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Colour and emotional intensity

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Colour and Emotional Intensity

by

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Honors Thesis

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Abstract

My study assessed the relationship between the colour of depicted clothing and ratings of emotional intensity in drawings of emotional scenarios. Participants ($N = 42$) viewed a set of drawings in one of seven colours, labeled the Actor and Cause, and rated the intensity of the emotions depicted on 11 emotional scales. Participants also listed colours they associated with specific emotions. Colour of clothing in drawings was not found to affect ratings of emotional intensity, but in drawings of sadness, embarrassment, and empathy the Actor obtained higher ratings than did the Cause. Colour-emotion associations obtained separately were, however, generally consistent with previous findings.

Colour and Emotional Intensity

Emotion recognition is an evolutionary advantage that can inform behavioural decisions (Elfenbein, Foo, White, Tan & Aik, 2007) and help individuals to effectively navigate social situations (Van Kleef, 2010). It is a process that is largely automatic and unconscious, thus requiring limited cognitive resources (Tracy & Robins, 2008). However, researchers in the areas of social, cognitive and perceptual psychology are still attempting to determine the factors contributing to the automaticity of emotion perception.

Theories of Emotion

Previous theories have conceptualized emotion expression and recognition as a mode of nonverbal communication. For example, both Ekman (1972) and Lewis (2000a) have suggested that physiological cues are necessary for emotion recognition. Ekman (1972) examined the affective patterns of movement in the facial musculature and found that some patterns were consistently associated with specific emotions across cultures. This led to the development of a "neuro-cultural theory of emotions" (Ekman, 1972, p. 212), which states that the representation and recognition of some facial expressions is biologically inherent, while other facial expressions are learned through social conditioning. Ekman (1972) initially identified happiness, sadness, anger, fear, disgust and surprise as the six "basic" emotions (p. 256) which appear to be universal to humans. Lewis (2000a) has similarly addressed how the function of body language, locomotion, and vocalizations are important indicators of emotion. In particular, he has focused on the development of so-called "self-conscious emotions" (Lewis, 2000b, p. 742), such as embarrassment, pride, shame, and guilt (Lewis, 2000a).

Parkinson (1996) has also emphasized the social function of emotions, suggesting that all emotions are, fundamentally, nonverbal signals that are decoded during interactions. Indeed, he has noted that almost all emotions directly or indirectly result from interpersonal situations (Parkinson, 1996). Furthermore, he has argued that all emotional social situations require at least two people: an individual, termed the "Actor", who is experiencing an emotion; and an individual who has prompted the Actor to feel that emotion, termed the "Cause".

Theories of emotion have been criticized for deemphasizing or ignoring the situational factors present during emotional expression. For example, Ekman's (2005) neuro-cultural theory is based on the results of showing participants images of facial expressions in the absence of many contextual cues. Models of situated cognition (Clark & Chalmers, 1998) on the other hand, have maintained that humans skillfully engage with the environment due to automatic processing of contextual cues. In this type of model, emotion recognition provides the individual with a repertoire of available affordances. Griffiths and Scarantino (2005) have designed an expanded situated model of emotion which includes the environment's effect on the dynamic unfolding of emotions. They suggest that individuals continuously monitor the social environment for cues to aid in their own emotion regulation. For example, they suggest that humans evolved a "goal-oriented" view of the world (Griffiths & Scaranatino, 2005, p. 8) to alert them to threats or positive incentives in their environment.

Several studies support a situated perspective of emotion. For instance, facial emotion recognition appears to be impaired by psychological disorders, such as schizophrenia (Comparelli et al., 2013), Parkinson's disease (Herrera, Cuetos, & Rodriguez-Ferreiro, 2011), and bipolar disorder (see Castanho de Almeida Rocca, van den Heuval, Caetano & Lefer, 2009).

Aldao (2013) has hypothesized that this impairment may be due to the "rigid and inflexible patterns of responses to the environment" (p. 156), thus implying that adaptive responses to contextual cues are necessary for accurate emotion recognition.

Colour and Emotion

Colour may be a contextual cue which affects emotional perception. For example, Williams, Grierson, and Carnahan (2011) asked participants to wear coloured glasses while performing a task in which they aimed their fingers at a target as quickly as possible. It was found that participants who wore red glasses responded significantly faster, as compared to participants who wore yellow, green, blue or clear glasses. The authors suggest that changing the colour of the individual's environment to red enhanced their threat perception and subsequent ability to react. Accordingly, the authors note participants reported negative affect while wearing the red glasses. Conversely, a study by Soldat and Sinclair (1997) found that while red did appear to be an environmental processing cue, it had a positive valence. In their study, participants were asked to perform problem solving tasks that could not be solved with heuristics on either red, white, or blue paper. They were also asked to rate the coloured paper's affect, as well as their own affective state. Participants rated the red paper positively, the blue paper negatively, and the white paper with neutrality. The authors hypothesized that positive valence of red paper would cause participants to use heuristics, whereas the negative valence of the blue paper would result in the participants solving the problems systematically. Participants who solved problems on the red paper did perform significantly worse, indicating they had attempted to use heuristics. As these results were independent of the participant's own affective state, the authors suggested that the affective valences of the colours were processed without affecting the participants' own

emotional states. These findings are consistent with the ecological valence theory of colour

preference developed by Palmer and Schloss (2010), which is founded on the premise that

colours have emotional associations. The authors argue that colour preference is an adaptive trait

humans evolved to facilitate activities such as spotting berries in trees. They have shown that

individuals tend to report positive associations for colours they favour, and negative associations

for colours they dislike.

    Colours can also be metaphorically and symbolically associated with emotions (see Kreitler

& Kreitler, 1972 for older literature). For example, Fetterman, Robinson and Meier (2012) tested

the metaphors of anger as "seeing red" and sadness as "feeling blue". Participants performed

tasks in which they categorized words as anger-related or fear-related, as well as anger-related or

sadness-related. Words associated with anger were categorized more quickly and more

accurately if they were presented in red font, and words that were associated with sadness were

categorized more accurately when presented in a blue font. Furthermore, categorization of fear-

related words was inhibited when presented in a red font, providing further evidence that

participants were unconsciously associating the colour red with angry words. The authors

suggest that the participants were affected by the colour-emotion associations of the presented

words. Similarly, Kaya and Epps (2004) have shown that colours are often associated with

symbols that affect the feelings elicited by the colours. For instance, participants in their study

associated the colour blue with sadness and water, and the colour green with forests and vomit.

In general, they found that participants rated the principal hues of red, yellow, green, blue and

purple the most positively. Boyatzis and Varghese (1994) and Hemphill (1996) have similarly

examined the emotional valence of colours. For adults, bright colours tended to elicit more

positive associations, and darker colours elicit more negative associations. In particular, white, pink, red, yellow, blue, purple and green were found to have positive valences, while brown, black and grey elicited negative responses (Hemphill, 1996).

Studies conducted with various methodologies have reported consistent colour-emotion associations (Baxter, 2007; Boyatzis & Varghese, 1994; Carey, 2008; Fetterman, Robinson & Meier, 2012; Hemphill, 1996; Hermsen, 2012; Humphrey & Lasko, 2006; Lalor, 2003; Rivard, 2004; Tull, 2008; Vandewiel, 2010). For example, one methodology used in colour-emotion research is to ask participants to draw pictures of emotions using colours of their choosing (Baxter, 2007; Carey, 2008; Lalor, 2003; Rivard, 2004; Vandewiel, 2010). Another methodology has entailed asking participants to point to (Lalor, 2003) or name (Boyatzis & Varghese, 1994; Hemphill, 1996) colours which reminded them of emotions. Furthermore, Hermsen (2012) and Tull (2008) asked participants to colour drawings or make paintings depicting various emotions. Humphrey and Lasko (2006) asked participants to make abstract line-drawings. These studies have typically found the following colour-emotion associations: purple with pride; blue with fear, empathy, guilt, and sadness; green with disgust and happiness; brown with disgust; yellow with happiness, embarrassment, love and surprise; orange with happiness, embarrassment, love and surprise; red with happiness, embarrassment, love, excitement and anger; and black with fear and anger.

In Hermsen's (2012) study, participants were asked to colour drawings depicting various emotions which were described by a sentence at the top of each drawing. She reported the following colour-emotion associations: anger with red; surprise and happiness with orange and yellow; disgust with brown and yellow-green; sadness and fear with blue; love and

embarrassment with red, yellow and orange; pride with yellow; and, finally, guilt and empathy

with blue. She also noted that a distinction between actor and cause for the drawings representing

anger, surprise, sadness, embarrassment and pride. Several drawings did not produce this actor-

cause difference; however, for these drawings, the participants may not have been able to

differentiate the actor and cause.

Colour-emotions associations in children become more consistent with age. A study by

Burkitt, Barrett and Davis (2004) found that, when children aged four to 11 were asked to draw a

picture of positive situation, they did so with a crayon of their preferred colour. Conversely, they

used their least preferred colour when asked to draw a picture of a negative situation. These

findings suggest that children's colour-emotion associated may be based on colour preference,

rather than preconceived colour-emotion associations. In contrast, Humphrey and Lasko (2006)

have shown that older children exhibit similar colour-emotion associations to younger adults,

while younger children demonstrate less predictable, and likely more preference-based, colour-

emotion associations. For instance, Vandewiel (2010) asked students and seniors to complete a

drawing task. She found that while seniors exhibited typical colour-emotion associations, they

used the least amount of colour.

The literature has not yet established whether colour-emotion associations are universal.

However, Lalor (2003) has found that participants from Canadian, Asian, European and African

cultural groups showed consistent colour-emotion associations. However, these participants were

all living in Canada and were therefore familiar with North American society. As Kaya and Epps

(2004) have cautioned, colour-emotion associations may differ for various cultures depending on

different traditional. For instance, the authors note that funeral attire is black in North American

society, but white in China. Thus, it is still unclear whether colour-emotion associations are innate or learned. However, Spector and Maurer (2011) have indicated there seems to be a "naturally-biased associations" of colour and shape. Children who were not yet literate associated the letters O and I with the colour white, X and Z with black, and C with yellow. Conversely, adults and literate children tend to associate B with blue, Y with yellow, A with red, and G with green. The authors suggest that this change in association occurs as individuals begin to associate word meanings with letters. Therefore, it seems as children age, colour associations adapt with learning, but that innate colour-letter associations also exist. These naturally-biased pairings may be true for colour-emotion associations as well.

The present study attempted to expand on previous research in two ways. Firstly, I aimed to assess whether colours can facilitate emotion recognition in the absence of the linguistic cues present in the study by Hermsen (2010). Secondly, I assessed whether the presence of certain colours affects the perceived intensity of emotions. I examined how colours of depicted clothing influenced ratings of emotional intensity in drawings of emotional scenarios. Participants viewed drawings depicting several emotions. Each drawing depicted two characters: the Actor who experiences an emotion, and the Cause who elicits the Actor's emotional response (see Parkinson, 1996). Participants in the study received a set drawings on paper in which the clothing of both characters was filled in with a specific colour.

It was hypothesized that the drawings with the characters' clothing filled in with the colour typically associated with the character's emotion (Humphrey, Rivas & Hermsen, 2013) would be rated higher in emotional intensity. Furthermore, based on findings by Hermsen (2012) that the Actor was coloured in with more intense colours than the Cause, it was hypothesized that

emotion intensity ratings would be higher for the Actor in drawings depicting typical colour-emotion associations.

Method

Participants

A convenience sample of undergraduate students (*N*=42) was recruited on a voluntary basis from King's University College in London, Ontario, Canada. Thirty participants were recruited from Introductory Psychology classes through an online research participation system, four participants were recruited from an upper level psychology course, and eight participants were approached in various locations around campus. Participants in the Introductory Psychology class were informed that they could earn bonus marks of up to 2.5% for completing a related assignment. The age of participants ranged from 18 to 64 years of age (*M* = 22.30 years), and the sample consisted of 16 males and 26 females. Written consent was obtained. Participants (*n* = 6) were randomly assigned to one of seven clothing conditions (Red, Blue, Green, Yellow, Orange, Purple, or Black) after agreeing to take part in the study. Attempts were made to assign an equal number of males and females to each condition, but due to unequal numbers a greater number of females were assigned to the green, yellow, and orange conditions. No participants reported having colour blindness when queried.

Materials

Drawings. The stimuli in the present study were eleven cartoon drawings (see Appendix A), adapted from created by Hermsen (2012). In each drawing, one androgynous character, the Cause, is eliciting an emotion in another androgynous character, the Actor (see Appendix A for descriptions of the drawings). Seven separate sets of these drawings were made, each differing in

the colour of the characters' clothing. In each set, the clothing was filled in using photoshop with one of the following colours: red, orange, yellow, blue, purple, black or green (see Appendix A for CYMK readings). The drawings were arranged in a paper booklet in a randomized order.

Prior to the study, ten independent judges assessed the monochromatic version of these drawings in order to obtain a baseline measure of intensity of emotion for each depicted character (see Table 1), using the Emotional Intensity Rating Scale (see Appendix B).

Emotional Intensity Rating Scale. On a 24-item scale, participants rated the depicted characters' levels of anger, surprise, happiness, sadness, fear, disgust, embarrassment, empathy, guilt, pride and love on a 5-point rating scale, with 1 being the least and 5 being the most (see Appendix B). The items were presented to participants in a randomized order.

Actor and Cause Questionnaire. Participants were provided the following definition based on a theory of social emotion by Parkinson (1996): "In the picture on the previous page, there is an Actor and a Cause. The Actor is the character feeling an emotional response to a situation. The Cause is the character who creates the situation that the Actor is responding to" (see Appendix C). Participants were asked to label the Actor and Cause for each drawing.

Colour-Emotion Association Questionnaire. To assess whether participant in the present study would report typical colour-emotion associations (Humphrey, Rivas & Hermsen, 2013), they were asked to write down one colour that they associated with each of the following emotions: anger, disgust, embarrassment, empathy, fear, guilt, happiness love, pride, sadness, and surprise (see Appendix D).

Table 1

Average Emotional Intensity Ratings Given By Independent Raters

Character	Emotion										
	Anger	Surprise	Happiness	Disgust	Sadness	Fear	Embarrassment	Love	Pride	Empathy	Guilt
					Anger Scene						
One	3.90 (0.83)	1.50 (0.88)	1.10 (0.33)	2.00 (1.54)	2.10 (1.20)	1.40 (0.88)	1.50 (1.33)	1.00 (0.00)	1.60 (0.73)	1.30 (0.71)	1.30 (1.00)
Two	4.00 (1.27)	1.50 (1.47)	1.00 (0.90)	1.90 (1.92)	2.10 (2.05)	1.20 (1.17)	1.50 (1.51)	1.10 (1.03)	2.30 (2.05)	1.10 (1.03)	1.30 (1.30)
					Surprise Scene						
One	3.90 (0.83)	1.50 (0.88)	1.10 (0.33)	2.00 (1.54)	2.10 (1.20)	1.40 (0.88)	1.50 (1.33)	1.00 (0.00)	1.60 (0.73)	1.30 (0.71)	1.30 (1.00)
Two	4.00 (1.27)	1.50 (1.47)	1.00 (0.90)	1.90 (1.92)	2.10 (2.05)	1.20 (1.17)	1.50 (1.51)	1.10 (1.03)	2.30 (2.05)	1.10 (1.03)	1.30 (1.30)

Happiness Scene

One	3.90 (0.83)	1.50 (0.88)	1.10 (0.33)	2.00 (1.54)	2.10 (1.20)	1.40 (0.88)	1.50 (1.33)	1.00 (0.00)	1.60 (0.73)	1.30 (0.71)	1.30 (1.00)
Two	4.00 (1.27)	1.50 (1.47)	1.00 (0.90)	1.90 (1.92)	2.10 (2.05)	1.20 (1.17)	1.50 (1.51)	1.10 (1.03)	2.30 (2.05)	1.10 (1.03)	1.30 (1.30)

Disgust Scene

One	3.90 (0.83)	1.50 (0.88)	1.10 (0.33)	2.00 (1.54)	2.10 (1.20)	1.40 (0.88)	1.50 (1.33)	1.00 (0.00)	1.60 (0.73)	1.30 (0.71)	1.30 (1.00)
Two	4.00 (1.27)	1.50 (1.47)	1.00 (0.90)	1.90 (1.92)	2.10 (2.05)	1.20 (1.17)	1.50 (1.51)	1.10 (1.03)	2.30 (2.05)	1.10 (1.03)	1.30 (1.30)

Sadness Scene

One	3.90 (0.83)	1.50 (0.88)	1.10 (0.33)	2.00 (1.54)	2.10 (1.20)	1.40 (0.88)	1.50 (1.33)	1.00 (0.00)	1.60 (0.73)	1.30 (0.71)	1.30 (1.00)
Two	4.00 (1.27)	1.50 (1.47)	1.00 (0.90)	1.90 (1.92)	2.10 (2.05)	1.20 (1.17)	1.50 (1.51)	1.10 (1.03)	2.30 (2.05)	1.10 (1.03)	1.30 (1.30)

Fear Scene

One	3.90 (0.83)	1.50 (0.88)	1.10 (0.33)	2.00 (1.54)	2.10 (1.20)	1.40 (0.88)	1.50 (1.33)	1.00 (0.00)	1.60 (0.73)	1.30 (0.71)	1.30 (1.00)
Two	4.00 (1.27)	1.50 (1.47)	1.00 (0.90)	1.90 (1.92)	2.10 (2.05)	1.20 (1.17)	1.50 (1.51)	1.10 (1.03)	2.30 (2.05)	1.10 (1.03)	1.30 (1.30)

Embarrassment Scene

One	3.90 (0.83)	1.50 (0.88)	1.10 (0.33)	2.00 (1.54)	2.10 (1.20)	1.40 (0.88)	1.50 (1.33)	1.00 (0.00)	1.60 (0.73)	1.30 (0.71)	1.30 (1.00)
Two	4.00 (1.27)	1.50 (1.47)	1.00 (0.90)	1.90 (1.92)	2.10 (2.05)	1.20 (1.17)	1.50 (1.51)	1.10 (1.03)	2.30 (2.05)	1.10 (1.03)	1.30 (1.30)

Love Scene

One	3.90 (0.83)	1.50 (0.88)	1.10 (0.33)	2.00 (1.54)	2.10 (1.20)	1.40 (0.88)	1.50 (1.33)	1.00 (0.00)	1.60 (0.73)	1.30 (0.71)	1.30 (1.00)
Two	4.00 (1.27)	1.50 (1.47)	1.00 (0.90)	1.90 (1.92)	2.10 (2.05)	1.20 (1.17)	1.50 (1.51)	1.10 (1.03)	2.30 (2.05)	1.10 (1.03)	1.30 (1.30)

Pride Scene

One	3.90 (0.83)	1.50 (0.88)	1.10 (0.33)	2.00 (1.54)	2.10 (1.20)	1.40 (0.88)	1.50 (1.33)	1.00 (0.00)	1.60 (0.73)	1.30 (0.71)	1.30 (1.00)
Two	4.00 (1.27)	1.50 (1.47)	1.00 (0.90)	1.90 (1.92)	2.10 (2.05)	1.20 (1.17)	1.50 (1.51)	1.10 (1.03)	2.30 (2.05)	1.10 (1.03)	1.30 (1.30)

Empathy Scene

One	3.90 (0.83)	1.50 (0.88)	1.10 (0.33)	2.00 (1.54)	2.10 (1.20)	1.40 (0.88)	1.50 (1.33)	1.00 (0.00)	1.60 (0.73)	1.30 (0.71)	1.30 (1.00)
Two	4.00 (1.27)	1.50 (1.47)	1.00 (0.90)	1.90 (1.92)	2.10 (2.05)	1.20 (1.17)	1.50 (1.51)	1.10 (1.03)	2.30 (2.05)	1.10 (1.03)	1.30 (1.30)

Guilt Scene

One	3.90 (0.83)	1.50 (0.88)	1.10 (0.33)	2.00 (1.54)	2.10 (1.20)	1.40 (0.88)	1.50 (1.33)	1.00 (0.00)	1.60 (0.73)	1.30 (0.71)	1.30 (1.00)
Two	4.00 (1.27)	1.50 (1.47)	1.00 (0.90)	1.90 (1.92)	2.10 (2.05)	1.20 (1.17)	1.50 (1.51)	1.10 (1.03)	2.30 (2.05)	1.10 (1.03)	1.30 (1.30)

Note. Standard deviations are in brackets.

Procedure

There were seven conditions: Blue, Black, Green, Yellow, Orange, Purple, and Red. All

participants completed the Emotional Intensity Rating Scale (see Appendix B) and Actor and

Cause Questionnaire (see Appendix C) for each drawing in a randomized order, with the

questions in each questionnaire also randomized. Finally, participants completed the Colour-

Emotion Association Questionnaire, with questions arranged in a randomized order (see

Appendix D). Afterwards, participants were debriefed, thanked for their participation, and

probed for suspicion. The study took approximately 20 minutes to complete.

<div align="center">

Results

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No participants indicated colour blindness, and thus all were included in the study. The

average baseline emotion intensity ratings given by independent judges (*N*=10) for the

uncoloured drawings (see Table 1) were subtracted from ratings given by participants (*N* = 42)

for the coloured drawings. In SPSS 20, a General Linear Model Analysis with Repeated

Measures was performed on these difference scores for each character in the set of drawings.

Clothing colour and emotional scene were input as independent variables, and character role and

emotion ratings were used as dependent variables.

A significant interaction was found for emotion scene and character role (Hotelling's Trace:

$T^2 = 5.98$, $F(5, 146) = 15.54$, $p > .001$), meaning that the Actor and Cause were seen as

expressing different levels of emotions in the different emotion scenes. There was a significant

main effect found for scene (Hotelling's Trace: $T^2 = 2.29$, $F(5, 26) = 5.95$, $p > .001$), confirming

that the drawings were rated differently. There was also a significant main effect for character

role (Hotelling's Trace: $T^2 = 0.67$, $F(5, 35) = 23.37$, $p > .001$), suggesting that emotion intensity

ratings were different depending on whether the character was the Actor or Cause. Percentages

of agreement for Actor and Cause are shown in Appendix A. Unanimous or nearly unanimous

agreement was found for drawings depicting anger, fear, guilt, pride, sadness and surprise, but

less consistent for drawings of disgust, embarrassment, empathy, happiness, and love.

Contrary to my hypothesis, no significant interaction was found between colour and emotion

scene nor colour and character role. These findings suggest that colour did not affect

participants' ratings of emotion intensity. Furthermore, no significant interactions were found

emotion rating scale by colour, emotion scene by character role by colour, and character role by

emotion rating scale by colour.

Students T-Tests were performed in Microsoft Excel to assess, for which drawing, where the

Actor and Cause differed. The T-Tests were conducted according to typical colour-emotion

associations (see Humphrey, Rivas & Hermsen, 2013). The Actor ($M =1.73$, $SD = 1.60$) of the

Red Embarrassment drawing was significantly more embarrassed than the Cause ($M = -1.47$, SD

$= 2.04$), $t(5) = 0.01$. In the Blue Sadness drawing, the Actor ($M =1.47$, $SD = 2.04$) was

significantly more sad than the Cause ($M = -1.76$, $SD = 0.75$), $t(5) = 0.00$. Similarly, for the

empathy drawing filled in blue, the Actor ($M = 1.67$, $SD = 1.75$) was rated as significantly more

empathic than the Cause ($M = -1.4$, $SD = 1.67$), $t(5) = 0.01$.

A frequency analysis was conducted on the colour and emotion associations reported by 41

participants (see Table 2). One participant was excluded from the analysis due misunderstanding

the instructions. The following were the most-reported colour-emotion associations: anger with

red, disgust with green; embarrassment with pink and red; empathy with blue; fear with black;

Table 2

Colours Names for Emotions by 41 Participants

	Emotion										
Colour	Anger	Surprise	Happiness	Disgust	Sadness	Fear	Embarrassment	Love	Pride	Empathy	Guilt
Red	35	3	3	1	-	9	8	25	6	1	-
Pink	-	3	5	-	-	-	15	16	1	3	1
Orange	1	9	4	3	-	2	5	-	1	2	3
Gold	-	-	1	-	-	-	-	-	4	-	-
Yellow	1	12	25	2	-	3	3	2	8	6	1
Green	-	5	-	23	-	1	3	-	6	3	11
Blue	-	-	2	-	27	4	3	-	3	19	9
Purple	-	4	2	2	1	2	1	-	9	5	5
Black	4	1	-	5	3	18	-	-	-	-	5
Grey	-	-	-	1	7	1	-	-	-	-	3
Brown	1	-	-	5	-	1	-	-	-	-	1
White	-	3	-	-	3	1	2	-	3	2	2
Rainbow	-	1	-	-	-	-	-	-	-	-	-

Note. Cells in colour were the most frequently reported.

guilt with green and blue; happiness with yellow; love with red and pink; pride with purple and yellow; sadness with blue; surprise with yellow and orange.

Discussion

Parkinson (1996) has theorized that emotions are social, noting that all emotional situations seem to involve an "Actor" who is experiencing an emotion, and a "Cause" who is prompting the Actor to experience the emotion. He has also characterized emotions as nonverbal messages decoded through social interactions, but researchers are still attempting to identify factors underlying emotion recognition. Ekman (1972) and Lewis (2000) have suggested that facial expressions and body language are essential for emotion recognition, while other researchers have argued that contextual cues, like colour, may also be influential (Clark & Chalmers, 1998; Griffiths and Scarantino, 2005; Humphrey, Rivera and Hermsen, 2013).

Previous studies have shown that individuals tend to associate specific colours with specific emotions. In particular, research has found the following colour and emotion associations: anger with red and black; surprise with orange and yellow; happiness with red, yellow and green; disgust with green and brown; sadness with blue; fear with black; embarrassment with red, orange and yellow; love with red, orange and yellow; pride with purple; empathy with blue; and guilt with blue (Baxter, 2007; Boyatzis & Varghese, 1994; Carey, 2008; Fetterman, Robinson & Meier, 2012; Hemphill, 1996; Hermsen, 2012; Humphrey & Lasko, 2006; Lalor, 2003; Rivard, 2004; Tull, 2008; Vandewiel, 2010).

My study examined whether the inclusion of specific colours in drawings of emotional scenarios would affect ratings of emotional intensity. Clothing of depicted characters was filled in with colours that were either consistent or not consistent with the aforementioned colour-

emotion associations. It was hypothesized that when the colour of the characters' clothing

corresponded with the depicted emotion, participants would rate the emotion as higher in

intensity. However, clothing colour was not found to have an effect on emotion intensity ratings,

indicating that participants used other cues in the drawings when identifying the emotions of the

characters. These findings therefore do not indicate that colour is salient enough to influence

ratings of emotional intensity, and are more supportive of Ekman's (1972) and Lewis's (2000)

theories that facial expressions and body language are the dominant aspects of emotion

recognition.

It was also hypothesized that, for drawings reflecting typical emotion associations, the

emotions experienced by the Actor would be rated as more intense than emotions experienced by

the Cause. Further analyses did find significant differences in emotional intensity, but only for

drawings in which the Actor and Cause were actually drawn as experiencing different emotions.

Again, the presence of colour did not seem to affect ratings of emotional intensity. These results

differ from those founds by Hermsen (2012), who used drawings that were almost identical to

the stimuli used in the present study. Hermsen (2012) found that participants coloured the Actor

with more intense colours in some, though not all, of the drawings. She suggested that, in the

drawings for which there was not an effect of role, the Actor and Cause may not have been

clearly defined. The inconsistent labelling of Actor and Cause by participants in my study (see

Appendix A) seems to confirm the ambiguity of the characters' roles. However, it should be

noted that Hermsen (2012) asked participants to colour the characters, whereas I asked

participants to view drawings that were already coloured. Therefore, the disparate findings may

be due to differences in the ways that individuals express and perceive colour-emotion

associations.

I also examined whether participants would name colour-emotion associations similar to

those previously found in the literature (e.g. Humphrey, Rivas & Hermsen, 2013), and found that

this was generally the case. Indeed, participants most often associated anger with red, disgust

with green, embarrassment with red, empathy with blue; fear with black; guilt with blue,

happiness with yellow; love with red, pride with purple, sadness with blue, and surprise with

yellow and orange. However, participants also reported some atypical associations, such as

pairing pink with embarrassment and love, likely because I assessed colour-emotion associations

with open-ended questions. This finding stresses the importance of including other colours in

future studies, and of not using forced-choice methods of assessment.

Taken together, the findings of my study suggest that colour-emotion associations may be

mainly perceptual, and that there are other, more salient factors underlying emotion recognition

and art perception. Nevertheless, it should be noted that my study has several limitations, and

thus the findings should be interpreted with caution. For instance, while clothing colour has been

previously found to affect the perceptions of others (e.g. Craig, Owen & Havlicek, 2010), it may

not affect emotion recognition. It is possible that, whereas altering clothing colour did not

influence emotion recognition, changing the colours of other features in the drawings may have

had an effect. Furthermore, because the stimuli used in my study were very basic drawings

serving to isolate the effects of colour and depicted body language, my findings may not be

reflective of the way that emotion recognition and art perception operate in the presence of many

other contextual factors. Future researchers may wish to use photographs of facial expressions,

or more complex, artistic drawings in order to enhance external validity. My study was also limited by the sample size, as well as the unequal number of males and female participants. Sex differences were not calculated for these reasons, but there is evidence that males and females differ in their abilities to recognize emotions (e.g. Hall, Hutton & Morgan, 2010; Thayer & Johnsen, 2000). Therefore, future studies may wish to examine sex differences.

Despite its limitations, my study expanded on previous research by eliminating the written descriptions of the emotional scenarios depicted in the drawings. These lingusitics cues may explained have why previous studies (e.g. Hermsen, 2012) found consistent colour-emotion associations, as well as why participants in my study reported typical colour-emotion associations when prompted with a named emotion. Future studies could seek to confirm that colour-emotion associations depend on language; for instance, it is possible that including descriptions of the drawings would lead participants to view them in a different way by attending less closely to facial expressions and body language. Results may also be different if participants were asked to rate only emotion per drawing. Overall, however, the disparity between the emotion ratings and the written colour-emotion associations found in the present study indicates that art perception is a complicated process that deserves more study.

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Appendix A
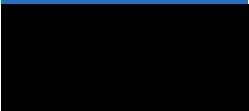
Description of Drawings

|	Role Designation			
Emotion	Character #1	Character #2	Agreement	Intended Scenario
Anger	Actor	Cause	100%	The Actor is angry at his/her friend for angrily ignoring him/her.
Disgust	Actor	Cause	60%	The Actor is disgusted because the Cause has happily jumped in a puddle and splashed him/her.
Embarrassment	Cause	Actor	83%	The Actor is embarrassed because the Cause is angry at him/her for receiving a bad mark on a paper.
Empathy	Cause	Actor	81%	The Actor feels empathy for the Cause, who is sad.
Fear	Actor	Cause	100%	The Actor is afraid because the Cause is happily attempting to pet a skunk.
Guilt	Cause	Actor	95%	The Actor feels guilty for not having money to give the Cause, who is sad.
Happiness	Cause	Actor	74%	The Actor and Cause are happy to be playing with each other.
Love	Actor	Cause	88%	The Actor and Cause love each other.

Pride	Actor	Cause	93%	The Actor is proud of the Cause for graduating.
Sadness	Cause	Actor	100%	The Actor is upset because the Cause, who is also sad, is leaving.
Surprise	Actor	Cause	100%	The Actor is surprised by the Cause, who is cheerfully presenting him/her with a cake.

Note. The designation of characters as Actor or Cause are based on definitions by Parkinson (1996). Agreement refers to what percentage of participants designated the aforementioned characters as Actor and Cause.

Print Colour Profiles in CMYK

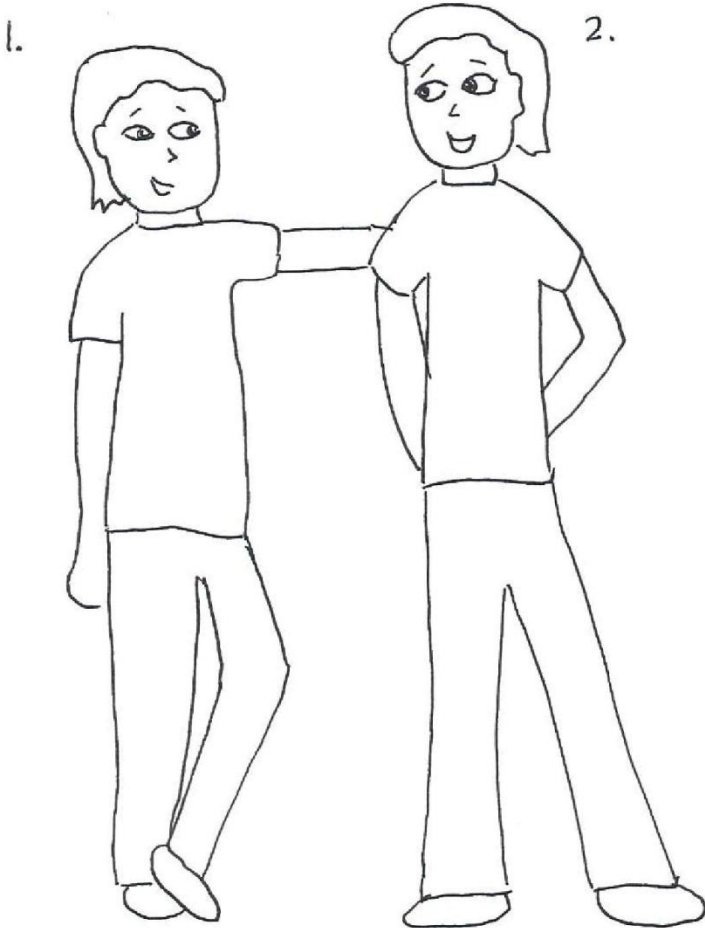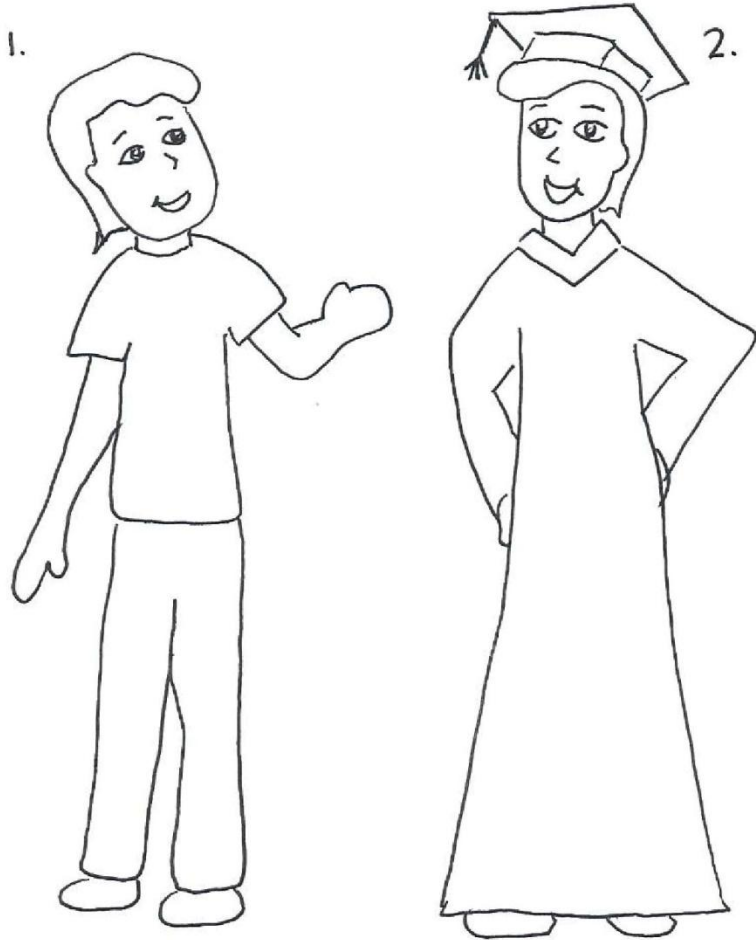| Colour	Cyan (C)	Magenta (M)	Yellow (Y)	Black (K)	Sample
Blue	84	53	0	0	
Black	75	68	67	90	
Green	100	0	50	100	
Yellow	0	0	100	0	
Orange	0	50	100	0	
Purple	0	100	0	50	
Red	0	100	100	0	

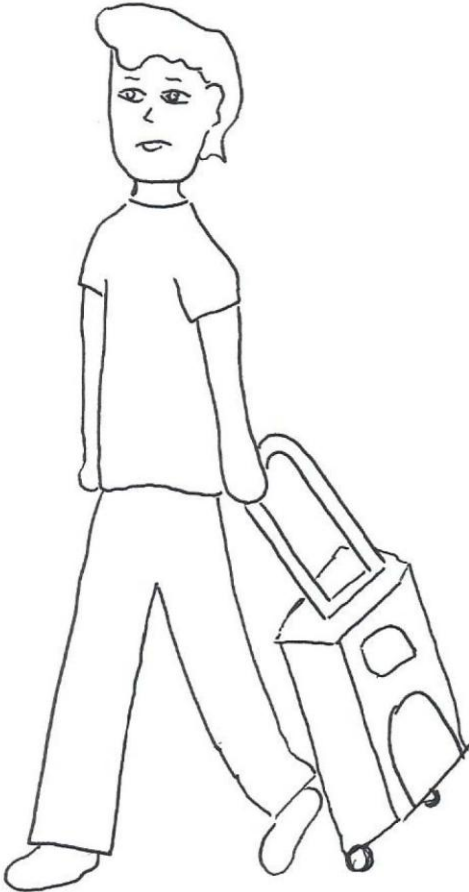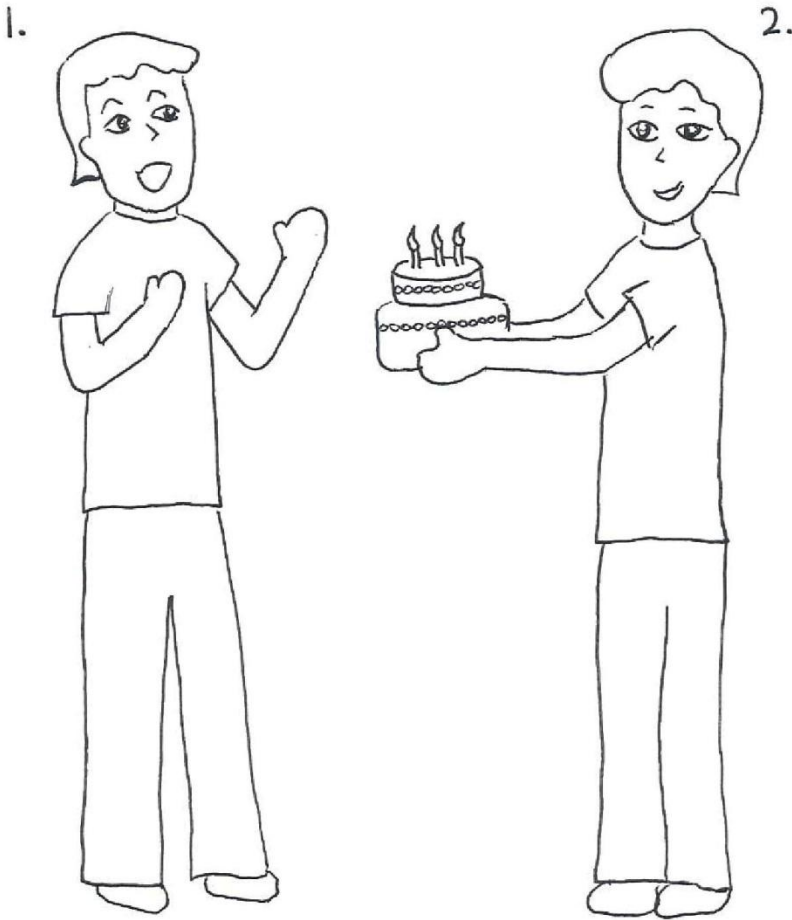*Note.* All values are in percentages.
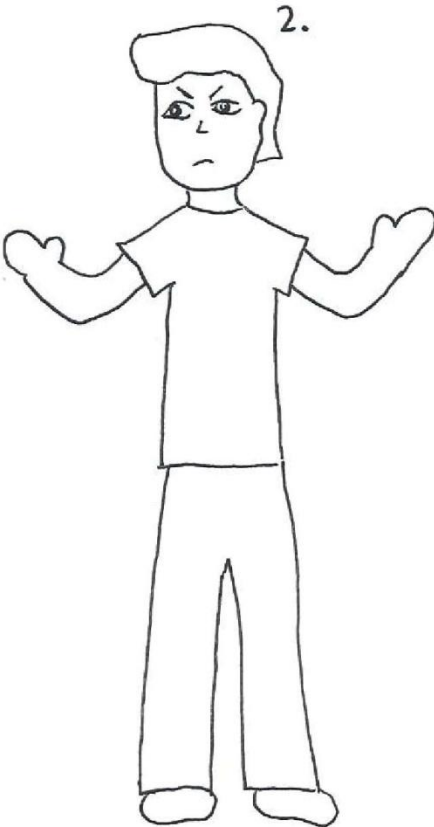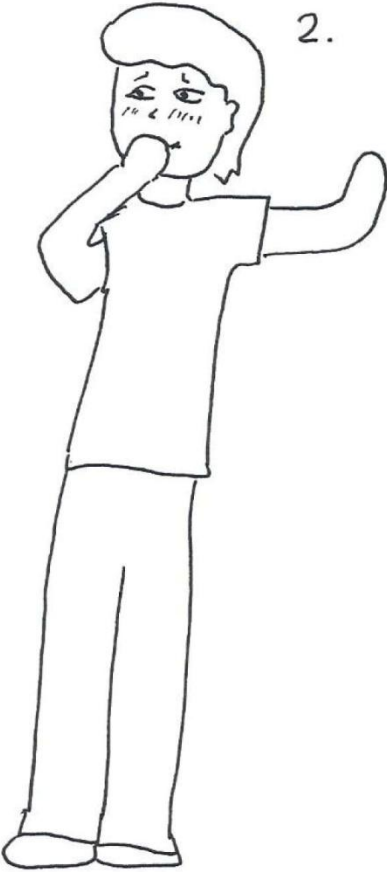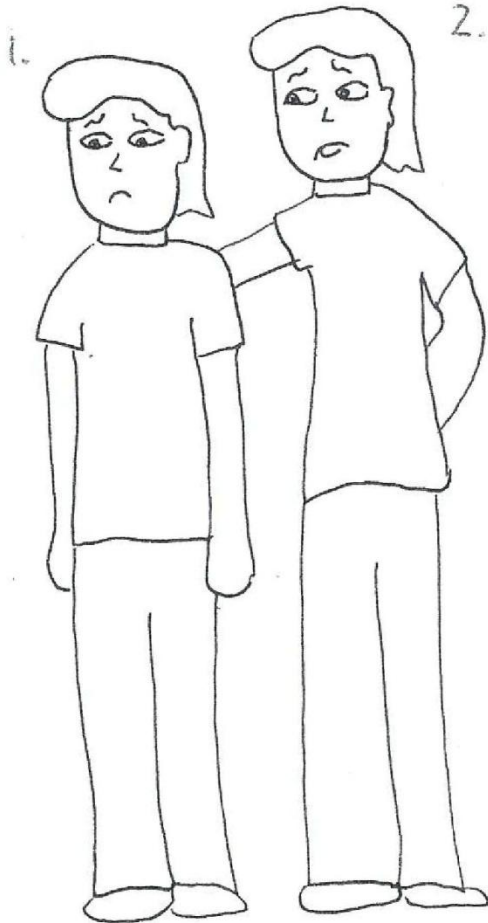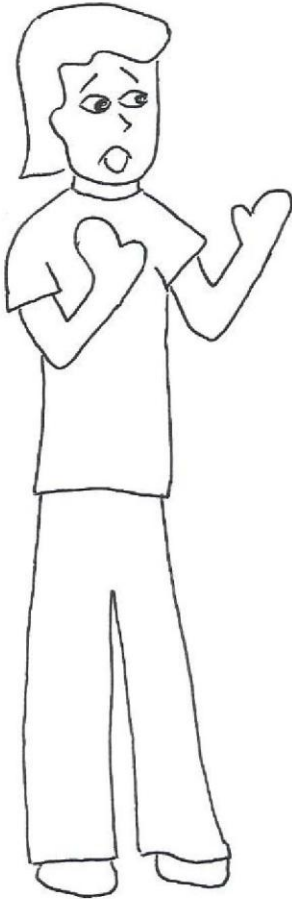
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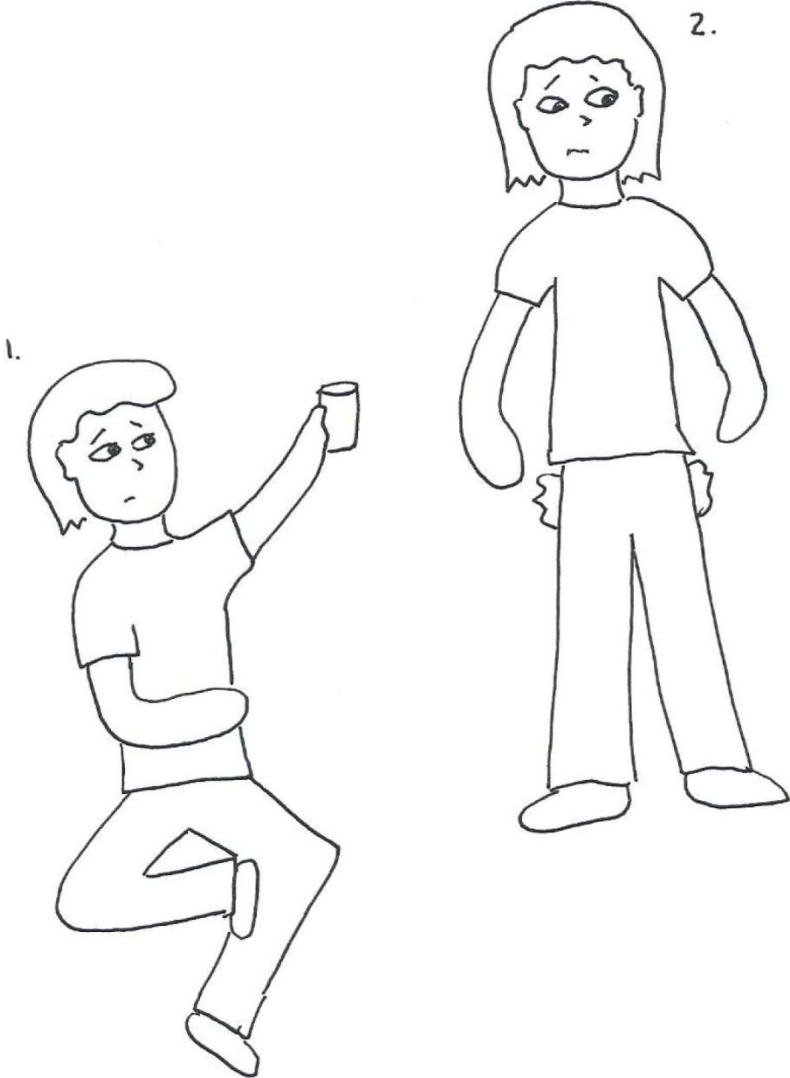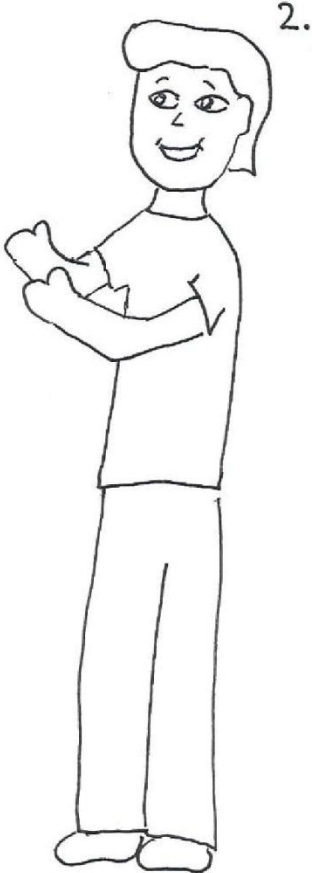
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Appendix B
Emotional Intensity Rating Scale

Using the rating system below, indicate the intensity of the emotions expressed in the picture on the previous page by circling the number which best represents the level of intensity of the emotion named on the left, where 1 is the least intense and 5 is the most intense.

For Character #1:

	Least				Most
Anger:	1	2	3	4	5
Surprise:	1	2	3	4	5
Sadness:	1	2	3	4	5
Fear:	1	2	3	4	5
Happiness:	1	2	3	4	5
Disgust:	1	2	3	4	5
Love:	1	2	3	4	5
Embarrassment:	1	2	3	4	5
Pride:	1	2	3	4	5
Guilt:	1	2	3	4	5
Empathy:	1	2	3	4	5

For Character #2:

	Least				Most
Anger:	1	2	3	4	5
Surprise:	1	2	3	4	5
Sadness:	1	2	3	4	5
Fear:	1	2	3	4	5
Happiness:	1	2	3	4	5
Disgust:	1	2	3	4	5
Love:	1	2	3	4	5
Embarrassment:	1	2	3	4	5
Pride:	1	2	3	4	5
Guilt:	1	2	3	4	5
Empathy:	1	2	3	4	5

Appendix C

Actor and Cause Questionnaire

In the picture on the previous page, there is an **Actor** and a **Cause**. The Actor is the character feeling an emotional response to a situation. The Cause is the character who creates the situation that the Actor is responding to.

Which character is the Actor?   #_____
Which character is the Cause?   # _____

Appendix D

Below is a list of eleven emotions. Beside each emotion, please write down the one colour you most associate with that particular emotion. Do not think too hard about your answer, but write down the first colour that comes to mind.

Anger: _____

Disgust: _____

Embarrassment: _____

Empathy: _____

Fear: _____

Guilt: _____

Happiness: _____

Love: _____

Pride: _____

Sadness: _____

Surprise: _____