"Attentional Bias associated with alcohol related cues: differences between old and young people"

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Date of submission: Tuesday
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Acknowledgments

First and for most I would like to thank July for her guidelines and patience which was undoubtedly of a great importance for this study. Moreover, I would like to express my gratitude to Dora for her ideas even though time expired very quickly and many of those remained only ideas. I could not of course dismiss the entire psychopharmacology unit which was far more supportive in any aspect.
Thank you all folks

Attentional Bias associated with alcohol related cues: differences between old and young people

Abstract: The aim of the present experiment was to investigate potential differences in attention to alcohol related cues between older subjects, followed by a further comparison with data which were achieved by a previous study with young subjects. During the study, we used different questionnaires in order to evaluate participants' *Profile of Mood States (POMS), Alcohol Expectancy Questionnaire (AEQ). Results:* Using One –Sample t test, it was unlikely to establish the main effect of the bias within the old-sample itself. Further comparisons between the two studies revealed significant differences for the questionnaires used, for the POMS factors: *sociability, liquid courage*; for the AEQ factors: *vigorous, elation, confidence, fatigue, & arousal*. Some of the potential reasons for the "Unbiased" Attentional outcomes are further discussed.

Introduction

Many theories have been focused on the basic understanding of human motivation and drive, and moreover, the way people perceive and process environmental stimuli that may trigger parts of their previous experiences. A lot of research has been focused on drug seeking behaviours and on the implicit way the cognition functions in order to determine these behaviours.
There is a plethora of incentive-motivational theories characterized by different so called "seeking behaviours" which tend to analyse an individual's perception towards the seeking of a drug, in altered environmental contexts. These include the *Incentive-Sensitization Theory* of drug dependence (Robinson & Berridge, 1993, 2001), the *Incentive Salience Theory* (Sokolov 1963; Bindra 1978; Robinson and Berridge, 1993), and others. Evidence for these theories comes from studies that measured individual responses either to tobacco or alcohol related stimuli such as: pictures of cigarettes, smoking related cues, words or scripts, glass of spirits, alcohol pictures, compared with neutral non-significant stimuli such as pictures of pencils, control words, etc. The above theories can be classified as sharing a basic common characteristic, that is: Classical Conditioning. Classical (Pavlovian) conditioning has been indicated to be one of the most powerful systems of pairing stimuli, and can therefore lead to addictive behaviours or addiction seeking attitudes.
It has been suggested that drug users tend to perceive drug-related stimuli as more positively valenced, compared with non-users (Mucha et al., 1999; 2000; Mogg et al., 2003; field et al., 2003). This can be explained in terms of their prior schematised experiences, pairings acquired when they were under the influence of a drug. Drug seeking behaviours are generally characterised as both positively and negatively defined, according to the level of the drug use, the drug's effect itself, and the environmental context where it has been used.

There is a lot of literature based on further understanding of what lies beyond the human addiction and on the question: *what are the real mechanisms underlying those attitudes?*

A clear and rather comprehensive example is that of the Attentional Bias effect.

Attentional bias is established when environmental cues mainly those related to a strong primarily paired stimulus capture one's attention in every day life situations. That can be with alcohol related pictures or adverts related to smoking behaviours etc. Attentional Bias can therefore be seen as the effect-outcome that results from an impulsive response or attendance of a primarily conditioned individual to a specific stimulus (such as an alcohol related picture), when that stimulus is apparent. In order to divulge Attentional Bias various techniques can be used such as the Stroop Task or the Dot Probe Task. The Stroop Task is widely regarded as a reliable measure of attention and the phenomenon is robust and always statistically reliable (MacLeod 1992). Another way to measure visual bias is by the usage of the Dot Probe Task. This task is specifically designed to assess visual attention on a computer screen, where pairs of stimuli (neutral vs. stationery) are presented simultaneously, followed by a dot probe which replaces one of these stimuli. Visual stimuli are classified in two categories, neutral such as: a hand holding a stapler or stationery: a hand holding a glass of wine, a bottle of wine. In order to measure Attentional bias, subjects are required to respond to the dot probe as fast as possible, and response latencies are therefore measured as an indication of visual attention to the stimuli (Townshend et al., 2001, Mather et al., 2003, Bradley et al., 2003). The Dot Probe Task has been found to be a strong and valuable indicator of the Attentional Bias effect (Townshend et al., 2001).

Dot probe tasks have been used so far in a numerous of different studies and for various reasons. Mather et al., (2003) were able to justify age differences on the issue of emotionality. Furthermore, Bradley et al., (2003) revealed significant differences on the level of attention between smokers and non-smokers, or alcohol related stimuli (Townshend et al., 2001).

The level of alcohol consumption is an important factor that predicts the outcome of the Attentional bias effect. Among clinical alcohol abusers, Attentional bias can be established using a variety of techniques (Ryan, 2002). Similarly, Cox et al., (2003) suggested that the level of alcohol consumption can be seen as a prognostic tool in circumstances such as high level of intake, among habitual alcohol drinkers. Yet, Waters et al (2003) using a dual task paradigm did not manage to support this view. They suggested that among abstinent alcohol abusers and controls (non-clinical) the Attentional performance is dropped on a lexical decision task for the abusers, and that the attentional bias effect was distracted since abusers lack any focus of attention (Waters H., Green MW., 2003). In a similar paradigm, Cox (Cox et al., 2002) found that unsuccessful in treatment alcohol abusers expose a significant increase in Attentional distraction for alcohol stimuli.

There is a general consensus that performance declines in various aspects throughout ageing and moreover, a variety of studies on ageing admonished a negative relation of older people and their cognitive performance. These studies include many issues of cognitive measurements on different tasks.

Attentional measurements still remain contradictory.

Parasuraman & Giambra (1991) proposed that sustained attention decreases throughout time. Yet, a follow up study by Giambra (1997, sited in Giambra, 1991)) did not manage to reveal differences in older subjects as far as their detection accuracy and detection time was concerned on an information processing task. Even though older subjects have a tendency towards false alarms when compared with younger subjects, their sustained attention accuracy on the task was found to be intact.

Age differences were also established using a dot probe task that concerned emotional faces (Mather et al., 2003). Aged people, tended to exhibit a bias effect, when dot appears to the same location as a neutral face, than with negative emotionally pictures. This did not seem the case with young samples. It has been suggested that older tend to remember less negative than positive related stimuli, and that in general they pay more attention to "meaningful" environmental stimuli. The previous corresponds to the idea of the socioemotional selectivity theory (Carstensen, Isaacowitz & Charles, 1999), which suggests that the assessment of time left in life drives this shift of negative environmental cues to more positive one's (sited in Mather et al., 2003).

Cross-cultural studies also found reaction-time differences on a cognitive performance task with alcohol consumers. The previous suggests that reaction time is a factor based on environmental context and stimuli when it concerns the consumption of alcohol (Bond et al., 2003).

Based on the previous studies, the current experiment was an attempt to further analyze attentional bias effect, using a dot-probe detection task that measured individual latencies in terms of alcohol related pictures. Thirteen mature participants and their reaction times were measured using an E-Prime detector. All data were therefore compared to those achieved by a previous study related to differences between young drinkers and their response's latencies. Attentional bias was calculated using the subtraction of the mean response time when the dot probe was in the same location as the alcohol related stimulus from the mean response time when the dot probe and the alcohol related stimulus were indifferent locations.

Materials and Methods

Participants

Thirteen mature male and female (5 male-8 female) participants were used in total, for the purpose of the current study. Participant No 4 was excluded from the analysis, since he did not satisfied the criteria of the study. All subjects were recruited from the University of Sussex Pool. Their ages were ranged between 37 and 56 (with a mean= 45.7) and had English as their first language. Participant collection was achieved via email correspondence, given prior a brief estimation of their weekly alcohol consumption, in terms of units. Units were calculated as 1 unit per small glass of wine (approx. 125 ml), half pint of beer or 1 measure of spirit. Only one of the participants drank alcohol in rare occasions.
Four out of thirteen old subjects were regular smokers (mean 1.6 (S.D. 0.4), All participants were given an informed consent prior to the study, which had been approved by the University of Sussex ethics committee. All participants were directly paid £6.00 per app. 40 min.

Dot Probe Task

The Dot Probe Task was composed by thirty alcohol-related pictures matched with thirty pictures of stationery. Alcohol-related pictures included a glass of white wine, or a hand holding a pint of beer. Stationery pictures included cues from every day life, such as a picture of male lips near a dictaphone, or a red car. Both picture stimuli were presented together in pairs, side by side on an 11-inch colour monitor, produced by an E-Prime version 1.0. (Psychology Software Tools, Inc).

Procedure for Dot Probe Task

The procedure used for the purpose of current experiment was based on that of Townshend and Duka (2001). Participants were asked to seat in front of the computer monitor and asked to read the instructions on the screen. They were told that their reaction time to the stimuli would be measured and that they must look at the fixation cross when it appeared on the screen. A pair of picture would follow this and then the Dot Probe would appear either to the left or right, replacing one of the previous presented pictures. They were asked to indicate as soon and as precisely as possible where the dot appeared by pressing either of the both keys on the keyboard. Before starting, they were presented with ten practice trials followed by 160 main trials. Participant's responses were recorded by E-Prime. The temporal distance of the fixation cross exposure was for 500ms, followed by a pair of pictures for 500ms. The Dot Probe was then presented for as long as the participants responded to it. The interval between the participant's response and the appearance of the fixation cross at the start of the next trial was 1000ms. Each pair –stimuli were presented four times, once for each of the independent variable conditions, which were picture location (left or right) and dot probe location (left or right). The dependent variable for this study was the response latencies which were collected by the E-Prime. Attentional bias scores of the participants were calculated by subtracting the mean response time when the dot probe was in the same location as the alcohol related stimulus from the mean response time when the dot probe and the alcohol related stimulus were in different locations.

Questionnaires

Alcohol Use Questionnaire (AUQ) and non-drinking questionnaire

All drinkers were given the Alcohol Use Questionnaire (AUQ, Mehrabian and Russell, 1978), with an exception of one low drinker who was given a non-drinking questionnaire instead. The AUQ determined a quantity-frequency, beverage-specific index of the alcohol consumption of each participant for the past 6 months.
AUQ provided a clear estimation of the weekly alcohol consumption. It addresses questions such as "how many glasses of wine do you have in a week?" or "how many pints of beer" etc.
The non-drinking questionnaire had been designed to measure very rare occasions of drinking behaviours. It had been composed by twelve questions in total and addresses issues such as when was the last time of been in a pub, whether there is any particular reason of avoiding alcohol etc.

Drug Use Questionnaire

All participants were given the Drug Use Questionnaire to define a priori any potential drug use background, in order to take part to the experiment. Drug Use Questionnaire consists of questions that actually measure the exertion of illicit recreational drugs such as marijuana, cannabis, stimulants such as cocaine or amphetamines, hallucinogens, opiates, barbiturates, benzodiazepines, anti-depressants. There is a three scale categorization used for the estimation of drug intake: none-mild-excessive, depended also to the last date of drug use. In our study, there was no interference between our participants and drug use, so none of them was excluded for this purpose.

Desire for Alcohol Questionnaire (DAQ)

Desires for Alcohol Questionnaire is a standardised technique to measure craving responses (DAQ; Love et al., 1998). It is composed by 14 item questions that analyze factors of alcohol craving. The four factors represent "mild desires and intentions to drink" (factor 1-4 items), positive and negative reinforcement (factor 2-4 items), "perceived control over drinking" (factor 3-2 items), and finally "strong desires and intentions to drink" (factor 4-4 items). In order to score the items of the questionnaire, a seven point scale was used; that is from item 1 (strongly disagree) up to 7 (strongly agree), and scores were calculated for factors 1, 2 and 4 so that high scores represented high craving. Scores for the 3rd factor, represent a loss of perceived control over drinking.

Digit Symbol Substitution Task (DSST)

This particular task (DSST) has been specifically designed to measure both speed performance and normal eye sight. It has been given to the participants of the current experiment, since both these factors interfere strongly with the Dot Probe Task.

National Adult Reading Test (NART)

NART, is a fast IQ measurement, designed by Nelson (1991), which provides evidence of the participant's verbal IQ fluency and performance in particular. It has been composed by 50 rarely used English words, difficult in pronunciation, and where subjects required pronouncing correctly.

Alcohol Expectancy Questionnaire (AEQ)

Alcohol Expectancy Questionnaire (AEQ) is a 38 item procedure which assesses positive and negative expected effects of alcohol consumption. It is been based on the *Comprehensive effects of alcohol Questionnaire* (Fromme, Stroote & Kaplan, 1993). The evaluation of the AEQ responses are determined according to seven expectancy factors, four positive (*sociability, tension, reduction, liquid courage* & *sexuality)*, and three negative (*cognitive and behavioural impairments, risk and aggression, and self perception*).

Profile of Mood States (POMS)

The Profile of Mood States (POMS; McNair et al., 1971) is been comprised of 72 mood related adjectives which participants are instructed to rate on a 5-point scale, ranging from "not at all" (0) to "extremely" (4). POMS measures factors such as: *Anxiety, Fatigue, Depression, Anger, Vigour, Confusion, Friendliness* & *Elation*. The previous factors are then subdivided into two different categories: (Anxiety + Vigour) – (Fatigue + Confusion), & Positive Mood=Elation – depression (de wit & Doty, 1994).

Procedure

At the beginning of the experiment, a cover sheet was filled in by the experimenter which was addressing general questions about participant's sex, age, smoking habits, drinking habits-usual brands, if subjects were under medication while contributing to the experiment etc., and a subject information and consent form to read and sign. The first questionnaires that were then administered to them were: the Alcohol Use Questionnaire & the Drug Use Questionnaire. The Dot Probe Task was then completed, which was followed by the POMS and the AEQ. Participants had then to perform once again the Dot Probe Task, to make sure that the Attentional Bias could still be revealed for a second trial, followed by the DSST, DAQ & NARTask. At the end of the experiment all participants were debriefed for actual purpose of the study and were asked to sign up a form with the £6.00-received each respectively.

Results

Bias effect for mature participants

One-sample T-test did not reveal any significant differences between the bias scores in our sample, neither for the first Dot Probe Task, nor for the second repetition of it. Mean averages and standard deviations can be seen in table 1.1 (for more information look at: the *Appendix 1*).

	Subject's No	Mean	S.D.	Level of sign.
Bias 1	12	5.67	13.2	**.166**
Bias 2	12	-3.26	41.3	**.789**

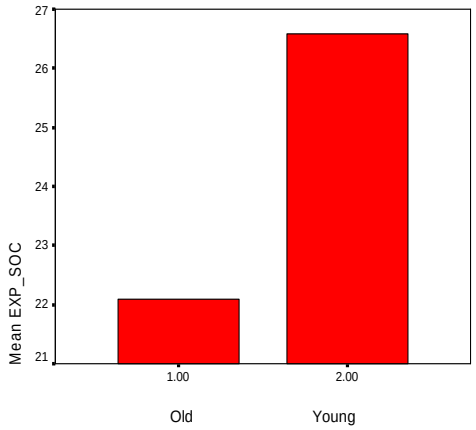
Table 1.1: Displays the level of significance between the bias scores

Using Pearson's correlation analysis for our data we did not manage to establish any correlations between the bias scores and either POMS, DAQ, or AEQ. The main effect of the bias scores did not reveal any differences with the above questionnaires.
Following analysis were revealed using the first session's Attentional Bias Scores, both for young and old participants, due to the fact that mature scorings at the second repetition of the *Dot Probe Task* were far away from significance, and since there was no main bias effect of the trail 1, it was unlikely checking for any persistence of it.

Comparison of bias effect between **younger**[1] and **older** participants

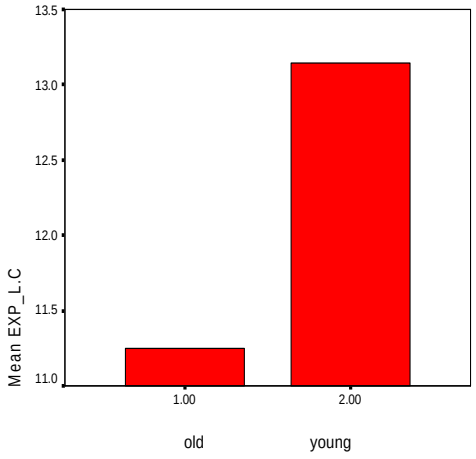
Expectancies scores

Using multivariate Analysis for the Alcohol Expectancy Questionnaire, we managed to reveal differences between the younger and older participants for the factors: a) *sociability* (Graph 1), the F factor was calculated to be 10.7 with a level of significance at 1% (P<.002) & for b) *liquid courage* (Graph 2) at 5%, with F value = 3.8 (P<.056) (for more information, look at the *Appendix 2*).



Graph 1: Displays the Mean differences between the Old-Young subjects and their expectancies on sociability factor

From graph 1, it can clearly be seen that younger people have greater sociability expectancies from alcohol consumption when compared with older people.



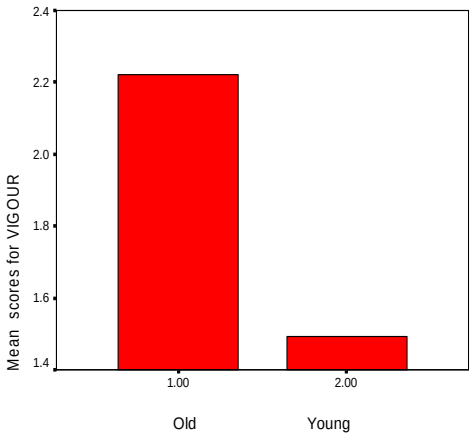
Graph 2: Displays the Mean differences between the Old-Young subjects and their expectancies on the factor of liquid courage

[1] Young's data were used by a similar study which measured the bias effect of alcohol related pictures, using identical techniques and questionnaires.

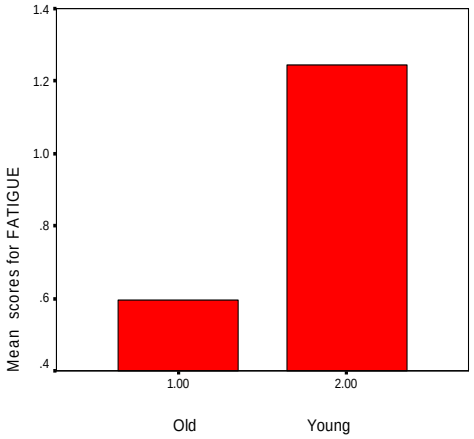
Similarly, the scorings of the younger were calculated to be higher for the liquid courage factor than those of the older.

Profile of Mood States (POMS)

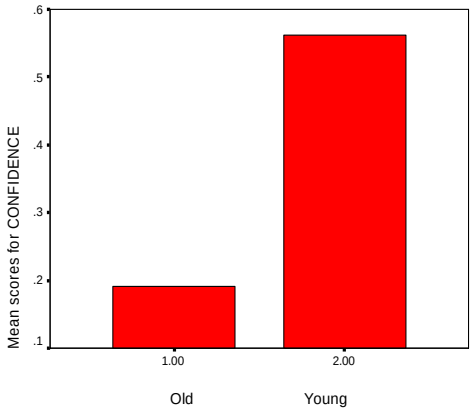
Further Analysis with One-way Anova revealed significant differences for the Profile of Mood States (POMS) between young and old participants. More precisely, there were found differences for *vigorous*, with F=6.6, (with P<0.05), *fatigue* with F=7.1 (5%), *confidence* with F=5.1 (at 5% level), *elation*, with F=4.6 (P<0.05), and finally for *arousal* with F=9.4 (1%level of significance) (for differences see *Appendix 3*).



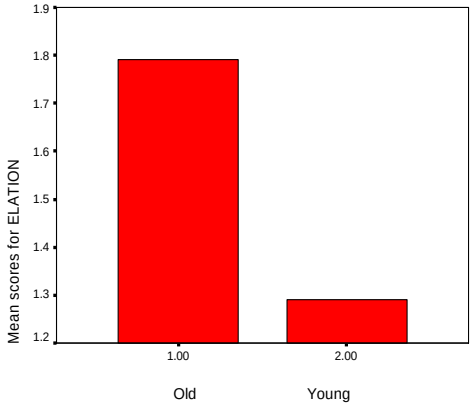
Graph 3: Shows differences in vigour levels; Older seem to be more vigorous than younger



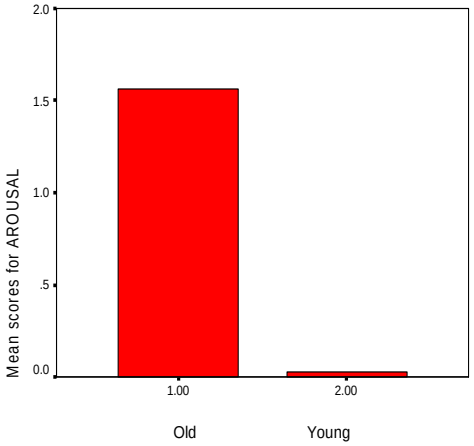
Graph 4: Shows differences at the level of fatigue; Young scored higher at this factor than older



Graph 5: Shows differences at the level of confidence; young seem to be more confident



Graph 6: Shows differences at the level of Elation; older are found to be more elated than younger



Graph 7: Shows differences at the level of arousal; young seem to be not aroused at all during the task

Discussion

From our Analysis we did not manage to establish a main Attentional Bias effect for the sample used. The mean averages were calculated to be 5.67 (S.D. 13.2) for the first session of the *Probe Dot Task*, with a level of significance .166, and -3.26 (S.D. 41.3) for the session two with a level of significance .789. Nor there was significance for the different questionnaires that were administered to the subjects. This can be due to the sample size used for this particular study, which was quite small and might therefore prevailed our results.

When both the data of this study and those of the previous were taken into account there was found differences for the *Alcohol Expectancy Questionnaire* and more precisely for the *sociability* factor, with the younger scoring significantly higher than the old ones. Moreover, statistical significance was established at a 5% level for the factor of *liquid courage*, with young scoring again higher.

Significant differences were also found for the POMS questionnaire. One-way Anova exposed significant differences for: *vigorous* at 5% level with old scoring higher, *fatigue* at 5% level with younger scoring higher, *confidence* at 5% level with younger scoring better, elation at 5% level with old been more elated and finally for *arousal* at 1% level having a higher score from the olds.

The sample size as already been mentioned, was critically small, and even if we were able to define differences within the sample itself, it could not be generalized, or could just be due to a level of chance. When we checked for differences on the questionnaires using the data of the older people only, again no differences were found either for the expectances or for the POMS. Checking the unit's consumption per week, there was no main difference between the subject's alcohol consumption. This conforms to the alcohol expectancy questionnaire's scores which did not disclose any differences as well. Another potential explanation might be the fact that older people tend to show a sustained attention over time (Parasuraman & Giambra, 1991), maybe not only to alcohol related stimuli (such as those in the dot probe task) but generally to environmental stimuli. However, the previous still remains controversy, since others (Giambra, 1997) did not manage to find any differences either on the attentional sustenance of older people, or on their detection accuracy. The most plausible explanation is that of the sample size used for this particular study.

When the data of our study compared with that of the younger people, the even though the bias effect was still absent, the POMS and the expectancy scores gave us a better understanding even though quite complicated about their alcohol beliefs and their mood state. Younger for instance, have greater sociable expectations when they drink than older. This seems quite reliable, since younger perceive alcohol consumption as a more freely process relieving them from any kind of societal norms or constrain, and tend to exhibit a more sociable attitude towards their environmental context. Instead, older they seem to be more "stable" in the sense that the environmental context where they normally drink (i.e. friends or family, birthdays, anniversaries) is more or less pre defined in terms of social interactivness and stability. This seems to be the case with the liquid courage factor as well. Again, for this factor, young score higher; this explains their

need to be socially accepted and conformised within an environmental group.

As far as the POMS is concerned, the scorings and differences between the groups corresponds well to previous studies, in the sense that older seem to be more vigorous while performing the task than young, more aroused and finally more elated. It has been suggested that older people tend to have a more positive perception towards environmental stimuli and especially those with meaningful characteristics (Marther et al., 2003). The personal evaluation of the dot probe task might have been perceived by the older as a matter of importance and their attention greater and more meaningful towards it, than in younger. Yet, for the level of fatigue and for the level of confidence young's scorings are higher than that of the old one's.

Finally, current study was a heroic attempt to explore potential differences within a restricted sample-size population. The pictures chosen for the purpose of the experiment were actually identical with those used into the previous one with the young ones. Pictorial stimuli should be carefully selected in any future studies, and they also must keep up a correspondence to the age difference, which seems to play an important role for studies on the attentional bias area.

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APPENDIXES

Appendix 1: **One-Sample Test**

	Test Value = 0					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
BIAS	1.485	11	.166	5.6717	-2.7338	14.0772
BIAS2	-.274	11	.789	-3.2642	-29.5249	22.9966

Appendix 2: Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	EXP_SOC	168.924(a)	1	168.924	10.787	.002
	EXP_T.R	.345(b)	1	.345	.144	.707
	EXP_L.C	29.932(c)	1	29.932	3.877	.056
	EXP_SEX	11.853(d)	1	11.853	1.664	.205
	EXP_IMP	22.821(e)	1	22.821	1.126	.296
	EXP_AGG	3.009(f)	1	3.009	.324	.573
	EXP_NEG	11.488(g)	1	11.488	2.666	.111
Intercept	EXP_SOC	19683.796	1	19683.796	1256.914	.000
	EXP_T.R	1658.601	1	1658.601	692.412	.000
	EXP_L.C	4945.317	1	4945.317	640.546	.000
	EXP_SEX	3204.160	1	3204.160	449.778	.000
	EXP_IMP	20915.642	1	20915.642	1031.698	.000
	EXP_AGG	4960.343	1	4960.343	534.057	.000
	EXP_NEG	1630.462	1	1630.462	378.380	.000
GROUP	EXP_SOC	168.924	1	168.924	10.787	.002
	EXP_T.R	.345	1	.345	.144	.707
	EXP_L.C	29.932	1	29.932	3.877	.056
	EXP_SEX	11.853	1	11.853	1.664	.205
	EXP_IMP	22.821	1	22.821	1.126	.296
	EXP_AGG	3.009	1	3.009	.324	.573
	EXP_NEG	11.488	1	11.488	2.666	.111
Error	EXP_SOC	579.435	37	15.660		
	EXP_T.R	88.630	37	2.395		
	EXP_L.C	285.657	37	7.720		
	EXP_SEX	263.583	37	7.124		
	EXP_IMP	750.102	37	20.273		
	EXP_AGG	343.657	37	9.288		
	EXP_NEG	159.435	37	4.309		
Total	EXP_SOC	25525.000	39			
	EXP_T.R	2014.000	39			
	EXP_L.C	6472.000	39			
	EXP_SEX	3862.000	39			
	EXP_IMP	24700.000	39			
	EXP_AGG	6279.000	39			
	EXP_NEG	2210.000	39			
Corrected Total	EXP_SOC	748.359	38			
	EXP_T.R	88.974	38			
	EXP_L.C	315.590	38			
	EXP_SEX	275.436	38			
	EXP_IMP	772.923	38			
	EXP_AGG	346.667	38			
	EXP_NEG	170.923	38			

Appendix3: Results from One-Way Anova

		Sum of Squares	df	Mean Square	F	Sig.
ANXI	Between Groups	.363	1	.363	1.419	.241
	Within Groups	9.463	37	.256		
	Total	9.826	38			
DEPRESS	Between Groups	.393	1	.393	.973	.330
	Within Groups	14.950	37	.404		
	Total	15.343	38			
ANG	Between Groups	.080	1	.080	.918	.344
	Within Groups	3.243	37	.088		
	Total	3.323	38			
VIG	Between Groups	4.407	1	4.407	6.670	.014
	Within Groups	24.447	37	.661		
	Total	28.854	38			
FAT	Between Groups	3.504	1	3.504	7.122	.011
	Within Groups	18.204	37	.492		
	Total	21.708	38			
CONF	Between Groups	1.139	1	1.139	5.143	.029
	Within Groups	8.195	37	.221		
	Total	9.334	38			
FRI	Between Groups	.365	1	.365	.831	.368
	Within Groups	16.264	37	.440		
	Total	16.629	38			
ELA	Between Groups	2.075	1	2.075	4.660	.037
	Within Groups	16.473	37	.445		
	Total	18.547	38			
AR	Between Groups	19.684	1	19.684	9.442	.004
	Within Groups	77.130	37	2.085		
	Total	96.813	38			
PM	Between Groups	4.283	1	4.283	3.538	.068
	Within Groups	44.799	37	1.211		
	Total	49.082	38			