The Influence of Cultural Exposure on Recognition of Emotional Facial Expression in East Asians

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Abstract

Emotional facial expressions were thought to be universal and recognised inter-culturally. Research suggests that there are elements of facial expressions that are universal but many aspects are culture specific. This research studied the effect of Cultural Exposure on East Asians recognition of F.A.C.S emotional facial expressions and found no significant differences on accuracy compared to Western Caucasians. Significant differences were found on latency between Caucasians (Md = 35033) and East Asians (Md = 47024), U = 225, z = -3.172, p = .002, r = -.413. As the East Asians had lengthy exposure to Western Society but were slower on recognition than natives it is proposed that there may be a 'critical period' of development where exposure is necessary to fully acclimatise to cultural differences.

Keywords: Cultural Exposure, Facial Expressions, East Asian, Western Caucasian

Introduction

In today's globalised economy a greater understanding of cultural differences is vital in an effort to avoid social confusion and conflict, not just on a personal, intimate level but also on an economic level.

In Charles Darwin's "The Expression of the Emotions of Man and Animals" he outlined how human emotion was largely conveyed through facial expressions (Ekman, 2003). His work also put forward the theory that these facial expressions were innate to all members of the human species and universal throughout different societies. Much research initially supported his theories. Separately Paul Ekman (as cited in Bourne & Hole, 2010) and Carroll Izard (as cited in Bourne & Hole, 2010) documented six basic emotions that are expressed through facial expressions and together conducted studies attempting to show that these six emotional facial expressions (anger, fear, disgust, happiness, sadness & surprise) are universal to humans of all races and can be recognised regardless of ethnicity or culture (Ekman & Friesan, 1971) though there were differing rates of accuracy in facial expression recognition depending on the culture of the observer. It was well documented that the Japanese were more likely to confuse certain of the negative emotions (anger, fear, sadness & disgust) and surprise than Americans (Bourne & Hole, 2010). One element of this may be that in Japanese society, as in almost all Asian collectivist cultures, overt displays of negative emotions are discouraged **(**Adams et al., 2010) although there may also be conceptual issues in relation to categorising the facial expressions of emotion.

Some of Ekman and Friesen's strongest findings come from the research they conducted in the late 1960's in New Guinea in response to criticisms of their earlier studies (Ekman & Friesen, 1980). Foremost among these criticisms was that due to high levels of inter-cultural exposure it could not be said that cross-cultural agreement was due to an underlying innateness. To control for out-group cultural influences, the researchers found several pre-literate tribes in New Guinea that had virtually zero previous exposure to outsiders. In several experiments they told the natives stories designed to elicit emotions and asked the participants to choose which image of a facial expression corresponded to the emotions they were feeling. The participants scored similarly to participants from the United States on this task, recognising happiness, anger and disgust with relatively high accuracy. Both groups showed a high rate of confusion between surprise and fear (Ekman & Friesen, 1980).

Previous studies (Ekman, 1980) have concluded that happiness was the most easily recognisable emotion and that anger was the least well recognised. Montagne et al (2007) (as cited in Bourne & Hole, 2010) and Calvo & Lundqvist (2008) (as cited in Bourne & Hole, 2010) studied differences in the intensity of facial expressions and latency in recognition. Happiness was again recognised more easily and significantly faster than the other emotions, however fear and not anger was the least well recognised. While they found no significant confusion in recognising the expression "happiness", there was significant confusion between all others. One possible explanation for their findings is that "happiness" is the only positive emotion. It is therefore more difficult to misclassify it with the several negative emotions. The elements of the emotional expression for "happiness" may not be easier to recognise but more difficult to confuse with the other negative emotional displays.

Paul Ekman and colleagues created the Facial Action Coding System (F.A.C.S) to measure all visible facial movement and identified 44 specific action units (muscle movements) (Ancoli, Ekman & Friesen 1980) and the six universal facial expressions of emotion have been determined as the specific movement of combinations of these action units (Maat, Pantic, Rademaker & Valstar, 2005). This system was designed so human observers were able to describe changes in facial expression in terms of observable facial muscle actions termed facial action units or AUs. F.A.C.S provides the rules for visual detection of 44 different AUs and their temporal segments (onset, apex, offset) in a video of an observed face. These rules allow experts to encode a facial expression into the specific AUs that produced the expression (Maat, Pantic, Rademaker & Valstar, 2005).

However criticism has been levelled at the universality of the F.A.C.S defined basic expressions of emotions as it may not take cultural differences in emotional expression into account. A study by Blais, Caldara, Jack, Scheepers & Schyns (2009) combined behavioural and computational analyses with novel spatiotemporal analyses of eye movements. They illustrated that Eastern observers used a culture-specific decoding strategy that was inadequate when attempting to reliably distinguish the F.A.C.S defined facial expressions of both fear and disgust. This has also been investigated by researchers in East Asian cultures. Huang, Siu Tang, Helmeste, Shioiri, & Someya (2001) studied psychiatric and medical students in America, China and Japan and found that both the Chinese and Japanese participants' attained significantly lower levels of recognition on posed F.A.C.S encoded static images of facial expressions relative to the Western Caucasian participants.

The six emotional facial expressions outlined above do not represent a comprehensive account of emotional facial expressions but are commonly held to be the six 'basic' and highly recognisable expressions. Recently the emotional expressions contempt, shame, embarrassment and compassion (as defined by F.A.C.S) have been put forward as potential 'basic' expressions. Christy, Hewett & Russell (2011) however investigated whether these would be widely recognisable as specific emotions. When observers had to respond with certain forced choice interpretations (such as a list of possible answers) there was high agreement found in two studies (58% & 42% respectively). Interestingly however, when the observers were asked to freely label the expressions agreement dropped significantly (18% & 16% respectively). This suggests that even within a culture these expressions do not elicit adequate agreement to overcome the contention of their universality

There are several theories in circulation relating to the causation and maintenance of cultural differences in Facial Expressions. The idea most central to this paper is that East Asians, with much research involving Japanese participants in particular, are more sensitive to social contextual influences than Western participants. Masuda et al (2008) demonstrated this with the use of computerised interactive scenarios and with the assistance of eye-tracking equipment found that Westerners were more likely to only focus on the emotions displayed by the central figure(s), while the East Asians would be heavily attentive to and influenced by any surrounding figures displaying emotional cues. These differences in attention have been said to indicate that Western society regard emotions as individual feelings while many East Asian societies find individual emotions inseparable from the feelings of the group (Masuda et al., 2008).

Ekman (1980) carried out a series of experiments exposing American and Japanese participants to emotionally arousing videos. He found that when the participants were exposed to the stimuli in a room where they were alone both groups would show similar reactions in expression and intensity. However when the experimenter was present the American participants maintained their previous high level of expressiveness while the Japanese participants would show little to no expressiveness, or show a significant increase in smiling even when viewing negative emotionally arousing stimuli that they had previously responded to with one of the several negative emotional facial expressions. This was the first major study that showed behavioural differences between Individualistic and Collectivist cultures in relation to socially dependent emotional expression. In 1969 Ekman and Friesen

coined the term “Cultural Display Rules” to account for the fact that social context would affect emotional expressiveness depending on a persons’ cultural background (Ekman & Friesen, 1980) .

More recently Matsumoto, Willingham and Olide (2009) studied the facial expressions of Olympic athletes (competing in Judo) in the emotionally charged scenario in which they discovered whether they had won gold, silver or bronze medals (fifth place participants were also observed). It was demonstrated that those from individualistic urban backgrounds were far more expressive in all categories while those from more collectivist, rural backgrounds were emotionally expressive in the immediate few seconds after being awarded their position before masking their emotions or displaying highly variable, less expressive culture dependent expressions. All initial expressions were said to coincide with the universal features of emotional facial expression.

When it comes to the decoding process of facial expression recognition there is remarkable disparity in the “gaze direction” or “scanning methods” used between East Asians and Western Caucasians (Blais et al., 2009). This line of research was first proposed after it became apparent that there were crucial differences between the emoticons used to display emotion in textual writings between cultures (Yuki, Maddux & Masuda, 2007). Emoticons are combinations of various keystrokes or written symbols intended to form an approximate facial expression. It was found that when using Western Caucasian emoticons to illustrate different expressions the facial region that altered to depict the emotion was largely the mouth, while the symbol representing the eyes did not alter (Yuki, Maddux & Masuda, 2007). East Asian emoticons focused on variations of the eyes while the symbol representing the mouth remained constant. The various emoticons can be seen illustrated in Figure 1.1 in the Appendix.

It has also been shown that when viewing F.A.C.S encoded facial expressions East Asians tend to focus on the eye region whereas WC distribute their attention evenly across the face (Blais et al., 2009). Following on from research which clearly shows people focus on differing areas of the face depending on which area is more involved in transmitting emotional cues (Alpers & Eisenbarth, 2011) it would seem that East Asians are selecting areas of the face that are characteristic of their own cultural “style” of facial expression (Jack, Caldara & Schyns, 2011). This has been explained by the fact that it is harder to control the eye region when displaying emotion. As many East Asian cultures, particularly Japan, have a

social norm in which overt emotions are suppressed it is logical that members of that culture will focus on the most informative areas of a face when attempting to decode expressions of emotion (Yuki, Maddux & Masuda, 2007). This seems to support the idea that a persons' internal representation of what constitutes each of the "universal" emotional facial expressions is highly dependent on their previous experience of emotionally expressive displays and calls further into question the comprehensiveness of the F.A.C.S system of categorising facial expressions. It is now widely believed that while there are universal schemas for displaying the six basic facial expressions of emotions there are also culturally specific ways in which these are displayed. Facial expressions are seen as a universal language but different cultures display different "accents" (Ambady, Elfenbein & Marsh, 2003).

Until recently a heavily influencing theory in facial expression recognition was the reverse simulation model of embodied simulation theory, this stated people recognized each others' facial displays of emotions by subtly mimicking their expressions. By researching patients with Moebius Syndrome, a condition involving facial muscle paralysis, this theory has largely been discredited (Bogart & Matsumoto, 2010). Patients with this condition did not score significantly worse on accuracy than a comparable group without the condition. The processing of facial emotion has largely been identified to involve complex interaction between elements of the limbic system, particularly in the amygdala, the insula, which is situated between the parietal and temporal lobes, and the fusiform gyrus (Haxby et al., 2000). While the research in the area is quite limited, Adams et al (2010) showed distinct differences in relation to eye-gaze sensitivity and the effect it had on recognising the facial expression of fear across cultures on a neural level. It is probable that there are cultural neurological distinctions for more of the emotional facial expressions.

In 2003 Amady and Elfenbein conducted a study to see if cultural exposure and familiarity would lead to increases in the accuracy of facial expression recognition of Chinese and American participants when judging posed expressions by members of the opposing culture. They found that within a short time (average 2.4 years in America) the Chinese participants were more accurate at recognising facial expressions of their non native country than their native country. This was said to be due to heightened sensitivity to facial expressions arising from a need to rely on non-verbal cues to decipher information as they were less proficient in their second language. This type of behaviour is something that is less essential among people living in societies that use their mother tongue. However the American facial

expressions were recognised more accurately by both groups. The American participants did not show the same ability to the Asian images. As recognised by the authors themselves the image sets used may have had a major influence on the results. The Caucasian facial expressions used in the study were illustrated using Ekman and Friesen's 1976 Pictures of Facial Affect. These are images of F.A.C.S encoded facial expressions showing the six universal basic expressions of emotion at maximum intensity levels. The Chinese equivalent images were taken from Wang and Markham's (1999) collection and images in this set were designed to be situational dependent and relatively neutral (Amady & Elfenbein, 2003). This could very possible explain why the Western expressions were recognised at a much higher degree by all groups of participants.

The contrast in intensity between the stimulus sets used forces us to take the previous findings with great scepticism. It can also be argued that the stimulus medium used, that of static images, detracts from the ecological validity of the study. As of yet little research has been conducted using motion video which shows a face in neutral form, then displaying an emotional expression before returning to a neutral position as is more likely to occur in a real world situation.

The current study seeks to address these issues by taking videos from the MMI facial expression database. These are the only stimuli of their type currently accessible to academic researchers. This database has been identified as the most comprehensive reference set of images and videos for studies on facial expression analysis to date (Maat, Pantic, Rademaker & Valstar, 2005).

Originally this study was intended to not only investigate East Asian and Western Caucasians recognition abilities in relation to Western Facial expressions but also both groups comparable performance on the East Asian equivalent. Unfortunately however there is no adequate stimuli with which the F.A.C.S encoded videos taken from the MMI Facial Expression database can be compared as there is no corresponding database.

In conjunction with using more appropriate stimuli this study will also measure East Asian participant's accuracy and latency in recognising Western Caucasian F.A.C.S encoded emotional facial expressions against one another based on time spent in Western Caucasian societies. This study will also compare the East Asian participants against native Western Caucasian participants on recognition ability. This study will investigate several hypotheses:

It is hypothesised that Western Caucasians will have greater accuracy in recognising F.A.C.S encoded facial expressions than the East Asian participants.

It is hypothesised that the East Asian participants will have greater latency in recognising F.A.C.S encoded facial expressions than Western Caucasian participants.

It is hypothesised that participants originating from East-Asian countries and residing in Ireland will be more accurate when judging F.A.C.S encoded facial expressions of Western Caucasians having spent longer periods in Western societies.

It is also hypothesised that participants originating from East-Asian countries and residing in Ireland will show less latency in judging F.A.C.S encoded facial expressions of Western Caucasians having spent longer periods in western societies.

If the theories underlying this experiment find support it will show that there are significant cultural differences involved in recognising emotional facial expressions but that individuals can adapt to these due to exposure. The aim of this study is to get a clearer picture of the effect of cultural exposure on emotional facial expression recognition and build upon the already existing knowledge base in this area.

METHODOLOGY:

Materials

A questionnaire devised by the researcher to obtain only necessary demographic information pertinent to the research was completed by each participant. Questions asked related to age, ethnicity, gender, number of years in Ireland, number of collective years in western society, the amount of exposure to Western visual media prior to living in Western Society and the use of subtitles. The full demographic questionnaire can be found in the Appendix (Appendix Figure 1.2)

A Consent form devised by the researcher was also distributed to each participant. This form can be found in the Appendix (Appendix figure 1.3)

Apparatus

The statistical programme SSPS 18.0 was used to analyse the collected data and Microsoft Office Excel was used to build the matrix tables. Cedrus Data Viewer was used to organise and display the experimental output.

The video stimulus was presented via Superlab 4.5.1 stimulus presentation software on a notebook computer with screen size 113 cm Height and 220 cm Width. The computer used was an Asus Eee PC 1005HA running Windows 7 operating software. The screen resolution was 1024 x 600. The experiment itself was original and purpose built specifically for this experiment.

All of the stimuli used in this study were videos obtained from the MMI Facial Expression Database. All video sequences have been recorded at a rate of 24 frames per second using a standard PAL camera. Each subject posing in the videos was instructed by an expert F.A.C.S coder on how to display the required facial expressions, and they were asked to include a short neutral state at the beginning and the end of each expression. All video sequences that were used in this study showed participants in front of a blue screen background and two high-intensity lamps with reflective umbrellas were used as lighting. All videos in the MMI Facial Expression Database are identified via a session number. The videos used in this study were: Fear - Female: 346 & 107. Male: 1802 & 1977. Surprise - Female: 117 & 350. Male: 1771 & 1829. Anger - Female: 1852 & 101. Male: 1810 & 1800.

Disgust – Female: 1882 & 105. Male: 1821 & 1840. Sadness – Female: 115 & 1889. Male: 1827 & 1871. Happiness – Female: 348 & 108. Male: 1825 & 1816.

Participants

28 participants of Irish origin and 31 of East Asian origin (Chinese = 13, Filipino = 11, Japanese = 1, Malaysian = 5, Korean = 1) studying in Dublin Business School in Dublin, Ireland were used as subjects in the main study. A pilot study consisting of 5 Irish and 5 Polish participants who were working in a fruit and vegetable wholesale distributors in Dublin City centre was conducted to ensure any flaws or issues with the experimental procedure or equipment could be identified before instigating the main study. The participants were selected via convenience sampling. It was elected to use students as previous studies have cited socio-economic status and education levels as major confounding variables. By including only students who were present on campus in DBS it could be assured that there was at least some exposure to real life Western Caucasians for all participants.

Design

A quasi-experimental design was used looking both within and between groups. The main dependent variables were Ethnicity and length of time spent in Western Societies. The independent variables were scores on accuracy and latency of response times.

Procedure

All participants were approached in either of Dublin Business Schools two Common Room facilities, one located in DBS's Castle House building and the other in DBS's Aungier Street facilities throughout the period 2nd of February to 2nd March. Potential participants were initially given an oral description of the nature and procedure of the experiment and offered the consent form and demographic questionnaire if they wished to participate. They were then shown a run through of the experimental procedure with images of shapes displayed in place of the experimental stimulus before undertaking the main experiment. This

was an attempt to neutralise any differences in computer proficiency or previous experience with a similar experimental set-up.

The stimuli presented were 24 (12 male & 12 female) videos illustrating F.A.C.S encoded Emotional Facial Expressions obtained from the MMI Facial Expression Database. Each of the six F.A.C.S encoded emotions of expression (Happiness, Sadness, Anger, Fear, Surprise and Disgust) were presented four times, two male and two female trials for each emotion with a different video representing each emotion shown on each trial. Participants then used a multiple choice forced response option to indicate their response. These were forced response options that could be selected via the keyboard. On each trial and over every experiment the emotion could be chosen with the following keys: Surprise (A), Fear (B), Happiness (C), Anger (D), Disgust (E) and Sadness (F). The possible response options were presented in two vertical columns of three words arranged by having those with the closest alphabetical key assignment arranged in descending order. The response options appeared in black and presented in the font Times New Roman on a blue background. For an illustration of the response screen see Appendix Figure 1.4. The participants were free to take as long as they needed after viewing the stimuli and before responding.

Results

Inferential statistics were used to explore the contribution of participants for the different groups, as well as to get the means and standard deviation for the dependent variables. (Appendix Table 1.1)

In relation to the first hypothesis an independent samples t-test found no significant differences between scores on accuracy for Caucasians and East Asians.

A mixed design ANOVA was conducted to assess the impact of ethnicity on the participant's accuracy on the six emotional expressions of emotions (Surprise, Fear, Happiness, Anger, Disgust & Sadness). The interaction effect between ethnicity and accurate recognition of the six expressions was not significant. But there was a substantial main effect within the expressions, Wilks' Lambda = .173, F(5, 53), = 50.669, p < .001, partial eta squared = 0.978.

Post-hoc paired samples t-tests were conducted to explore statistically significant differences between the emotional facial expressions.

Table 1.1

Variables	**Mean**	**SD**	**t**	**df**	**p-value**	**95% CI**	**Eta-squared**
Surprise x	3.288	.767	7.104	58	.000*	0.986 to	.465
Fear	1.915	1.163				1.759	
Suprise x	3.288	.767	-0.842	58	.000*	-0.710 to	.012
Happiness	3.780	.457				-0.273	
Suprise x	3.288	.767	3.279	58	.030*	0.178 to	.156
Anger	2.831	.769				0.737	
Suprise x	3.288	.767	-4.264	58	.000*	-0.468 to	.238
Disgust	3.728	.485				-0.234	
Surprise x	3.288	.767	.668	58	.507	-.203 to	.007
Sadness	3.186	.900				.406	

Fear x	1.915	1.163	-10.75	58	.000*	-2.212 to	.666
Happiness	3.780	.457				-1.517	
Fear x	1.915	1.163	-4.484	58	.000*	-1.324 to	.257
Anger	2.831	.769				-0.507	
Fear x	1.915	1.163	-11.12	58	.000*	-2.139 to	.681
Disgust	3.728	.485				-1.487	
Fear x	1.915	1.163	-5.813	58	.000*	-1.709 to	.367
Sadness	3.186	.900				-0.883	
Happiness x	3.780	.457	8.482	58	.000*	0.725 to	.553
Anger	2.831	.769				1.173	
Happiness x	3.780	.457	.685	58	.469	-0.098 to	.008
Disgust	3.728	.485				-0.199	
Happiness x	3.780	.457	5.340	58	.000*	0.371 to	.330
Sadness	3.186	.900				0.816	
Anger x	2.831	.767	-7.477	58	.000*	-1.139 to	.490
Disgust	3.728	.769				-0.658	
Anger x	2.831	.767	-2.497	58	.225	-0.641 to	.097
Sadness	3.186	.900				-0.071	
Disgust x	3.728	.769	4.458	58	.000*	0.299 to	.255
Sadness	3.186	.900				0.786	

Note: *significant at 0.05 level, 2-tailed

Table 1.2 Matrix Table Showing Recognition and Misclassification rates for East Asian participants in percentage.

East Asian	Surprise	Fear	Happiness	Anger	Disgust	Sadness
Surprise	81%	35%	2%	3%	2%	2%
Fear	12%	44%	0%	3%	2%	2%
Happiness	3%	1%	97%	3%	0%	0%
Anger	0%	2%	0%	69%	2%	7%
Disgust	3%	17%	0%	12%	93%	5%
Sadness	1%	2%	1%	9%	2%	85%

Table 1.3 Matrix Table Showing Recognition and Misclassification rates for East Asian participants in percentage.

Caucasians	Surprise	Fear	Happiness	Anger	Disgust	Sadness
Surprise	76%	31%	5%	4%	0%	5%
Fear	8%	47%	1%	2%	3%	2%
Happiness	2%	1%	83%	2%	1%	0%
Anger	0%	0%	0%	65%	1%	5%
Disgust	3%	10%	1%	11%	85%	12%
Sadness	1%	2%	1%	5%	1%	67%

In relation to the second hypotheses A Mann-Whitney U test found significant differences between the total latency scores for Caucasians (Md = 35033, n = 28) and East Asians (Md = 47024, n = 31), U = 225, z = -3.172, p = .002, r = -.413.

A post-hoc Kruskal-Wallis Test revealed statistically significant differences between Western Caucasians (n = 28) and East Asians (n = 31) average response times across three of

the emotional expressions. Significant differences were found in relation to surprise, $x^2(1, n = 59) = 8.41$, $p = .004$. The East Asians recorded a higher median score (Md = 3316.25) than the Western Caucasians (Md = 2703.00). Significant differences were found in relation to happiness, $x^2(1, n = 59) = 4.20$, $p = .040$. The East Asians recorded a higher median score (Md = 995.50) than the Western Caucasians (Md = 720.50). Significant differences were also found in relation to disgust, $x^2(1, n = 59) = 4.84$, $p = .028$. The East Asians recorded a higher median score (Md = 1306.50) than the Western Caucasians (Md = 1124.25). The mean latency scores on each emotion for both ethnic groups are illustrated in the Figure 1.1 below

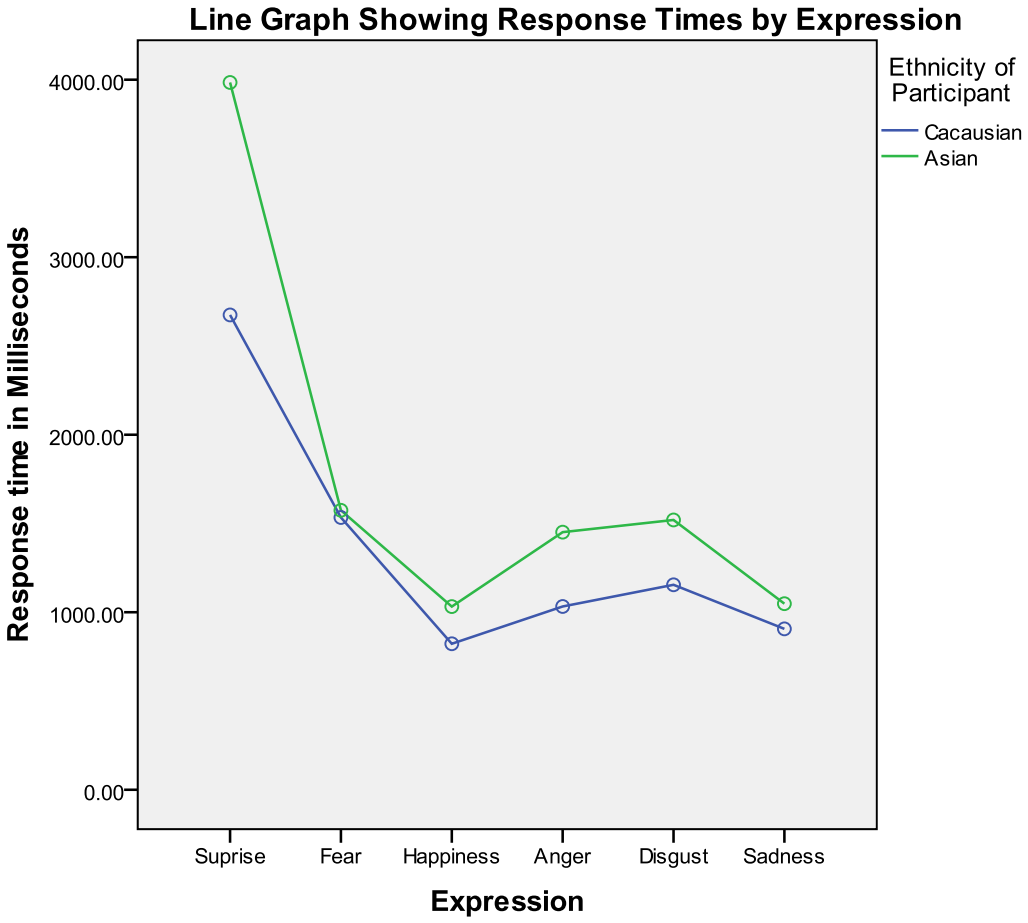

Figure 1.1

With regard to the final two hypothesis there were no significant differences found in relation to either accuracy or latency within the East Asian sample based on time spent in Western Society, Nationality or levels of exposure to Western Media prior to living in Ireland.

Discussion:

This study is attempting to investigate the impact of cultural exposure on performance of East Asian in relation to accuracy and latency in recognising facial expressions of emotions. Both East Asians living in Ireland and Western Caucasians native to Ireland were analysed. The findings of this study initially seem to support the universality of emotional facial expressions as no significant differences were found in relation to accuracy between either of the ethnic groups. This seems to support much of Ekman's work in relation to the theory of universality that claims the six 'basic' expressions are recognised with high consistency even across cultures (Ekman & Friesan, 1971). The results of the post-hoc paired samples t-tests showed that certain of the emotional facial expressions were recognised more accurately than others. It was shown that surprise was recognised to a higher degree than fear. Happiness was shown to be recognised more accurately than surprise. Surprise was accurately recognised more often than anger. Disgust was recognised at a better rate than surprise. Happiness was recognised accurately at a much higher rate than fear. Anger was recognised to a greater extent than fear. Disgust was recognised more accurately relative to fear. Sadness was recognised more consistently than fear. Happiness was recognised more so than anger. Happiness was recognised more accurately than sadness. Disgust was much better recognised than anger and finally disgust was recognised at a higher level than sadness. There were no significant differences on accuracy between surprise and sadness, happiness and disgust or anger and sadness.

The two matrix tables found in the results section (Tables 1.2 & 1.3 in the results section) illustrate the findings of this research relating to the probability of accurate recognition and rates of confusion on each emotion by both ethnic groupings. These findings show that both the Western Caucasians and East Asians were likely to accurately recognise a particular emotion at a similar level and also similarly likely to misclassify one emotion as another. In combination with the results of our independent-samples t-test for the first hypotheses this emphasises that the East Asian participants did not differ significantly from the Western Caucasians in their ability to decode the Western expressions. It is important to note that the two tables cannot be compared directly for accuracy levels as there was a total difference of three participants in sample sizes between the Western Caucasians and East Asians. This small difference, due to the sensitivity of percentage formulation based on total amounts

negates comparison. The matrix tables show that the most likely error for both ethnic groups was that participants would misclassify surprise as fear. The East Asians had a 35% probability of doing this and the Western Caucasians had a 31% probability. The two groups differed on their second highest rates of misclassification. There was a 17% confusion rate in reporting disgust as fear for the East Asians and a 12% rate of misclassifying disgust as sadness for the Western Caucasians. Fear was constant as the least accurately recognised emotion across both groups. In fact it was recognised at below chance levels by both ethnic groups. Confusion among the expressions in relation to surprise and in relation to the several negative emotions are in line with the previous studies.

The results here relating to accuracy are interesting as Blais et al (2009) have found strong evidence suggesting that when attempting to decode facial expressions of emotion East Asians utilise a culture specific gaze pattern that is inadequate to reliably distinguish the F.A.C.S encoded expressions representing "Fear" and "Disgust". They also found that these gaze patterns were still employed even if the corresponding area of the face was obscured and visually unavailable to the participant. In combination with this the significant differences seen in the results of the Mann-Whitney U test between the ethnic groups in relation to latency scores indicate that there is at least some level of cultural variation in relation to recognition. Calvo & Lundqvist (2008) showed that the more difficult expressions were to recognise accurately the longer it would take to do so. The fact that the East Asians took significantly longer to accurately recognise several of the expressions suggests that they found it harder to do so. This is probably related to the fact that East Asians use different gaze patterns when analysing facial expressions of emotion (Blais et al., 2009). As previously mentioned there are neurological differences associated with this (Adams et al., 2010).

It is suggested that due to these cultural accents, the analytic gaze patterns used by the Asian participant's would need to be adapted to allow them to reliably and accurately recognise Western expressions of emotion. There were no significant differences on latency within the Asian sample based on time spent in Western Society, but the East Asians were significantly slower in decoding the expressions than Western Caucasians. The Kruskal Wallace test showed that the East Asian participants were significantly slower to recognise the emotional facial expressions for Surprise, Happiness and Disgust. While there were no significant differences in relation to anger as the result fell just outside the range of statistical significance, there was a trend that can be seen in Figure 1.1 in the results section.

These results, in combination with the high level of Western Exposure on behalf of the East Asian participants, it seems that cultural differences in facial expression recognition can be adapted to, but that there remains an ethnic in-group superiority effect. The notion of an in-group advantage has already been found in several other studies. Wickline, Bailey and Nowicki (2009) found that there were in-group advantages not only on the accuracy of facial expression recognition but also on voice recognition when looking at African-American, African, European Americans and European participants. Ambady & Elfenbeins (2003) study that has been mentioned earlier also demonstrated the presence of an in-group advantage in relation to emotional facial expression recognition in relation to accuracy and latency scores, however criticisms of the stimuli used have also been mentioned in this paper as a possible confounding factor.

So far the previous research, and elements of this study's own findings have indicated that there is a universal aspect to facial expression recognition but there are also significant cultural differences that lead to an in-group advantage in either, or both, accuracy of recognition and latency in recognition. It has been shown that differences in gaze patterns are still observed in participants who have only recently been introduced to Western Society.

This was the case in Jack, Caldara & Schyns 2011 study, in which the participants had an average residence of 1.8 months. It was also shown that there were major differences in relation to the internal representations of what constituted each of the emotional facial expressions. The internal representations of both the Western Caucasians and East Asians were produced with the aid of eye tracking equipment and can be seen in Appendix Figure 1.5. They have clearly demonstrated substantial differences in the areas that East Asians focus on to decode facial emotional displays than Western Caucasians. The fact that in the current study fear was the emotional expression with the least difference in terms of total latency of response time alongside the fact that no significant differences were found in relation to accuracy based on ethnicity is important as this is the only expression that has so far been experimentally shown to have different underlying neural activity due to cultural differences in gaze patterns (Adams et al., 2011). To have achieved a similar level of accuracy to the Western Caucasian participants on fear recognition it would have been necessary for the East Asian participants to have adapted the gaze-patterns they were using. It is impossible from the data collected here to determine precisely how much exposure to Western Culture was needed before adaptations such as this took place. This is due to both the high reported levels of exposure to Western Media prior to living in Western Society and

the sample size in relation to the statistical analysis that was carried out. This last point will be discussed in more detail later in the paper.

One proposed alternative for the significant differences found in relation to latency is a phenomenon put forward by Silvia, Allan & Beauchamps (2007) who asked participants to attempt to recognise emotional displays. They showed that non-clinical social anxiety caused people to be significantly slower at recognising emotional facial expressions than less anxious individuals. It could be postulated that due to the higher levels of social anxiety that is the norm in more collectivist societies as shown by Schreier et al (2010) this is the factor causing East Asians to be slower at decoding the facial expressions of emotion. However closer inspection of Silvia, Allan & Beauchamps results showed that significant differences were only found in relation to recognising happiness. In 2004 Mullins and Duke undertook a similar study and found that non-clinical social anxiety was related to slower response times in emotional facial expression recognition. However it was found that there were no significant differences on the trials for anger, fear, happiness or sadness. As in the current study significant differences were found on the latency scores in relation to happiness, surprise and disgust it does not seem that this is a comprehensive enough theory to consider. This theory seems even less likely when Leber, Heidenreich and Stangier's 2009 study illustrating the need for participants to be in a situation that would elicit socially anxious feelings to cause any differences.

Of the 31 East Asian participants only two reported absolutely no exposure to Western media before living in a Western society. No significant differences were found based on how much media exposure was reported either, as categorised by whether exposure had been daily, weekly, monthly or occurring less frequently than monthly. It was initially thought that significant differences might be found when looking at whether or not subtitles were used when watching Western Media prior to moving to a Western Society. This was proposed as it may have been a predictor of Western language fluency levels. However no significance differences were found in relation to this. After the data had been collected however it was realised that by not also controlling for whether dubbing was present (having a translated audio file in the observers native language play instead of the original Western language audio file) when watching television shows or films it could possibly mean that not enough adequate information was obtained to use this as an effective control.

The majority of western media exposure reportedly experienced by the East Asian participants in this study prior to living in Western Society was reported to be Hollywood films and television dramas. This may help to explain why there were no significant differences in recognition ability between the East Asian participants in relation to the levels of media exposure experienced. Carroll & Russell (1997) demonstrated by studying professional actors displaying emotional facial expressions in feature films that even if the actors managed to mimic aspects (partial facial movements) of emotional displays in accordance with F.A.C.S defined expressions they rarely included all necessary features to be considered genuine representations. If the participants were not being exposed to sufficient levels of genuine facial displays of emotion it is unlikely to have significantly improved their ability to recognise F.A.C.S encoded expressions.

On the basis of the evidence presented so far, namely latency rates remaining slower for East Asians despite a high level of cultural exposure, it is proposed that there is a 'critical period' or at least a 'sensitive period' in development in which East Asians must be exposed to Western facial expressions of emotion to attain similar levels of processing ability.

The idea of a critical or sensitive period stems from a substantial body of evidence for a similar effect in relation to the acquisition of languages. Lenneberg in 1967(As cited in Hurford, 1991) reported that children who had suffered traumatic aphasia before puberty were significantly more likely to recover and develop higher levels of speech ability and fluency than those who suffered similar trauma after puberty, both in adolescence and adulthood. This was said to be due to the greater plasticity of the brain during childhood. One interesting feature presented was that in infancy both hemispheres of the brain play a role in language learning. As we age and areas of our brain specialise, we lose the dual hemispherical aspect of language learning.

Similar findings have been found in studies of the rare occurence of 'feral' children. The case of 'Isabelle', a child raised by a speechless mother until the age of six, showed interesting findings, as once introduced to language she developed normal fluency levels for her age by the age of seven. When contrasted with the case of 'Genie', who was only exposed to language at age 13, there were marked differences as she learned aspects of language but never acquired anything close to normal fluency levels (Tichacek, 2003). Pidgin and Creole languages have also been shown to have critical periods for acquisition (Tichacek, 2003).

While strong evidence has been accumulated in relation to critical periods for acquiring second languages there is still some debate that it may be socio-economic and educational factors that are actually inhibiting attainment of native in-group levels of fluency. Newman, Bavelier, Corina, Jezzard & Neville (2002) demonstrated quite convincingly that there was a critical period for learning sign language and that this has a neurological basis. It was seen that native 'signers' show extensive activation in both the right and left hemispheres of the brain. The native 'signers' had increased activation in the angular gyrus of the right hemisphere but this was absent in those who learned sign language after puberty.

It is quite possible that the East Asian participants in this sample were able to adapt their gaze patterns to enable them to accurately decode F.A.C.S expressions to the same level as Western Caucasians but that due to not developing the necessary underlying neural mechanisms involved in doing this for the culturally specific expressions in an early stage of development they are not able to do so as efficiently as those exposed from a young age. This is said to be reflected in their significantly slower response times.

There are several limitations regarding the current study. Firstly the sample sizes were relatively small and this had consequences for the statistical analyses that were carried out. While it was originally intended to categorise the East Asian participants into shorter time periods of exposure to Western Societies this could not be done without compromising the validity of the statistical results. The East Asian participant's level of exposure was categorised into two groups depending on whether they had lived in Western Society for either a period of up to five years or a longer period. Future research should aim to incorporate a greater number of participants and specifically aim to obtain participants that would allow categorisation based on those who have been in the country for a very short period (weeks), slightly longer (Months), one year, several years and a decade or over. This should allow researchers to more closely investigate the adaptations of gaze-patterns by again looking at accuracy and latency scores between these groupings. While it may bring up the issue of having to control for more extraneous factors than the presented study this experiment will need to be replicated to see if the effect persists in a non-student sample.

In a lecture recently given in Queens University Belfast by Dr. Geoff Beattie (2012), an eminent researcher in the field of non-verbal interpersonal gestures, he claimed that while the F.A.C.S encoded facial expressions of emotion do largely correspond to the real world equivalent facial motions of expression, his research has indicated that judging static images

of these emotions did not determine a person's everyday ability to do so. This study shared a similar view and for that reason chose motion videos of the six basic expressions as it is emphasised that it is the whole motion of an expression and not just its facial action units positions at maximum intensity that allows for reliably accurate decoding. However Dr. Beattie goes one step further in saying that even this method is flawed as interpersonal non-verbal emotional communication is dynamic. It is claimed emotive expressions rarely occur in isolation or for extended time periods but that they will manifest quickly and then morph into another emotive expression without first returning to a neutral state. This theory identifies a weakness of not only this study but of a large proportion of the academic research carried out in relation to emotional facial expression recognition to date. The use of appropriate videos as stimuli is still felt to be much more ecologically valid than presenting only static images as stimuli.

While it can be difficult to obtain due to factors such as the Hawthorne Effect, and excluded from the present study due to financial constraints and time limitations, spontaneous F.A.C.S encoded displays of emotion should be incorporated into any future endeavours in this area instead of investigating only posed expressions. There is little of this material readily available and would need to be produced specifically for research in this field. Related to this is the fact that while we often have unimpeded views of the facial expressions we encounter every day, there are times when these faces are partially obscured. This may occur either if we are attempting to speak to a person at a distance and objects stand in the way or the persons face is covered by facial hair or items such as spectacles. Further research should aim to investigate whether a cultural in-group advantage will also result in superior recognition abilities in these situations. This may imply that those with natural cultural exposure also have the ability to more accurately fill in the missing action units necessary to accurately decode the expressions. This could possibly operate in a similar manner to how in order to perceive the world in an organised and coherent way our brains must fill in gaps in environmental stimuli (Sekuler, 2000). This could be investigated in several manners. The MMI Facial Expression Database currently has a selection, albeit limited, of images and videos in which the participants are either bearded or wearing glasses. This would allow for investigation with more naturally obscured expressions. For greater control of which action units are missing however areas of the expressive face could be artificially altered with digitally imbedded coverings.

Similarly it has been shown that we are sensitive to identifying posed emotions from natural ones. In 2006 Peace, Miles & Johnston conducted an experiment that illustrated whether or not a model used a posed or spontaneous facial expression as stimuli determined how positively participants would rate the t-shirt they were wearing. This effect has been shown in children as young as 4 years old, even when these are presented at a medium level of intensity (Thibault, Gosselin & Brunel, 2009). A person's ability to differentiate posed emotions from those of genuine ones is present from a young age but begins to increase significantly after the age of 7 years (Gosselin, Perron, Legault & Campanella, as cited in Bourne & Hole, 2010). The ability to differenciate between genuine and posed expressions of emotion may have a bearing on a participant's recognition and reporting of which emotion they believe they have seen. During the process of this study, through verbal qualitative data voiced by the participants that emerged during several of the experiments it became apparent that many participants, both East Asians and Western Caucasians, were aware that the emotional expressions they were viewing had been posed. This is quite relevant as a multiple choice forced response option method was incorporated into the experiment. Even though as previously mentioned this has been shown to inflate recognition levels when attempting to investigate potential proposed 'universal' emotions (Christy et al., 2011) it was felt that the substantial evidence for F.A.C.S encoded expressions as being accurately representative of Western Caucasian displays of emotion justified using this method.

An important note to be mentioned is that due to the time constrictions in collecting data the experiments were carried out in the beginning of February and continued on until the 2nd of March. This meant that the 2012 Chinese New Year fell just prior to the onset of the study and this was celebrated for several days afterwards in the Castle House Common Room. This may possibly have been a factor promoting higher scores on behalf of the East Asian participants due to higher levels of contact between Chinese and Irish students. While due to the short duration and small scale of the festivities this is not likely to have had a major influence on the results it did warrant a mention as a potential limitation.

An important strength of this study is that by having only students from the one academic institution participate, socioeconomic status and education levels could be controlled for to a high degree. This is significant as these have been said to be major confounding variables in previous studies (Herba & Phillips, 2004).

The results of this study could be said to have implications in almost all fields that involve cross-cultural interpersonal relations. By recognising that there is potentially a critical period in which one must be exposed to out-group cultural displays of emotion to be able to reach similar performance levels as in group members it highlights the need for further investigation into the parameters of what that critical period may be. As already cited Newman et al (2002) and Tichacek (2003) have found that the critical period cut off point for peak performance in acquiring both a pidgin language and sign language respectively is in and around the onset of puberty when the relevant language learning areas of our brain specialise and lose plasticity. It is felt that also looking at this time period in relation to exposure to cross-cultural emotional expression is the line of investigation future research should take. When doing so, non-natives who moved to a Western Society before the onset of puberty should be compared to a same-cultural sample that got exposure only after experiencing puberty.

There are also commercial implications for the findings of this study. In January of this year Millward Brown, a global leader in brand, media and communications research and Affectiva, a leading emotion measurement technology company, announced the formation of a partnership aimed at developing a programme that will allow unique insight into the emotional impact of their TV advertising by integrating Affectiva's facial expression analysis technology (Affdex) with Millward Brown's Link ad copy-evaluation and optimization solution (Affectiva, 2012). This will effectively be a combination of hardware (web-camera) and software that can analyse and recognise people’s facial expressions of emotion when viewing advertisements on a computer screen in an attempt to gain knowledge of the viewers emotional reactions. As the programme in question would be created to recognise the corresponding combination of movements of facial action units as defined by F.A.C.S this study, and much of the more recent research in the field, would suggest that this would only be highly accurate for certain Western Caucasian societies. Before it could be implemented on a broad international level more culturally specific ways to encode expressions would have to be investigated.

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Appendix

(^_^) (^▼^)	smile, Happiness	(^o^) :A	laughing out loud	d(^_^)b	headphones or listening to music;	d(^_^d)	Thumbs up!
(-.-)Zzz	sleeping	(Z.Z)	sleepy person	\(^_^)/ \õ/	cheers, "Hurrah!"	(*^.^*) ^.^ *__*	shyness

Figure 1.1 Illustrations of some of the East Asian emoticons used (Yuki, Maddux & Masuda, 2007).

Gender_____

Age_____ Ethnicity_____

Nationality_____ No. Years living in Ireland_____

Please only complete the rest of this form if Ireland is not your country of origin or you have lived in another country for any period of time.

Collective years living in Western Society_____ (if Different from above)

Estimated time spent (Vacations etc...) in Western Society prior to living in a Western Nation_____

Prior to living in a Western Country were you regularly exposed to visual western media (i.e. Films, TV Shows, Magazines etc....) _____

If yes above was exposure (Please Circle One) Daily / Weekly / Monthly / Less Frequently than Monthly.

If Films and TV were watched regularly were subtitles used (Please Circle One) Yes / No

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Figure 1.2 Demographic Form issued to participants

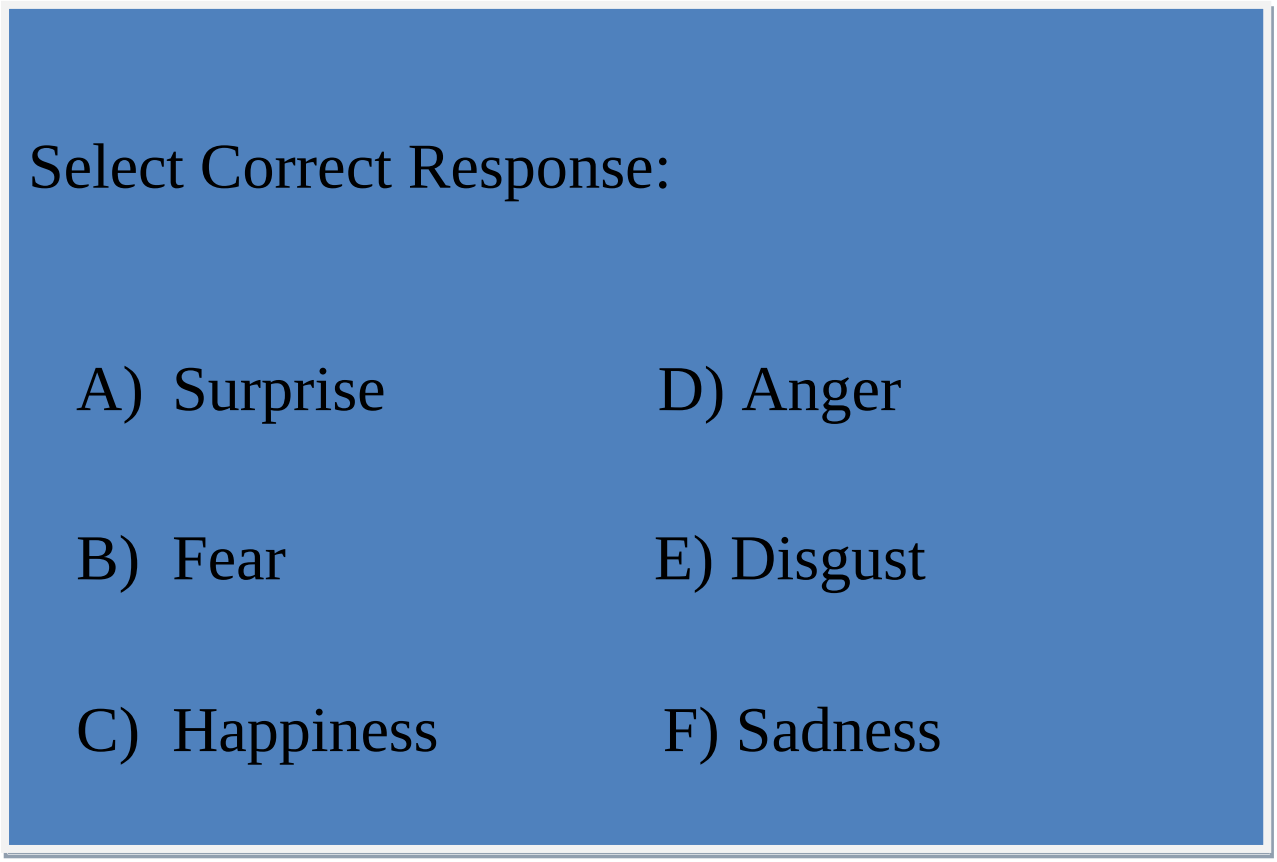
You are invited to participate in an experiment as part of a final year Psychology thesis Paper. Participation will involve filling out a demographic information form to obtain only data which is relevant to the research. You are not obliged to give any information that will allow immediate identification and all efforts will be taken to ensure anonymity. The experimental task involves a computerised multiple choice answer session relating to a serious of short videos. Participants will be instructed on how to complete the task and a short demonstration of the software used will be given. The task will take approximately 10 minutes.

All raw data obtained (i.e. demographic information and participants responses) will only be viewable or made available to persons pertinent to the research.

Participation is strictly voluntary and participants are free to withdraw at any stage. Reasons for withdrawing are not necessary but would be appreciated to inform the research and avoid any further discomfort to future participants.

Results of the experiment and a full debrief can be made available after the experiment has concluded in April 2012. These can be requested but an E-mail address will have to be given. Be aware that giving an E-mail address could possibly detract from ensuring complete anonymity. Any E-mail addresses giving will strictly only be used for delivering the experimental results. All demographic information forms containing your information will be shredded once the experiment terminates.

Figure 1.3 Consent form issued to participants.



Appendix Figure 1.4: Response screen that was presented to participants after viewing emotional expressions.

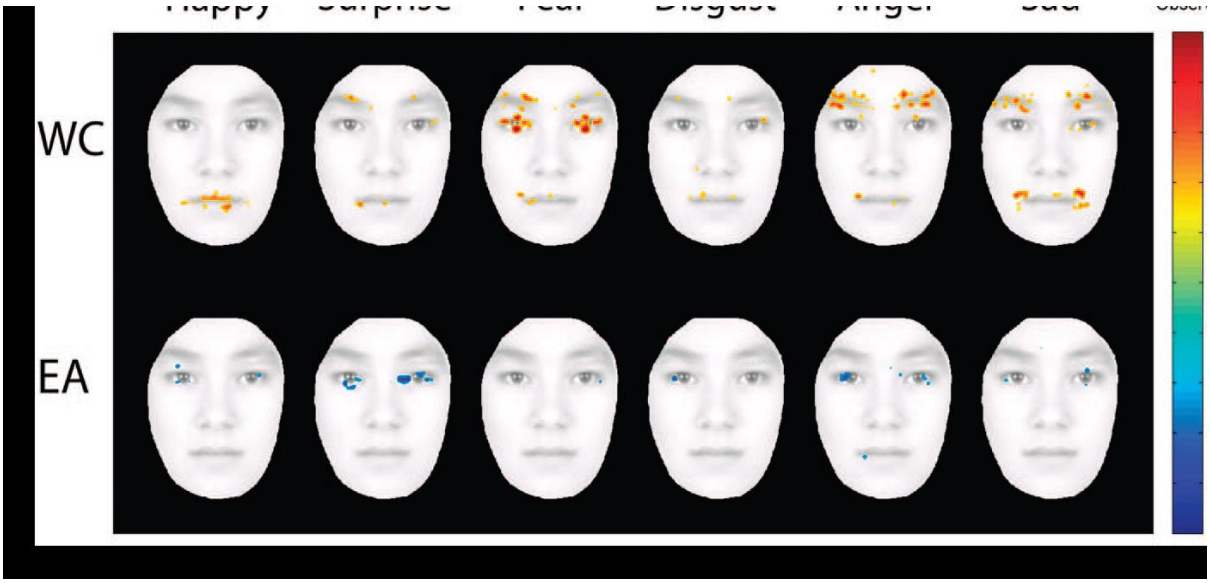


Figure 1.5 Results from Jack, Caldara and Schyn (2011) that illustrate the different gaze patterns used for each expression for East Asians and Western Caucasian based on their internal mental representation of the emotion.

Appendix Table 1.1

Categorical Data

Variables		**N**
Ethnicity of Participant	Caucasian	28
	East Asian	31
Nationality of Participant	Irish	28
	Chinese	13
	Filipino	11
	Japanese	1
	Malaysian	5
	Korean	22

Continuous Data

Variables	**M**	**SD**	**Minimum**	**Maximum**

East Asian x Number of years living in Western Society	6.183	3.470	0.17	17.00