Course:	**PSYC1011: Psychology 1B**
Assignment:	**Tutorial Research Report: 'Right hemispheric bias and left visual field superiority: The effects of gender, handedness and mood on the perception of chimeric faces'**
Name:	**Jane Student**
Student Number:	**3456789**
Course:	**Bachelor of Psychology**
For:	**Psychology Office**
Submitted:	**4pm, 13 October 2000**

Abstract

In our free-viewing chimeric faces task, in which a right hemispheric (RH) bias was indicated by judging chimeric faces with the smile on the left side of the face to be happier than faces where the smile is on the right side (a left visual field dominance in the judgments of the faces), it was found that while there was a general left visual field (LVF) superiority evident throughout the entire sample, it was seen to a greater extent amongst females relative to males, and when judging female faces compared to male faces. Right-handers were also found to exhibit a greater LVF superiority than non-right handers (left-handers and ambilaterals). Despite our own predictions, subjective mood was found to play no role in the strength of LVF superiority, though there was a positive correlation between self-reported mood and how happy the chimeric faces were rated to be.

Right hemispheric bias and left visual field superiority: The effects of gender, handedness and mood on the perception of chimeric faces

Previous research into the perception of emotion has highlighted how this cognitive ability is influenced by a multitude of factors. A number of biological, social and environmental variables help determine our ability to judge the emotional state of others and, more specifically, the magnitude of emotion we perceive them to be expressing.

There is a general consensus amongst scientists that the two hemispheres of the brain are each specialised in the performance of different tasks. In general terms, the left hemisphere governs speech and other verbal tasks (Baron, 2001), while the right hemisphere specialises in the performance of visuo-spatial tasks and the comprehension and communication of emotion (Baron, 2001; Habib, 1998; Ladavas, Umilta & Ricci-Bitti, 1980). Consequently, the majority of research has revealed that when perceiving emotion, stimuli that activate our right hemisphere are going to more greatly influence our judgments than those that stimulate activity in our left hemisphere (Baron, 2001; Schwartz, & Smith, 1980).

Because the perception of emotion is a highly visual task, any right hemispheric (RH) bias theoretically should be strongly influenced by the design of our visual system. As Baron (2001) and Eccles (1984) acknowledge, the human visual system is structured in such a way that stimuli are perceived contralaterally; items presented to the left visual field (LVF) stimulate predominantly the right hemisphere, whereas items in the right visual field (RVF) stimulate chiefly the left hemisphere.

Thus, people who possess a RH bias when judging facial emotional expressions will be more influenced by the emotion expressed on the left side of the face than the right side (Roskowski, Snelbecker, & Rosen, 1986); this phenomenon is known as LVF superiority. Consequently, a chimeric face with a smiling left side and a neutral right side should be judged as 'happier' than a chimeric face with the smile on the right side if people display this LVF superiority. Several studies (e.g. Campbell, 1978; Christman & Hackworth, 1993; Schwartz & Smith, 1980) support this theory, and have inferred from the presence of this LVF superiority the existence of a RH bias when making judgments on facial emotional expressions. Our study aims to replicate these findings, hypothesising that participants, when judging happy-neutral chimeric faces, will exhibit this LVF superiority, thus indicating a RH bias.

Additionally, past studies have shown that this RH bias for the comprehension of emotion is shaped by various factors. Gender of the observer and the chimeric face, handedness, and mood, have all been found to influence the degree to which people display LVF superiority when judging facial expressions.

A number of studies have found females, as well as being more expressive and descriptive than males (Baron, 2001), demonstrate a greater LVF superiority than males (Crucian & Berenbaum, 1998; David, 1989; Ladavas *et al.*, 1980; Levy & Heller, 1992; Rubin & Rubin, 1980; Sanz-Martin & Loyo, 2001). Other studies have found gender to have no effect (Landis, Assal, & Perret, 1979). While this study seeks to clarify the role of gender, the previous research has led us to hypothesise females would show a stronger LVF superiority than males in this study.

With the small number of previous studies investigating the effects of gendered emotional stimuli showing highly mixed results (Campbell, 1978; Hugdahl, Iversen, & Johnsen, 1993), this study aims to explore whether the gender of the chimeric faces influences participants' judgments. If females are in fact more expressive than males, then there would be a greater differentiation between their expressive (happy) face and their neutral face in the chimeric faces. Thus, the study hypothesised that any RH bias (and subsequent LVF superiority) would be more pronounced when viewing female faces compared to male faces, as this specialised function of the right hemisphere would not be impeded by first having to determine whether the two expressions on the face are in fact different.

The finding by Bryden (1982) and Hellige *et al.* (1994) that left-handers are less likely to exhibit typical patterns of hemispheric specialisation suggests they will not display a RH bias to the same extent as right-handers. The majority of past research supports this theory (David, 1989; Compton & Levine, 1997; Levy, Heller, Banich, & Burton, 1983). We hypothesised that our study would replicate these findings, with right-handers exhibiting a greater LVF superiority than non-right-handers (left-handers and ambilaterals).

Compton & Levine (1997) found that an induced negative mood resulted in a shift in perceptual asymmetry on their face perception task in favour of the RVF, indicating a decrease in RH bias. This raises the possibility that a naturally-occurring negative mood could have the same effect, reducing the superior RH involvement that is otherwise evident in a positive mood. The fact that this study also found that changes in perceptual asymmetry throughout the menstrual cycle were in fact

attributed to fluctuations in mood rather than hormonal changes, as well as the finding in other studies that depressed patients display a decreased lateralisation of the RH bias (Jaeger, Borod, & Peselow, 1987; Kucharska-Pietura, & David, 2003) also suggest that spontaneous mood variations are associated with changes in RH contribution. However, numerous studies have made the conflicting finding that subjective mood has no effect on LVF superiority (Fogel, 2000; Harris & Snyder, 1992). This highlights the need to clarify the role of mood in the perception of emotion. In light of this past research, this study hypothesised that there would be a positive correlation between mood and RH bias; that is, the happier people reported themselves to be, the greater LVF superiority they would display

Thus, the aim of this study was to clarify any role gender, handedness and mood has on LVF superiority in judgments of emotional chimeric faces. While we expected the study sample to show a general LVF superiority in the comprehension of emotion, we hypothesised that this LVF superiority would be more pronounced amongst the female participants compared to the males, the right-handers more so than the non-right-handers, and those who reported themselves to be in a positive mood, compared to those in a more negative mood. We also hypothesised that viewing female chimeric faces would elicit a greater LVF superiority than when judging male chimeric faces. A RH bias would be inferred from the presence of this LVF superiority.

Method

Design

The study sought to investigate LVF superiority, and any influences on this perceptual asymmetry that presumably indicates a RH bias, through the use of a free-viewing chimeric faces task. The variables of interest were gender, handedness, and subjective mood state, and how these influenced the degree of LVF superiority displayed when judging chimeric faces. For handedness, participants were classed as either right-handed, ambilateral, or left-handed. Subjective mood state was obtained through self-report on a rating scale from 0-100. RH bias was to be measured through the presence of LVF superiority when judging the perceived 'happiness' of the chimeric faces. LVF superiority was indicated by the extent to which participants consistently judged chimeric faces with the smiling side on the left to be happier than those with the smiling side on the right. A mean score above the chance rate of 7 (out of a possible 14) presumably indicated an overall LVF superiority when judging the emotional content of faces.

Participants

Participants were 300 University of New South Wales students (90 males, 210 females) from the Psychology 1B course, who participated voluntarily on the basis of tutorial attendance. The mean age for males was 19.8 years, with a range of 18-29 years, while females ranged from 18-27 years of age, with a mean age of 19.1 years.

Materials

The chimeric faces were presented on overheads (see Appendix A). Each participant received two A4 sheets of paper. One, the Hand Usage Questionnaire (see Appendix B), had the list of activities to determine handedness. The other, the 'Chimeric Faces' sheet (see Appendix C) contained the materials needed to obtain age, gender, Handedness Score and Handedness Category, Mood Score and Chimeric Faces Score.

Procedure

Participants first received and filled out the Hand Usage Questionnaire so as to determine handedness, obtained by indicating whether one hand dominated in the performance of a list of 13 tasks (which included writing, throwing and using scissors). For each task, a right-handed dominance earned one point, being able to use either hand scored two points, and the use of the left hand earning three points. The total sum of these scores gave each participant a Handedness Score out of a possible 39. This score than determined their Handedness Category; right-handedness was indicated by a score of 13-17, a score of 18-32 indicated the participant to be ambilateral, while those scoring 33-39 were classified as left-handed. Next, the 'Chimeric Faces' sheets were distributed. Mood Scores were obtained through asking participants to "rate your current mood as a score out of 100 where 0 – the saddest I have ever been and 100 – the happiest I have ever been". The presence of LVF superiority was indicated by a Chimeric Faces Score. This score was determined by the participants being presented with fourteen pairs of chimeric faces, at which they viewed each pair for five seconds to determine "1) whether the top or bottom face is happiest", and "2) your rating of how happy the top and bottom faces appear", rated

on a scale from 1-7, with 1 indicating “very sad”, and 7 suggesting “very happy”. The chimeric faces were made up of either the smiling and neutral faces of the same person, or faces of two different people. All chimeric faces were either male or female; none involved any male-female pairings. Happy faces were paired with neutral faces because happiness is the most easily recognised emotion (Ladavas *et al.*, 1980), and so it was believed to be the most effective emotion in highlighting any hemispheric bias in emotional perception. Participants scored one point if they indicated the face with the smile on the left side to be happier, as this LVF bias was interpreted as a sign of differential RH involvement in the making of these judgments. Out of a possible score of fourteen, a mean score above seven (the chance rate) was believed to indicate LVF superiority in the perception of the emotional content of the chimeric faces. When looking specifically at only male or female chimeric faces, any score above the chance rate of 3.5 indicated LVF superiority.

Results

The data gathered revealed a significant LVF superiority amongst the study sample, with participants overall scoring a mean Chimeric Faces Score of 8.64 (with a standard deviation of 1.1), a score significantly higher than the chance rate of 7. As Table 1 indicates (see below), Chimeric Faces Scores were significantly higher in females compared to males, with females scoring a mean of 8.98 (1.1), whereas males scored a mean of only 8.08 (1.2). Gender of the chimeric faces was also seen to have a strong influence. Participants were found to display a significantly higher LVF superiority when viewing the female faces, scoring significantly higher above the chance rate of 3.5 with a mean score of 4.32 (1.7), whereas a mean of only 4.03 (1.7) was found when viewing the male chimeric faces.

Table 1: Effects of gender: The influence of gender of the participants and gender of the chimeric faces on Chimeric Faces Scores

	Females	Males	Overall
Chimeric Faces Score: /14	8.98 (1.1)	8.08 (1.2)	8.64 (1.1)

	Female Chimeric Faces	**Male Chimeric Faces**
Chimeric Faces Score: /7	4.32 (1.7)	4.03 (1.7)

As Figure 1 (below) illustrates, right-handers displayed a significantly greater LVF superiority than non-right-handers, with a mean Chimeric Faces Score of 8.43 (1.8) compared to the non-right-handers' mean Score of 7.06 (1.9).

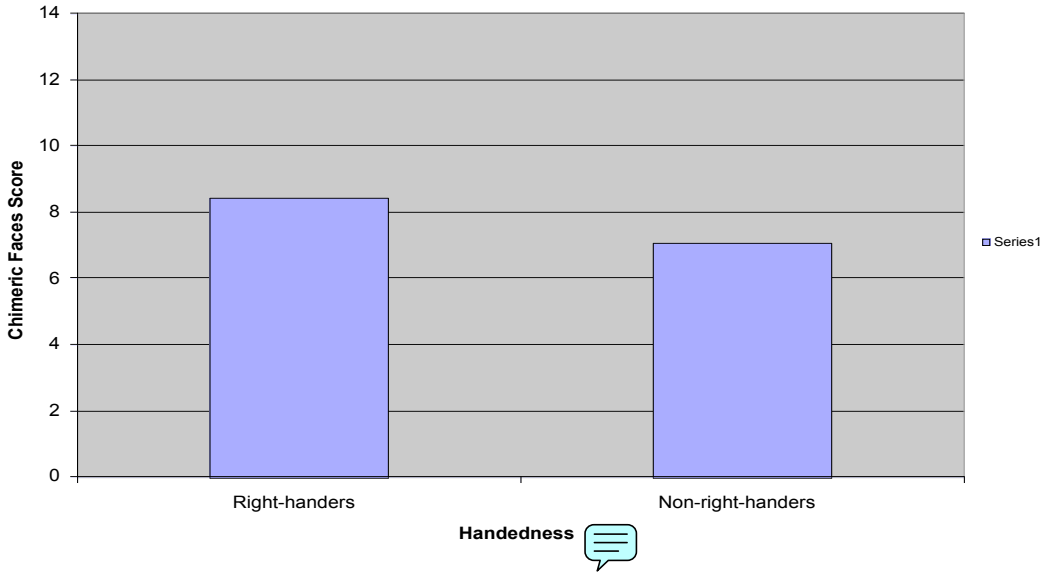


Figure 1: Chimeric Faces Score as a function of handedness

There was no significant correlation between Mood Score and Chimeric Faces Score (r=-0.05). However, there was a significant positive correlation between Mood Scores and Face Ratings (r=0.41), such that the higher the reported mood, the higher the Face Rating score.

Discussion

The present study confirmed the existence of LVF superiority in the perception of the emotional content in the chimeric faces. Consistent with our hypotheses, the entire study sample displayed an overall LVF superiority in their judgments of the chimeric faces, with females found to show this to a greater extent over males. The perception of female faces was found to elicit a significantly higher level of LVF superiority compared to male faces, and right-handers, compared to non-right-handers, exhibited a greater LVF superiority. Contrary to our hypotheses however, mood was shown to play no significant role in the strength of LVF superiority. Instead, it strongly influenced how happy the participants judged the chimeric faces to be. This LVF superiority can be seen to indicate a RH bias for the processing of facial emotional expressions.

Our finding that females display a greater LVF superiority than males supports the common theory that the RH bias is stronger in females for emotional perception (and expression), whereas males display a more pronounced RH bias for visuo-spatial tasks (Crucian & Berenbaum, 1998; Ladavas *et al.*, 1980). Several explanations have been put forward for these gender-based differences. Levy & Heller (1992) propose that these sex differences in emotional processing and spatial ability are the result of the displacement of one set of abilities by the other due to limited cerebral capacity within the right hemisphere, the person's sex determining which ability is to be preserved. Alternatively, Sanz-Martin & Loyo (2001) suggest that these gender differences derive from the influence of sex hormones. Crucian & Berenbaum (1998), by contrast, have argued that the noted sex differences in emotional perception could

in fact be attributed to gender differences in the development of the temporal cortex, suggesting it matures faster in females, promoting earlier and better emotional perception. They also make the proposition that these gender differences could result from social factors, as girls are encouraged more than boys to express their emotions, acknowledge others' emotional states, and participate in non-verbal communication. Our study could investigate this possible role of social factors by conducting it cross-culturally, to see if the strength of the LVF superiority varies relative to different socio-cultural contexts.

Our finding that a greater LVF superiority is elicited when judging female chimeric faces compared to male faces not only suggests that the greater expressive ability of females makes it easier for the right hemisphere to identify and process emotional facial expressions, but also supports the view that females display a greater overall ability when perceiving and expressing emotions. Thus, it could be said that the prominent RH bias seen in females gives them an advantage in non-verbal communication. However, the fact that all seven pairs of the female chimeric faces were presented after the seven pairs of male chimeric faces raises the possibility that this stronger LVF superiority may in fact be due to the practice effects of the study procedures, rather than any effect of the faces' gender. A simple way to eliminate this possible confounding factor would be to present the chimeric faces in an ABAB pattern, alternating between male and female faces.

The stronger LVF superiority found in right-handers is consistent with the findings of studies such as Karev (2000). However, it contradicts that of Alony (1998), who found that the perceptual biases of right-handers and non-right-handers

were actually opposing; that is, while right-handers displayed a RH bias, left-handers actually displayed a LH bias, rather than simply a weaker RH bias. However, these results arose from data based on the judgments of chimeric faces that were composed of mirror images of the left and right side of the same face, rather than happy-neutral chimeric faces. This debate surrounding the nature of the differences in the perceptual asymmetries of right- and non-right-handers highlights the necessity for further research in this area. Several studies (e.g. Luh, Redl, & Levy, 1994) suggest that these differences in perceptual asymmetry are the result of differing patterns of brain organisation and hemispheric specialisation between right- and left-handers. However, such findings have not been validated to a great extent, and need to be further investigated.

While our findings on the effects of mood went against our own predictions, they are consistent with that of David (1989), who also found that while mood influences the perception of emotional intensity, the magnitude of the RH bias remains unchanged. The fact that mood does not appear to influence the extent of LVF superiority suggests, according to Harris & Snyder (1992), that the RH bias for emotional perception is robust enough to transcend any fluctuations or differences in mood.

However, several methodological issues have raised concerns as to how accurately the study was able to measure RH bias. The chimeric faces task really only measures LVF superiority, and it is from this that we infer a RH bias in the perception of emotion. While this inference has been found to be valid in numerous studies (e.g. Kucharska-Pietura & David, 2003; Schwartz & Smith, 1980), these studies were

based on more direct measurements of RH involvement. The fact that this was a free-viewing chimeric faces task means we did not isolate RH contribution, or control the level of LH contribution in the participants' judgments of the faces. This leaves our study vulnerable to alternative explanations as to the existence of this LVF superiority. For example, Phillips & David (1997) suggest that the dominance of the LVF when judging emotion can be explained relative to the role of visual scanning paths. They propose that our 'normal' visual tracking paths draw us to view the left side of the face first, and with more scrutiny than when viewing the right side. Thus, these researchers suggest that LVF superiority may be the result of our scanning strategies, rather than any superior perceptual capabilities within the right hemisphere. A more effective means of measuring actual RH contribution would be to control and measure to a greater extent the level of LH involvement in these judgments. This could be done through the use of commissurotomised patients as participants. These patients have had their corpus callosum severed, eliminating any communication between the left and right hemispheres. Any emotionally expressive stimuli then presented in their LVF would only stimulate the right hemisphere, allowing the more accurate measurement of RH contribution in the perception of emotion. Alternatively, as seen in Schwartz & Smith (1980) the use of a tachistoscope on 'normal' participants to present the chimeric faces on would provide yet another more effective means of measuring hemispheric contributions to perception, as it allows the two visual fields to be split and isolated. The use of PET scans when exposing participants to emotional stimuli could also provide a more accurate measurement of RH and LH involvement in these tasks.

The ability of our study to accurately measure RH bias may also be impeded by the fact that we used only happy and neutral emotional expressions in our chimeric faces. Several studies have demonstrated the possibility that RH involvement changes in conjunction with task difficulty; as task difficulty increases, perceptual biases shift from the usual LVF superiority to a RVF superiority (Carbary, Almerigi, & Harris, 2001; Ladavas *et al.*, 1980). Ladavas *et al.* (1980) make the suggestion that tasks that actually require the participant to discriminate the specific emotional content of different facial expressions may be a more effective means of determining the extent of RH bias than tasks that merely ask participants to judge the intensity of only one emotion comparatively. This suggestion proposes yet another improvement we could make to our study.

Another issue that arises from our use of only happy faces and neutral faces is the fact that in doing so, we have assumed that the LVF and right hemisphere play the prominent role in the processing of all emotions. This theory is known as the "right hemisphere" hypothesis (Workman, Peters, & Taylor, 2000). However, a conflicting theory, known as the "valence hypothesis", argues that while the right hemisphere plays the major role in the processing of negative emotions, the left hemisphere (or the "verbal hemisphere", Baron, 2001) has an important role in the perception of positive emotions. Workman *et al.* (2000) suggest that there is a greater degree of LH involvement in the perception of positive and pro-social emotions because such emotional expressions commonly accompany and facilitate verbal communication. Numerous studies have supported this theory, finding the RH bias is more pronounced in the identification of sad expressions (Moretti, Charlton, & Taylor, 1996), and the presence of high LH involvement when judging positive emotional stimuli (Adolphs,

Jansari, & Tranel, 2001; Baron, 2001; Natale, Gur, & Gur, 1983). These research findings suggest we may have been able to more extensively investigate RH bias had we used sadness, or some other negative emotion, instead of happiness in our chimeric faces; conversely, the use of both negative and positive emotional expressions may have revealed differing rates of hemispheric specialisation for the various emotions.

On the other hand, several studies have supported the "right hemisphere" hypothesis, finding no difference in RH bias for the perception of positive and negative emotions (Christman & Hackworth, 1993; Drebing, Federman, Edington, & Terzian, 1997). Such findings suggest that our results using only happy expressions can in fact be generalised to other emotions. However, while Drebing *et al.* (1997) support the hypothesis that different emotions have no function as to the strength of the RH bias, they do suggest that the use of multiple emotions may be a more effective measurement of perceptual asymmetry because it is more representative of the types of judgments made in daily social interactions. Again, this suggests that our study could more accurately investigate RH bias if we were to use a multitude of emotional expressions, even if only to compare to our current findings, to see if there are any significant differences.

The apparent dominance of the right hemisphere in our judgments of emotional facial expressions raises the issue as to whether this RH bias exists when perceiving other forms of emotional body language, such as postures and gestures. However, before we can investigate such possibilities, researchers need to address the validity of presuming RH bias at the presence of LVF superiority. This is particularly

important to address because, as our study highlighted, LVF superiority is strongly influenced by a number of variables, namely gender, handedness, and mood. This could possibly have important implications as to the strength of any RH bias. Researchers therefore need to devise more effective means of measuring RH bias if we wish to further our knowledge and understanding of this phenomenon.

References

Adolphs, R., Jansari, A., & Tranel, D. (2001). Hemispheric perception of emotional valence from facial expressions. *Neuropsychology, 15 (4)*, 516-524.

Alony, S. (1998). Aspects of handedness: Cognitive and affective variables. *Dissertation Abstracts International: Section B: the Sciences and Engineering, 59 (6-B)*, 3109.

Baron, R.A. (2001). *Psychology* (5th ed.). Needham Heights: Allyn & Bacon.

Bryden, M.P. (1982). *Laterality: Functional asymmetry in the intact brain*. New York: Academic Press.

Campbell, R. (1978). Asymmetries in interpreting and expressing a posed facial expression. *Cortex, 14 (3)*, 327-342.

Carbary, T.J., Almerigi, J.B., & Harris, G.J. (2001). The left visual hemispace bias for the perception of chimeric faces: A further test of the difficulty of discrimination hypothesis. *Brain and Cognition, 46 (1-2)*, 57-62.

Christman, S.D., & Hackworth, M.D. (1993). Equivalent perceptual asymmetries for free viewing of positive and negative emotional expressions in chimeric faces. *Neuropsychologia, 31 (6)*, 621-624.

Compton, R.J., & Levine, S.C. (1997). Menstrual cycle phase and mood effects on perceptual asymmetry. *Brain and Cognition, 35*, 168-183.

Crucian, G.P., & Berenbaum, S.A. (1998). Sex differences in right hemisphere tasks. *Brain and Cognition, 36*, 377-389.

David, A.S. (1989). Perceptual asymmetry for happy-sad chimeric faces: Effects of mood. *Neuropsychologia, 10*, 1289-1300.

Drebing, C.E., Federman, E.J., Edington, P., & Terzian, M.A. (1997). Affect identification bias demonstrated with individual chimeric faces. *Perceptual and Motor Skills, 85 (3, Pt 2)*, 1099-1104.

Eccles, J. (1984). *The Human Mystery*. London: Routledge & Keating Paul.

Fogel, T.G. (2000). Patterns of perceptual asymmetries in the perception of chimeric faces: Influences of depression, anxiety, and approach and withdrawal styles of coping. *Dissertation Abstracts International: Section B: the Sciences and Engineering, 60 (10-B)*, 5223.

Habib, M. (1998). Hemispheric lateralisation of emotion: experimental paradigms and theoretical debates. *Revue de Neuropsychologie, 8 (4)*, 587-641.

Harris, L.J., & Snyder, P.J. (1992). Subjective mood state and perception of emotion of chimeric faces. *Cortex, 28 (3)*, 471-481.

Hellige, J.B., Bloch, M.I., Cowin, E.L., Eng, T.L., Eviator, Z., & Sergent, V. (1994). Individual variation in hemispheric asymmetry – multitask study of effects related to handedness and sex. *Journal of Experimental Psychology, 123 (3)*, 235-256.

Hugdahl, K., Iversen, P.M., & Johnsen, B.H. (1993). Laterality for facial expressions – does the sex of the subject interact with the sex of the stimulus face? *Cortex, 29 (2)*, 325-331.

Jaeger, J., Borod, J.C., & Peselow, E.D. (1987). Depressed patients have atypical hemispace biases in the perception of emotional chimeric faces. *Journal of Abnormal Psychology, 96 (4)*, 321-324.

Karev, G.B. (2000). Cinema seating in right, mixed and left handers. *Cortex, 36 (5)*, 747-752.

Kucharska-Pietura, K., & David, A.S. (2003). The perception of emotional chimeric faces in patients with depression, mania and unilateral brain damage. *Psychological Medicine, 33 (4)*, 739-745.

Ladavas, E., Umilta, C., & Ricci-Bitti, P.E. (1980). Evidence for sex differences in right-hemisphere dominance for emotions. *Neuropsychologia, 18*, 361-366.

Landis, T., Assal, G., & Perret, E. (1979). Opposite cerebral hemispheric superiorities for visual associative processing of emotional facial expressions and objects. *Nature, 178*, 739-740.

Levy, J., & Heller, W. (1992). Gender differences in human neuropsychological function. In A.A. Gerall, H. Moltz & I.L. Ward (eds.) *Sexual differentiation: Handbook of behavioural neurology*, Vol.11 (pp.245-274), New York: Plenum Press.

Levy, J., Heller, W., Banich, M.T., & Burton, L.A. (1983). Asymmetry of perception in free viewing of chimeric faces. *Brain and Cognition, 2 (4)*, 404-419.

Luh, K.E., Redl, J., & Levy, J. (1994). Left- and right-handers see people differently: Free-vision perceptual asymmetries for chimeric stimuli. *Brain and Cognition, 25 (2)*, 141-160.

Moretti, M.M., Charlton, S., & Taylor, S. (1996). The effects of hemispheric asymmetries and depression on the perception of emotion. *Brain and Cognition, 32 (1)*, 67-82.

Natale, M., Gur, R.E., & Gur, R.C. (1983). Hemispheric asymmetries in processing emotional expressions. *Neuropsychologia, 21 (5)*, 555-565.

Phillips, M.L., & David, A.S. (1997). Viewing strategies for simple and chimeric faces: An investigation of perceptual bias in normals and schizophrenic patients using visual scan paths. *Brain and Cognition, 35 (2)*, 225-238.

Roskowski, M.J., Snelbecker, G.E., & Rosen, R.S. (1986). Jayne's chimeric faces: Another look into the mirror. *Personality and Individual Differences, 7 (6)*, 781-786.

Rubin, D.A., & Rubin, R.T. (1980). Differences in asymmetry of facial expressions between left- and right-handed children. *Neuropsychologia, 18*, 373-377.

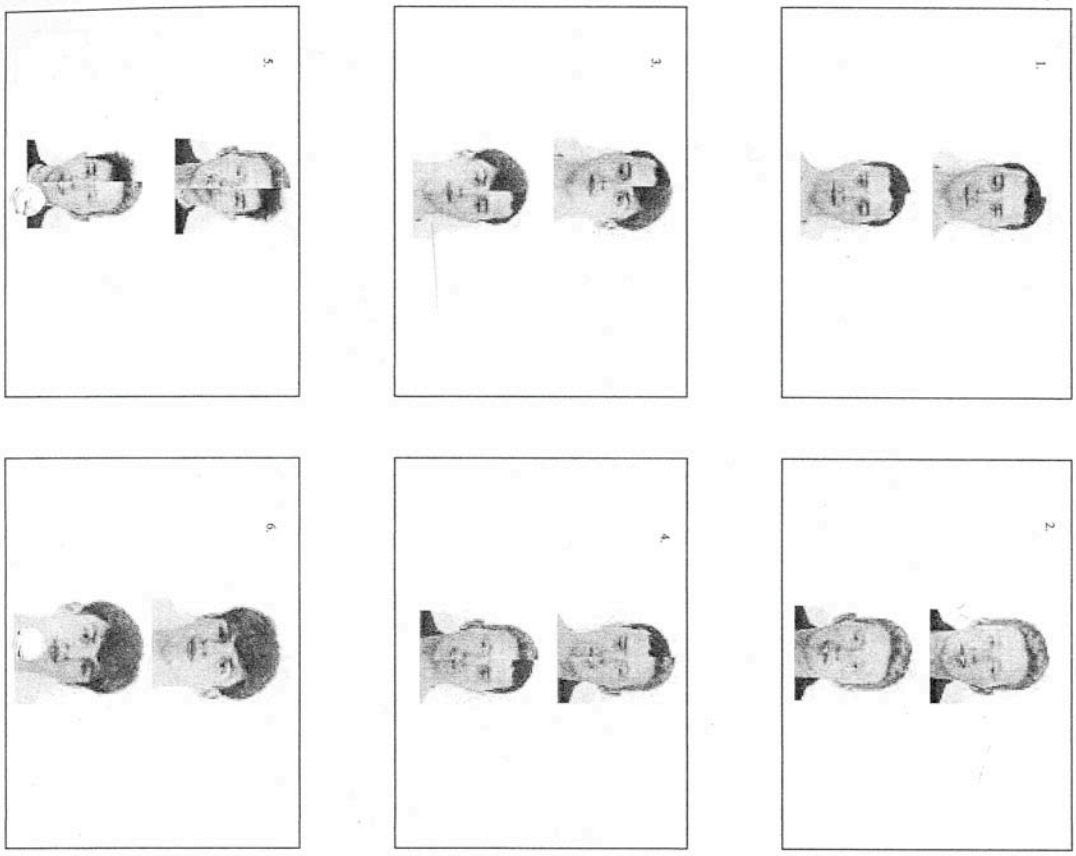
Sanz-Martin, A., & Loyo, J.R. (2001). Sex differences in emotional processing. *Revista Mexicana de Psicologia, 18 (3)*, 313-386.

Schwartz, M., & Smith, M.L. (1980). Visual asymmetries with chimeric faces. *Neuropsychologia, 18 (1)*, 103-106.

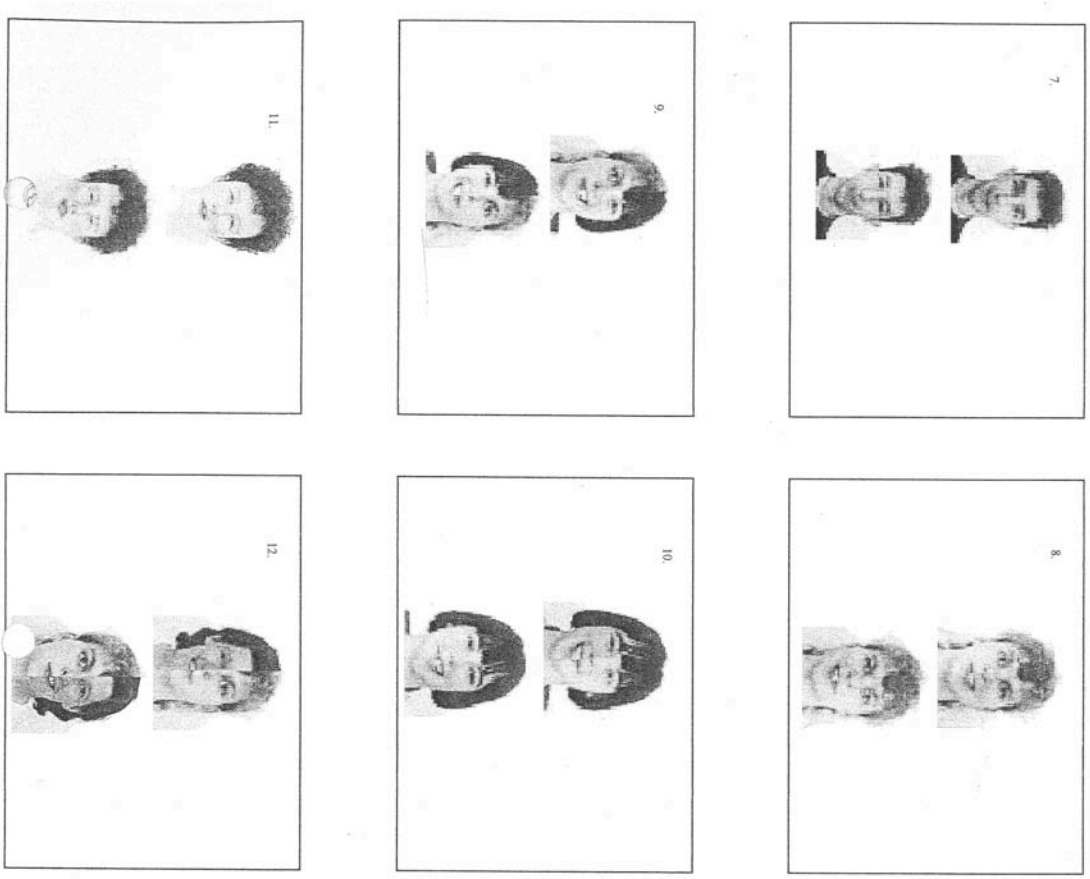
Workman, L., Peters, S., & Taylor, S. (2000). Lateralisation of perceptual processing of pro- and anti-social emotions displayed in chimeric faces. *Laterality, 5 (3)*, 237-249.

Appendix A

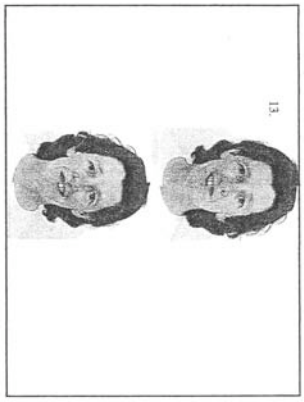
The pairs of chimeric faces were presented in the order indicated on the slides.



Appendix A



Appendix A



Appendix B

Hand Usage Questionnaire

Please indicate which hand you ordinarily use for each activity:

With which hand do you:

1.	draw?	Left	Right	Either
2.	write?	Left	Right	Either
3.	use a bottle opener?	Left	Right	Either
4.	throw a ball to hit a tree?	Left	Right	Either
5.	use a hammer?	Left	Right	Either
6.	use a toothbrush?	Left	Right	Either
7.	use a screwdriver?	Left	Right	Either
8.	use an eraser on paper?	Left	Right	Either
9.	use a tennis racket?	Left	Right	Either
10.	use scissors?	Left	Right	Either
11.	hold a match when striking it?	Left	Right	Either
12.	stir a can of paint?	Left	Right	Either
13.	On which shoulder do you rest a bat before swinging?	Left	Right	Either

Score 1 for Right, 2 for Either and 3 for Left.

13-17 – Right Handed 18-32 – Ambilateral 33-39 – Left Handed

Appendix C

Tutorial 6 – Chimeric Faces

Student no:_____Age: _____ Gender: Male Female

Handedness Score:_____ Handedness Category: R A L

Please rate your current mood as a score out of 100 where
0 – the saddest I have ever been and 100 – the happiest I have ever been

Mood score: _____

For each chimeric face shown, in the table below please indicate
1) whether the top or bottom face is happiest
2) your rating of how happy the top and bottom faces appear, using the scale from 1 to 7 below

1----------2----------3----------4----------5----------6----------7
very sad sad somewhat sad neutral somewhat happy happy very happy

Face Number	Top or Bottom Happiest	Rating of **Top** Face (1-7)	Rating of **Bottom** Face (1-7)
example	Top	7	4
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			

Chimeric Faces Score:_____