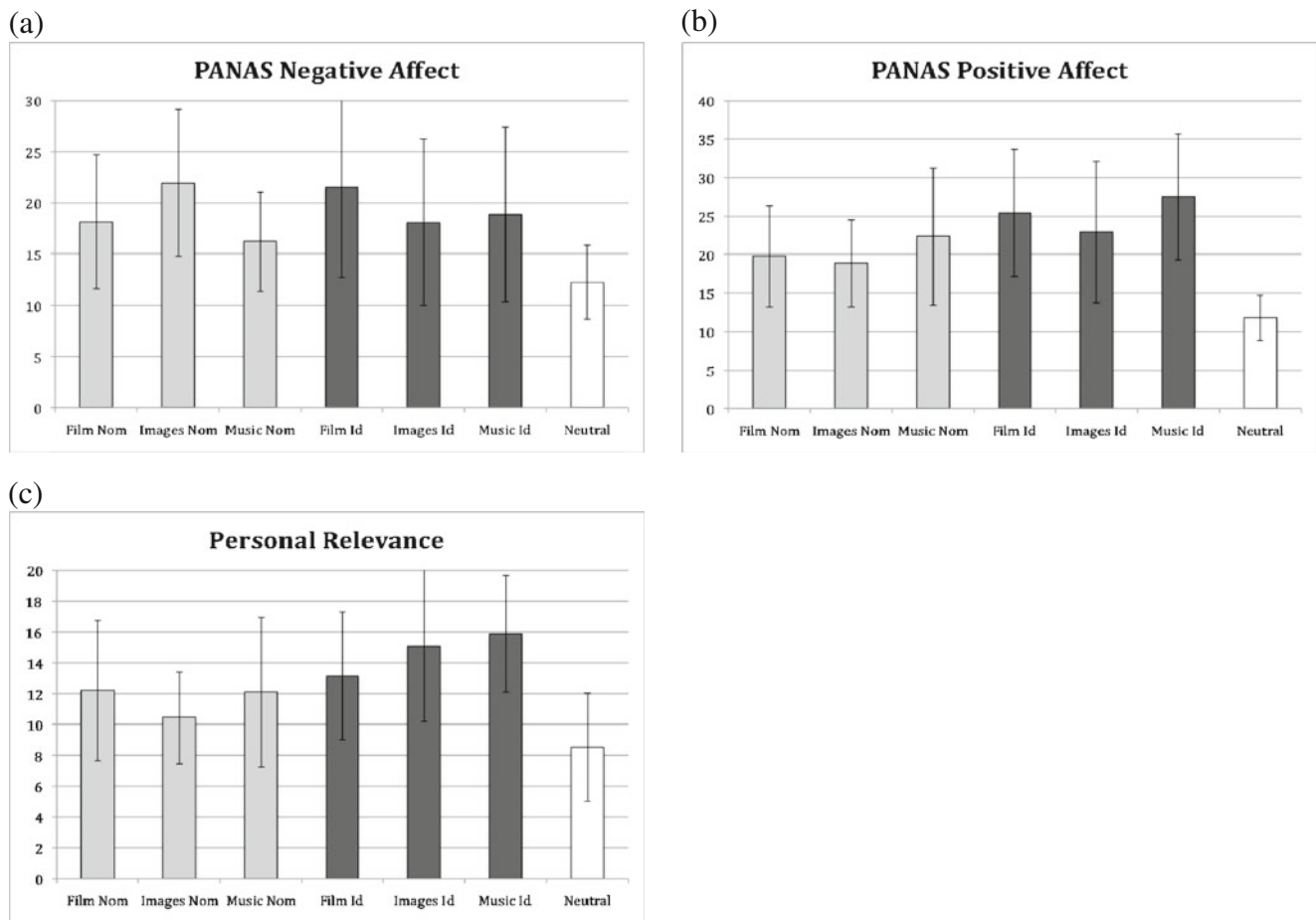


Fig. 2 Mean ratings of (a) negative affect; (b) positive affect; and (c) personal relevance for individual media and selection types

relationship between individual differences in baseline emotion regulation skills, levels of depressed mood, and general levels of negative affect on media ratings were explored using simple regressions. Results showed no significant relationship between scores on the ACS or the BDI and SAM ratings of valence, arousal, or PANAS ratings of PA and NA. However, significant relationships with BEQ scores and all ratings scales were found. BEQ scores were strongly correlated with SAM affect ratings ($\beta=-0.61$, $R^2=.37$, $p<.008$) and moderately correlated with SAM arousal ratings ($\beta=0.44$, $R^2=.19$, $p=.05$). Significant correlations were also found between BEQ scores and NA ($\beta=0.52$, $R^2=.28$, $p=.02$), and PA ($\beta=0.51$, $R^2=.26$, $p=.03$).

Discussion

The present study sought to explore potential qualitative differences between three types of media widely used for the induction of emotion in the laboratory—film clips, still images, and music—using a clinical sample. In addition to examining the relative effectiveness of these three media types in the

elicitation of emotion, differences in their ability to elicit personally relevant, negative emotional experiences, and differences between standardized, experimenter-selected media versus idiographic, participant-selected media were explored. All three media types did significantly differ from neutral conditions in their ability to elicit negative emotion, regardless of selection type, suggesting that overall, all three media types are effective in eliciting negative emotion. In addition, no significant differences were found in the ability to elicit negative affect between nomothetic and idiographic media types across all comparisons, with the exception of the comparison between idiographic films and nomothetic music, wherein the idiographic media (films) resulted in greater endorsement of negative affect. This suggests that participant-selected, idiographic media may be just as effective as standardized nomothetic media in eliciting negative emotion in the laboratory. Significant differences between media and selection type did emerge, however, when examining the personal relevance of the emotional experiences elicited, and when examining levels of *positive* affect endorsed.

Participant-selected, idiographic media were rated as significantly more personally relevant than nomothetic media

across all comparisons, as expected. This suggests that, whereas idiographic and nomothetic media do not appear to differ in the *quantity* of negative affect induced, significant differences are found between selection types in the *quality* of affect induced. Nomothetic images were rated lower on personal relevance than any other media regardless of selection type, and idiographic music was rated highest. Interestingly, looking across conditions, higher ratings of personal relevance did not appear to correspond with higher ratings of negative affect. In fact, for standardized, experimenter-selected media, nomothetic images were rated significantly higher on negative affect than films or music, despite being rated lowest on personal relevance, and idiographic music was rated highest on personal relevance, but did not differ from films or images on ratings of negative affect. However, higher ratings of personal relevance across conditions did correspond with higher ratings of *positive* affect across all comparisons. Nomothetic images were rated the lowest on positive affect and idiographic music was rated the highest on positive affect compared to all other media types, regardless of selection type, directly echoing the results for endorsement of personal relevance. Significant differences on ratings of positive affect were found between nomothetic and idiographic media selection types overall, despite finding no significant differences on measures of negative affect. Further, two of the nomothetic conditions, films and images, did not significantly differ on ratings of positive affect from neutral conditions. Thus, in this study, media types were distinguished qualitatively by both the degree of personal relevance and the degree of positive affect elicited. The fact that significant differences emerged in levels of positive affect but not negative affect suggests emotional experiences elicited by more personally relevant media were more complex, eliciting a full range of emotions encompassing both positive and negative affective qualities.

Closer examination of the relationship between individual variations in personal relevance ratings and affective ratings revealed that higher ratings of personal relevance significantly predicted higher ratings of negative and positive affect, unpleasantness (valence), and arousal, with the strongest predictions found for both negative affect and arousal. This suggests that individual variations in affect ratings were significantly influenced by individual variations in the degree of personal relevance. In addition, baseline endorsement of expressivity and strength of emotional responding was positively correlated with all affective ratings (positive and negative affect, valence, and arousal), suggesting that a greater tendency to experience and express emotions predicts higher endorsement of affect-related responses.

Interestingly, in an informal interview of participants at the conclusion of the experiment in which participants were asked which media type they felt was most effective at eliciting a negative emotional experience, only one participant identified nomothetic images, despite their being rated

higher on negative affect than any other media. What might account for these findings? One possible explanation for these findings is that the static, novel content of the nomothetic images elicit an orienting response in the viewer, which, in turn, influences emotional processing (Bradley 2009). Orienting responses were first described by Pavlov (1927; see Bradley 2009) as an “investigatory reaction,” or literally a “What is it?” reaction. Sokolov (1963) later expanded this concept to incorporate the physiological changes that accompany this investigatory reaction, using the term “orienting response” to refer to the behavioral and physiological reaction to novel stimuli. This orienting response is present in response to all novel stimuli regardless of affective valence, but the magnitude of this response changes as a function of the motivational significance of the stimuli, or the extent to which stimuli activate cortico-limbic appetitive and defensive systems that in turn mediate sensory and motor processes facilitating perception and action (LeDoux et al. 1984; Morris et al. 1997; Robinson and Petersen 1992; Taylor et al. 2000). Bradley (2009) suggests responses to novel stimuli in the laboratory are an index of these early survival processes. For example, presentation of novel pictures (pleasant, unpleasant, and neutral) have been found to elicit measurable skin conductance and heart rate changes, both reliable indicators of orienting (Critchley 2002), with greater magnitude of responses found for pleasant and unpleasant relative to neutral stimuli. Notably, after repeated presentations of IAPS images, diminished skin conductance and heart rate responses (Lang et al. 1993) and decreased activation of neural structures implicated in assessing emotional salience (Phan et al. 2003) have been found, further indicating that these changes represent an initial orienting response to novel stimuli.

Orienting functions to facilitate sensory and perceptual processing in preparation for action (Bradley 2009). Therefore, when orienting occurs, stimulus processing is enhanced. Further, when the stimulus is aversive, it activates defensive motivation systems, which have been found to further enhance sensory, perceptual, and memory processes (Kensinger 2004; Phelps et al. 2006). Thus, the same mechanism that allows us to “zero in” on a novel stimulus to determine its motivational significance will also enhance the affective evaluation of the stimulus and our memory of this evaluation, allowing us to quickly categorize a stimulus as “good” or “bad.” Therefore, initial affective evaluation will be enhanced when a stimulus is novel. It is possible that viewing images from the IAPS for the first time will result in enhanced judgments about their negative affective value, which may influence self-reported endorsements of affect regardless of their personal relevance.

Therefore, initial evaluation of the emotional responses to images may be reflective of affective processing of the motivational significance of the stimuli, but may not be as

reflective of more complex processing involving episodic memory, imagery, or conditioned emotional responses, as seen in music or film. A recent fMRI study comparing the presentation of IAPS images alone versus IAPS images combined with music (Baumgartner et al. 2006) lends support to this view. When presented alone, increased activation in response to negative IAPS images was found only in the cognitive dorsal system implicated in emotion perception (right dorsolateral prefrontal cortex, left superior frontal gyrus). No other significant activations were found. By contrast, when music was combined with IAPS images, significant activations were found in the amygdala, orbitofrontal and ventromedial frontal cortex, insula, and brainstem, key regions implicated in identifying the emotional significance of stimuli and producing an affective state, as well as in hippocampal and parahippocampal structures implicated in both declarative and procedural memory processing. Further, these activations correlated with participant report of more intense emotional experience during the combined music and IAPS condition. Baumgartner and colleagues (2006) suggest that these findings represent a functional and structural dissociation between processes of cognitively evaluating emotions on the one hand and strongly feeling and experiencing emotions on the other, and that different induction methods activate either a more cognitive mode or a more “feeling” mode of emotional processing. The presence of hippocampal and parahippocampal activation in the combined condition only suggests that the emotions elicited by the addition of music may have activated memories (and potentially imagery) above and beyond evaluations of emotional salience.

This pattern is consistent with findings in the present study of greater endorsement of personal relevance in the music relative to images and film conditions. In this study, the degree of personal relevance elicited by media was assessed by the extent to which presented media elicited thoughts, memories or images related to current or past situations, as well as the extent to which participants felt they could relate to and/or personally experience the emotions displayed by the media. The finding that idiographic music received the highest ratings for personal relevance is also consistent with Juslin and Västfjäll’s (2008) theory of emotional responses to music. According to this theory, emotional responses to music are thought to result from psychological processes such as evaluative conditioning, visual imagery, and episodic memory. Coupled with the findings of Baumgartner and colleagues (2006) noted above, therefore, findings in the present study lend support to the idea that emotions elicited by music involve not only emotion perception but more elaborate processing as well, triggering personally relevant memories and associations, and this further elaboration of the emotional response may differentiate music from still images in the quality of the emotional experience induced. It is important to note, however, that idiographic images did not differ significantly from

idiographic music on any measures in this study and also resulted in significantly higher endorsement of personal relevance. This suggests that it may not be the static nature of images that resulted in lower ratings of personal relevance, but the actual content of the pictures themselves.

Although no neuroimaging study that we are aware of directly compares music and film, the lower endorsement of personal relevance evidenced in the film conditions, regardless of whether films were experimenter- or participant-selected, may also indicate that a somewhat different emotional response is generated by films. Because of their dynamic nature, films may elicit a more elaborated emotional response than still images. However, compared to music, which can have direct associations with events or situations in an individual’s life, and may therefore directly conjure personal memories, affective associations, or emotionally evocative images, films present representations of real life situations and events, from which personal meaning is abstracted. This additional processing “step” may differentiate the emotional response to films versus music. Further research, particularly neuroimaging studies comparing emotional responses to music and film, would help to clarify this.

There are a number of limitations to this study to note. First, the current study included a heterogeneous sample with a range of anxiety and mood disorders. Given the high rates of comorbidity between anxiety and mood disorders (Kessler et al. 2005), and common affective processes found across the disorders (Wilamowska et al. 2010), similarities in responses to affective stimuli might be expected. However, a recent study suggests there may be temporally related variations in emotion-induced responding across differing depression-related versus anxiety-related symptom presentations (Larson et al. 2007). Differential patterns of affective responding were found between participants endorsing high anxious-arousal, high anxious-apprehension, or high anhedonia during and immediately following the presentation of affective images. Potentiated blink responses were found during presentation of pleasant and unpleasant pictures in the anxious-arousal group; potentiated responses to pleasant and unpleasant pictures were found immediately following picture offset in the anxious-apprehension group, and sustained blunted responses to pleasant pictures were found in the anhedonia group. Thus, responses to emotion induction procedures may vary according to presenting diagnoses, and it is possible that the results found in the current study with a heterogeneous sample may differ from results in a sample of depressed-only or anxious-only patients. Future studies examining responses to emotion induction procedures in anxious versus depressed individuals would help clarify potential disorder-related differences in responses. Second, all film clips used in the present study also contained music. It is not known, therefore, if significant differences would be found for moving images that did not include music. Third,

in order to eliminate potential confounds, the present study focused on the elicitation of one specific emotion—sadness. Therefore, it is unclear whether these findings would generalize to media eliciting other discrete emotions, such as fear or anxiety. Fourth, this study relied solely upon self-report measures. Future studies including neural, physiological and behavioral measures may shed further light on potential differences between media types. Finally, the sample in this study was predominately female (70%), and predominately non-Hispanic Caucasian (80%), limiting the ability to generalize these findings across genders and other racial and ethnic groups.

Conclusion and Future Directions

In conclusion, significant, qualitative differences were found between images, films, and music. Higher ratings of positive affect differentiated media rated as significantly more personally relevant than media rated as less personally relevant, with no differences on ratings of negative affect, valence, or arousal. This suggests perhaps a more complex, mixed emotional response to media that is deemed as personally meaningful. The question is, do these qualitative differences matter?

Depending upon the research question at hand, the differences between media types described here may matter a great deal. For studies exploring emotion perception, orienting, and the automatic processing of emotional significance, the evidence presented here suggests IAPS images may be sufficient. However, if the variable of interest involves emotional processes in the context of a personally relevant emotional experience, and particularly how these processes relate to psychopathology, such as in studies examining adaptive versus maladaptive emotion regulation strategies, or studies investigating changes in emotional processing as an outcome of treatment, eliciting a more complex response involving not only emotion perception but also memory, imagery, and thought may be required. In this case, music or films may be more effective than images. The results of this study suggest that, at least for music and images, the use of participant-selected rather than experimenter-selected media confers a specific advantage, particularly in the ability to elicit a range of emotional experiences (encompassing both positive and negative affect). However, participant-selected media presents another challenge by introducing greater variability and less experimental control. Future studies could benefit from the development of methods for controlling variability in studies using participant-selected media, such as using rating scales or cutoff scores on measures of affect for inclusion of selected stimuli. Finally, future studies examining the relative effectiveness of film, images and music, as well as selection type, to induce emotion as applied to *specific* emotion-related research questions (e.g. investigations of emotion regulation versus emotion perception) will help to further clarify the

advantages of using one type of media over the other. As a result, we may begin to move closer towards eliciting emotional experiences in the laboratory in a more ecologically valid way.

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