Scientific Research

Effect of Affect Induction Method on Emotional Valence and Arousal

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Abstract

Human functioning is influenced by the affective state. The literature contains several references to the possibility that valence and arousal have separable influences on attention. There are several methods of inducing affective state but the most popular are by music and video clips. The latter are more vivid and stimulate several sensory systems, leading to the hypothesis that a stronger effect will result when using video clips for the induction of affective state. Both methods have been used in many studies in the past but their different contributions have never really been tested. Thus the aim of the present study is to systematically establish or refute the assumption that video clips are the stronger tool for affect induction. In order to test this hypothesis a study was conducted in which 194 subjects participated in four groups. Positive and negative affect conditions were induced by validated music and video clips. The results established the validity of the hypothesis. The results should be applied in cognitive research testing the relations between induced affect and cognitive abilities in order to determine whether the effect is replicated when the cognitive abilities are tested.

1. Introduction

The aim of this study was to determine the optimal affect induction method. The research hypothesis assumed that due to the vividness of video clips, they would be more effective than music clips for inducing affect.

Affect, a person's externally displayed or reported mood, is composed of two orthogonal factors, positive and negative (e.g., Watson & Tellegen, 1985), and/or arousal and pleasantness (Eich et al., 2007). Positive affect is an "emotional state that is characterized by subjective good feeling and happiness" (Watson, Clark, & Tellegen,

1988). As such, it reflects the extent to which a person feels enthusiastic, active and happy. In contrast, negative affect is a dimension of subjective distress and unpleasurable engagement that subsumes a variety of aversive emotional states, including anger, contempt, disgust, guilt, fear and nervousness. These mood factors relate to different classes of variables (Watson et al., 1988). Negative affect, but not positive affect, is related to self-reported stress and coping (Clark & Watson, 1988) and frequency of unpleasant events (Stone, 1981). Positive affect is related to social activity and satisfaction and to the frequency of pleasant events (Watson et al., 1988). High arousal is characterized by the feeling of a lot of energy or activity. Low arousal is characterized by the feeling of low energy or tiredness (Eich et al., 2007).

Recent findings have emphasized that human functioning is influenced by the affective state. The literature contains several references to the possibility that valence and arousal have separable influences on attention. Effects of arousal can be seen in impairments of immediate memory associated with traumatic stress (Nadel & Jacobs, 1998) and in distractions caused by task-irrelevant stimuli (Schimmack, 2005). Influences of valence can be seen in the way threatening stimuli, such as snakes and angry faces, attract attention (Lang, Davis, & Ohman, 2000) and in the way that positive and negative induced-affect produce opposing task-irrelevant stimulus pre-exposure effects (Lazar et al., 2012). However, it is also possible that valence and arousal interact to produce unique outcomes. For example, individuals who are sad or depressed (low arousal with negative affect) tend to process the finer details of a scene at the expense of gist, whereas individuals who are happy (high arousal with positive affect) tend to focus on the gist at the expense of details (Gasper & Clore, 2002; Huber, Beckmann, & Herrmann, 2004). Determining the unique roles of valence and arousal is not the goal of our study; however, in order to investigate the effect of valence and/or arousal an appropriate tool should be used. Thus the present study tests the effectiveness of music and video clips in affect induction in terms of both valence and arousal.

Studies have used several means to induce affect. According to Lazar et al. (2012) Positive Affect (PA) scores were higher following a positive affect film clip and lowest following a negative affect film clip. Similarly, Negative Affect (NA) scores were highest following a negative affect film clip and lowest following a positive affect clip. Eich et al. (2007) used music clips in order to induce affect and found four types of music that produced high/low arousal affect and pleasant/unpleasant affect. Eich induced affect by music clips, but instructed the participants to imagine an affective event that matched the music. In other words, while listening to happy music, participants were instructed to reminisce about a real, happy event that they experienced. Hence, while the findings might be the result of the music clips, they might have been caused by recall of the event. Bradley et al. (2006) used pictures for the same purpose. The latter study showed correlation between attention performance and emotional state using affect laden pictures.

Previous studies have shown that the timing of auditory stimuli is not identical to the timing of visual stimuli. An auditory stimulus is often experienced as being longer than the equivalent duration of a visual stimulus, and duration discrimination was more accurate for auditory than for visual stimuli (Goldstone & Lhamon 1974). The modality effect is explained within the frame of a scalar timing model, developed from scalar expectancy theory (Gibbon, 1977, 1991). The model is comprised of three interrelated information processing stages consisting of clock, memory, and decision. In the clock stage, a pacemaker emits pulses at some mean rate. A switch is placed between the pacemaker and an accumulator. When a switch controlled by the timing signal closes, the pulses pass the switch and enter the accumulator to be added. In the memory stage, the working memory receives the temporal information from the accumulator and serves as an extended buffer. Reference memory stores critical temporal information from past trials. The comparator determines a response based on a comparison of temporal representation stored in working memory with reference memory (Gibbon, 1991).

According to modality effect the influence of auditory stimuli is different from the influence of visual stimuli. Video clips involve auditory and visual processing while music clips involve only auditory processing. Therefore, the aim of this study is to find out which type of affect induction produces a stronger influence on mood valence (negative vs. positive) and arousal (low vs. high).

Both the positive and negative affect will be induced by video clips and music clips. The basic hypothesis is that a stronger effect will be induced by the video clips than by the music clips.

2. Method

2.1. Participants

Two hundred ninety-four subjects, 119 female and 175 male, mostly first-year students from Tel-Hai College,

Israel, participated in the study. The mean age was 25.43, with a range from 20 to 49. All subjects had normal or corrected to normal vision and normal hearing and Hebrew as their native language.

2.2. Apparatus and Stimulus Materials

All experimental events were presented by a PC computer on a color monitor (super VGA). Each subject was presented with one positive or negative affect video clip or one positive or negative affect music clip. A Hebrew version of the Positive and Negative Affect Schedule (PANAS; Watson, Clark & Tellegen, 1988) and Mood Grid was used to measure the effectiveness of the clips in inducing affect.

The PANAS assesses separately positive and negative affect that is experienced at a specific point in time. The questionnaire consists of 20 items, ten for the positive scale (Items: 1, 3, 5, 9, 10, 12, 14, 16, 17, 19) and ten for the negative scale (Items: 2, 4, 6, 7, 8, 11, 13, 15, 18, 20). For each item, the subject indicates his/her feelings on a scale of 1 to 5, where 1 means "very little" or "nothing", and 5 means "very much". Cronbach's coefficient alpha reliability for the scales is 0.89 and 0.85 for positive affect and negative affect, respectively (Shachar, 2005).

The Mood Grid consists of a 9×9 array of cells. The horizontal dimension represents self-perceived emotion, from extremely unpleasant to extremely pleasant. The vertical dimension represents self-perceived arousal, from extremely low to extremely high.

For the positive affect condition the musical selection *Slavonic Dances*, *Op.* 46, *No.* 6 *in D Major* or a segment (01:09:29-01:14:00 minutes) of the movie "*Party in the Billiard Room*" was used. For the negative affect condition the musical selection *Quintet for Piano and Strings No.*1 *in D minor*, *Op.* 89 or a segment (00:58:39-01:02:30 minutes) of the movie "*Operation Yehonatan* (*Operation Entebbe*)" was used.

2.3. Procedure

The subjects were divided into groups of ten participants each. The participants in each group were instructed that they would see/hear a five-minute clip on a screen/surround system, and that they would be asked to watch/listen carefully.

Immediately after watching/listening one of the four clips, the PANAS was administered. Subjects received two affect scores. The PA score is the sum of the scores of the 10 positive scale items; the NA score is the sum of the scores of the 10 negative scale items. Scores on each scale can range from 10 to 50.

Upon completion of the PANAS questionnaires, subjects were given the following instructions for choosing Mood Grid cells:

"So we're going to start with the mood grid. This measures how you're feeling in terms of your arousal, or energy level. The mood grid has two dimensions; the first is how you're feeling emotionally, from extremely unpleasant to extremely pleasant, and the other is how aroused you are, and we think of arousal as how much energy or activity you are experiencing. The center represents neutral emotion and as you go out, these represent slightly, moderately, very, and extremely pleasant. Arousal fluctuates the same way, only this time it moves row by row. With the top representing extremely high arousal, lots of energy or activity, and the bottom representing extremely low arousal, so low energy or tired.

These factors can vary independently of each other. What I mean is that knowing how pleasant or unpleasant a person is feeling does not tell me how much arousal or energy they are experiencing. It is possible to have any combination of the two or be in any square at a given point in time."

Mood grid scores were defined by the location of the grid cell chosen by each subject. As such, subjects received two scores, one for Pleasantness and one for Arousal. Each score can range from -4 (very unpleasant or very low arousal) to +4 (very pleasant or very high arousal).

3. Results

Figure 1 presents the scores on the positive and negative scales as a function of the different induced-affect clips and as a function of the different affect induction methods. Figure 2 presents the expected scores on arousal and pleasantness scales as a function of the affect clips and induction methods.

The movie manipulation markedly affected the scores for PA, NA, Arousal and Pleasantness in comparison to music manipulation, as was expected. According to the results, the positive affect manipulations yielded positive
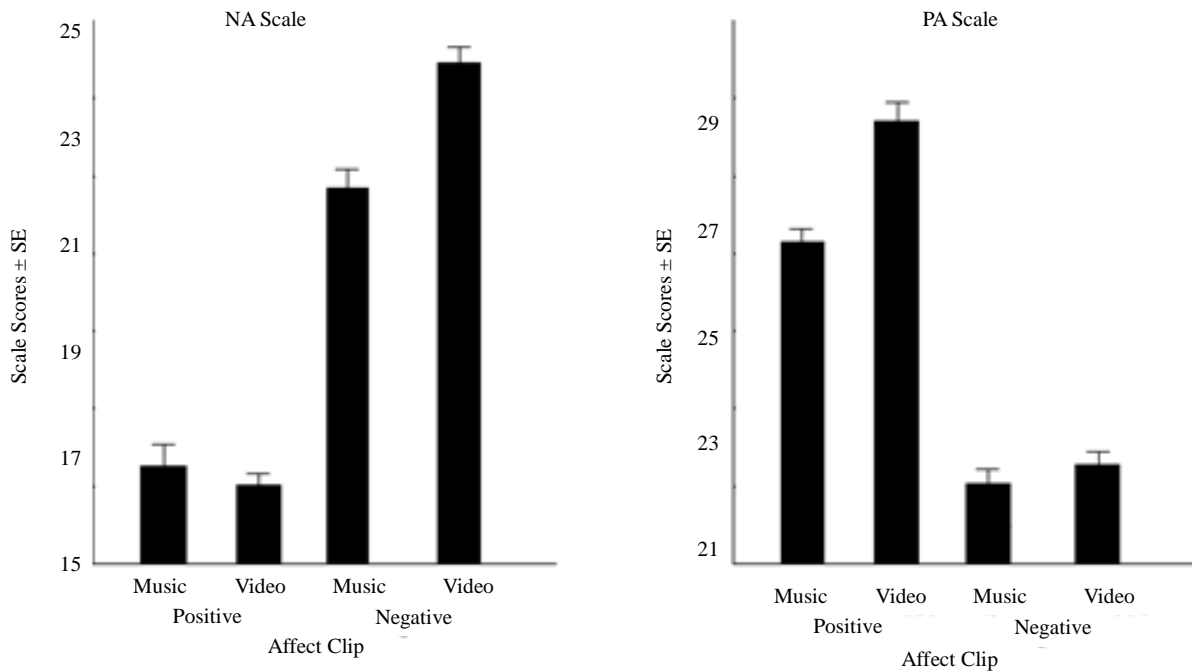
Figure 1. Expected mean Negative Affect scores (NA; left panel) and Positive Affect scores (PA; right panel) as a function of type of affect-induction clip (Positive and Negative Affect) and induction tool (video clip and music clip).
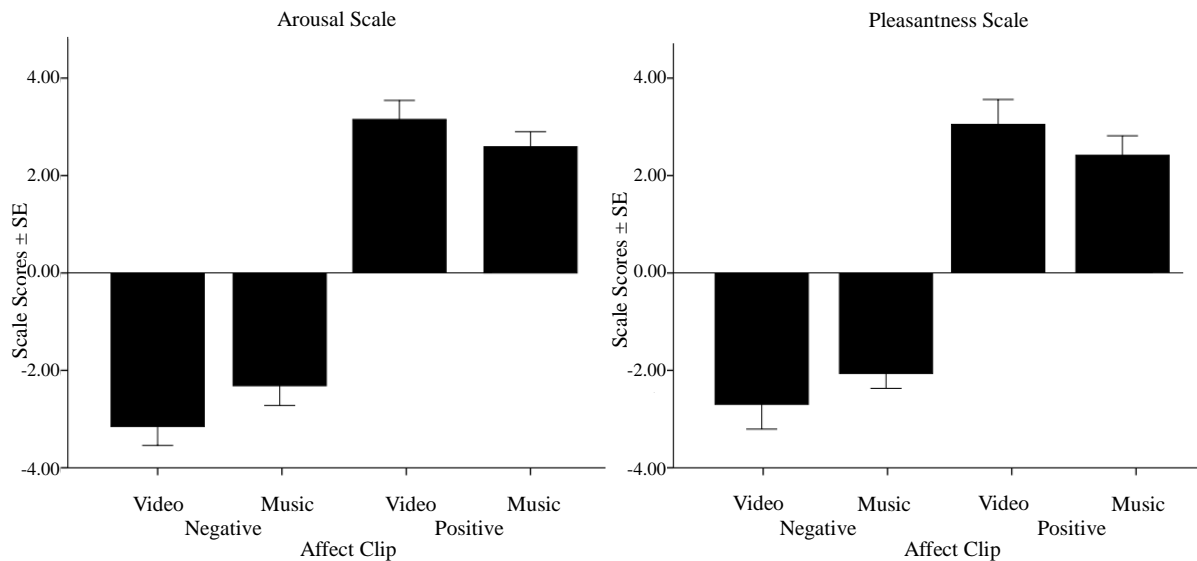

Figure 2. Expected mean Arousal scores (left panel) and Pleasantness scores (right panel) as a function of type of affect-induction clip (Positive and Negative) and as a function of affect induction tool.

affect while the negative affect manipulations yielded negative affect. Higher arousal followed positive affect clips in comparison to negative affect clips. The difference between the scores of male and female participants was insignificant, $p > .10$. Since PA and NA are orthogonal dimensions (Watson et al., 1988), indicated here by the absence of significant correlation between the two scores [$r(294) = .02$, $p > .10$], PA and NA scores were analyzed separately. A one-way ANOVA of PA scores revealed a significant effect of the manipulation, $F(3, 293) = 2.65$, $p = .049$. Scheffe post hoc tests revealed no significant differences between the groups, $p > .10$. A similar ANOVA of NA scores also showed significant effect of the manipulation $F(3, 293) = 8.44$, $p < .001$. Scheffe post hoc tests revealed a significant difference between the positive video clip and the positive music

clip groups, $p = .007$, between the negative video clip and the positive music clip groups, $p < .001$, and between the positive and negative music clips groups, $p = .004$. The difference between the positive and the negative video clip groups was insignificant, as was the difference between the positive video clip and the negative music clip groups ($p > .10$). A one-way ANOVA of arousal scores revealed a significant effect of manipulation, $F(3, 293) = 4.29$, $p = .006$. Scheffe post hoc tests revealed a significant difference between the negative video and music clip groups, $p = .03$, and between the negative and the positive music clip groups, $p = .01$ and between the positive and the negative video clip groups, $p = .01$ and between the positive video clip and the negative video clip groups $p = .04$.

4. Discussion

The aim of this study was to determine the optimal affect induction method. The research hypothesis assumed that due to the vividness of video clips, they would be more effective than music clips for inducing affect. The validity of the hypothesis was established. The positive video clip induced a stronger positive affect in comparison to the positive music clip, and the negative video clip induced a stronger negative affect in comparison to the negative music clip. The results were similar when the PA was the dependent variable as well as when the NA or pleasantness were the dependent variables. Higher arousal followed positive affect while lower arousal followed negative affect, but the affect was stronger for the video clip manipulation in comparison to the music clip manipulation.

Video clip information is perceived by two information roots, the auditory root as well as the visual root (Kandel et al., 2013), while music information uses solely the auditory root (Kandel et al., 2013). Thus the amount of information processed is greater with the former in comparison to the latter (Eysenck, 1993). In other words, the more information processed the clearer it is. Eich et al. (2007) suggested that music clips might be more effective in inducing affect than video clips. They explain their claim by the effect of information overload. They assert that the load of information might disturb information processing, lowering the ability to induce affect. The results of the present study clearly show that the load of information has a minor effect, if at all, on the induction of affective state.

The effect of the video clip was established when arousal was tested as an independent variable. The surprising result, however, was that while the arousal after positive affect manipulation was high, arousal was found to be low after negative affect manipulation. The results might be due to the clips that were chosen. In other words, the positive affect manipulation induced a happiness-like mood while the negative affect manipulation induced a depression-like mood. The difference between depression and happiness is seen not only in the valence, negative and positive, respectively, but also in the level of arousal. Happiness is characterized by high arousal while depression by low arousal (Carlson, 2012). Further studies should be conducted in order to compare the effect of music as well as video clips of the same/different kind of valence and arousal.

The influence of mood was found to enhance or weaken cognitive function (e.g. Lazar et al., 2012). In general, positive mood improves the performance in attention, memory and decision-making tasks (Lazar, 2012). The majority of earlier research used video clips or pictures to induce mood. In contrast, learning disability testing aids involve listening to music. The present study may cast doubt on the efficacy of these testing aids; hence, the influence of listening to music before and during the performance of cognitive tasks should be re-examined.

5. Conclusion

In summary, the present study examined the effect of type of mood induction on the affect and degree of arousal. The findings show unequivocally that video clips influence mood more than music clips, as observed using four dependent variables: positive affect, negative affect, level of pleasantness and arousal level. In addition, the arousal level was found to be higher as a result of positive mood compared to negative mood. This study should lead to further research that tests these findings using higher resolutions.

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Appendix A: The Positive and Negative Affect Schedule (PANAS; Watson et al., 1988)

This scale consists of a number of words that describe different feelings and emotions. Read each item and then list the number from the scale below next to each word. Indicate to what extent you feel this way right now, that is, at the present moment OR indicate the extent you have felt this way over the past week (circle the instructions you followed when taking this measure)

1 Very Slightly or Not at all	2 A Little	3 Moderately	4 Quite a Bit	5 Extremely

_____ 1. Interested		_____ 11. Irritable	
_____ 2. Distressed		_____ 12. Alert	
_____ 3. Excited		_____ 13. Ashamed	
_____ 4. Upset		_____ 14. Inspired	
_____ 5. Strong		_____ 15. Nervous	
_____ 6. Guilty		_____ 16. Determined	
_____ 7. Scared		_____ 17. Attentive	
_____ 8. Hostile		_____ 18. Jittery	
_____ 9. Enthusiastic		_____ 19. Active	
_____ 10. Proud		_____ 20. Afraid	

Appendix B: Mood Grid

EXTREMELY HIGH AROUSAL

EXTREMELY UNPLEASANT

EXTREMELY PLEASANT

1	2	3	4	5 +	6	7	8	9
10	11	12	13	14	15	16	17	18
19	20	21	22	23	24	25	26	27
28	29	30	31	32	33	34	35	36
37	38	39	40	■	41	42	43	44
45	46	47	48	49	50	51	52	53
54	55	56	57	58	59	60	61	62
63	64	65	66	67	68	69	70	71
72	73	74	75	76	77	78	79	80

EXTREMELY LOW AROUSAL