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Improved Ability in Emotional Recognition and Social Skills After Emotional Recognition Training in Children

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Abstract

The recognition of emotional expressions is essential to achieving emotional regulation and social development. Therefore, stimulating this recognition could benefit children's cognitive and social levels. The aim of this study was to assess the effects of training in emotional recognition on the recognition of emotional expressions and the social behavior of children. Typically-developing children (8-10 years old) were divided into two groups for either emotional or identity training. Before and after training, the recognition of three emotions (happiness, sadness, anger) and of identity was assessed by matching and memory tasks. In addition, a social skills scale was applied to parents. After training, only participants in the emotion group improved their accuracy (correct responses minus commission errors) in recognizing happiness and sadness, and on the identity tasks. The parents of the children in the emotion group also referred higher scores on the social skills scale. Results suggest that these children improved their recognition of emotional expressions by enhancing the attention paid to specific facial features. This improvement in emotional recognition induced by training may facilitate social interaction.

Keywords: training, emotion recognition, social skills, children, faces, identity

1. Introduction

In recent decades, the development of socio-emotional skills in children has attracted increasing interest among researchers because accurate recognition of facial emotional expressions plays a crucial role in the adequate development of social behavior. Faces convey information of great biological and social importance, such as sex, age, identity, emotional expressions, and intentions that allows people to predict the behavior of others and adapt their own behavior accordingly, leading to improved social relationships. Children who can correctly identify expressions on their peers' faces, or comprehend the emotions elicited by everyday social situations, are more likely to react prosocially to their peers' displays of emotions (Denham et al., 2003; Denham, Bassett, Brown, Way, & Steed, 2015).

Emotional recognition develops over the life-cycle but trajectories vary for different emotions. For example, studies have shown that happiness is recognized earlier –from age 6– then sadness and anger (ages 8-10). Other reports, however, suggest that recognition of anger is not enhanced until after age 10, as occurs with expressions of fear, surprise, and disgust, which do not improve notably until after that age. Conflicting results for this order of appearance seem to depend on task demands, among other factors (Brechet, 2017; Chronaki, Hadwin, Garner, Maurage, & Sonuga-Barke, 2015; Durand, Gallay, Seigneuric, Robichon, & Baudouin, 2007; Mancini, Agnoli, Baldaro, Ricci Bitti, & Surcinelli, 2013; Montirosso, Peverelli, Frigerio, Crespi, & Borgatti, 2010; Rodger, Vizioli, Ouyang, & Caldara, 2015; Thomas, De Bellis, Graham, & LaBar, 2007; Vicari, Reilly, Pasqualetti, Vizzotto, & Caltagirone, 2000).

The ability to recognize emotions has been associated with social competencies in children, adolescents, and adults (Denham et al., 2003; 2015; Mostow, Izard, Fine, & Trentacosta, 2002; Salguero, Fernández-Berrocal, Ruiz-Aranda, Castillo, & Palomera, 2011). Significantly, researchers have also found that emotional knowledge is a predictor of academic success, acceptance by peers, and social behavior in typically-developing children (Denham et al., 2002; 2015; Izard et al., 2001; White, Russell, Qualter, Owens, & Psychogiou, 2021). In contrast, lower rates of emotional recognition predict more behavioral difficulties (Nowicki, Bliwise, & Johnson, 2019), social problems, and internalization of symptoms (Castro, Cooke, Halberstadt, & Garrett-Peters, 2018; Dede, Delk, & White, 2021; Schultz, Izard, Ackerman, & Youngstrom, 2001).

Earlier studies provide evidence that certain kinds of intervention can improve the recognition of emotional expressions, but most of that work has been carried out –with good results– in adults with some type of deficiency or disorder, such as an intellectual disability (McKenzie, Matheson, McKaskie, Hamilton, & Murray, 2000), schizophrenia (Tsotsi, Kosmidis, & Bozikas, 2017), head injury (Neumann, Babbage, Zupan & Willer, 2015), antisocial personality disorder (Quintero, Gil, Zapata, Vélez, & Sepulveda, 2021), or Huntington's disease (Kempnich, Wong, Georgiou-Karistianis, & Stout, 2017). Two studies conducted with healthy medical students focused on the importance of improving positive interactions with their patients. Both studies observed improved emotional recognition skills after training in emotional micro-expressions (Endres & Laidlaw, 2009; Vázquez-Campo et al., 2019).

Most studies of this kind in children have also been conducted with groups affected by some kind of disorder, such as developmental disabilities (Stewart & Singh, 1995), autism spectrum conditions (Golan et al., 2010; Ryan & Charragáin, 2010), or behavioral problems (Dadds, Cauchi, Wimalaweera, Hawes, & Brennan, 2012; Hunnikin, Wells, Ash, & van Goozen, 2021). It is important to note that after interventions designed to improve emotional recognition, children who exhibited behavioral problems showed enhanced social competencies (Dadds et al., 2012). A recent study by Hunnikin et al. (2021) found that the degree of impairment of the recognition of negative emotions was significantly related to the severity of disruptive behaviors, especially difficulties in peer relations. They further observed that children with behavioral problems significantly improved their emotional recognition after a computerized intervention. In their work, Wells, Hunnikin, Ash, and van Hoozen (2020) observed that improved emotional recognition was associated with longer-term improvements in behavior and wellbeing in children with behavioral problems.

Despite the evident importance of training in emotional skills, as far as we know, few studies have been performed with typically-developing children. In some of those works training focused on emotional understanding and its importance for empathy and the theory of mind processes (Ornaghi, Brockmeier, & Grazzani, 2014; Pons, Harris, & Doudin, 2002). In Ornaghi et al.'s study (2014), children read emotional scripts during training that presented prototypical situations of everyday life with emotional connotations. Subjects in the emotional training group then participated in conversational activities with their peers related to the nature, causes, and regulation of emotions. In contrast, the children in a control group were asked to make drawings based on the stories they read. In that study, the emotional training given succeeded in enhancing emotional understanding and other aspects of social cognition. However, we know of only one study that involved typically-developing children in an intervention program based on facial emotional recognition. It was conducted by Grinspan, Hemphill, and Nowicki (2003), who reported improvement in their participants' ability to read facial emotions.

The aforementioned studies of behavioral and social changes induced by training in emotional recognition, mainly in children with atypical development, suggest that typically-developing children could also benefit from training in these abilities. Although emotional recognition improves over time in school-age children, it does not reach the highest accuracy levels until adulthood. We suggest, as well, that training in the recognition of basic emotions could enhance the recognition of other, more complex emotions, by guiding children to focus attention on specific facial features and to understand the meaning and intentions reflected in facial expressions. The effects observed in those studies of facial recognition training suggest that formal intervention programs could improve emotional, social, and academic competencies and prevent behavioral problems in typically-developing children.

Thus, the aim of this study was to observe the effects of emotional recognition training and its impact on the social behavior of typically-developing children. We hypothesized that the group trained in emotional recognition would perform better than the control group trained in identity recognition with respect to (i) their ability to recognize emotions; and (ii) their socioemotional skills.

2. Method

2.1 Participants

We sent invitations to children's parents following the protocols of the schools selected for the study. Those who agreed to participate were contacted to explain the objectives and conditions of the study. In this way, we recruited 29 typically-developing children. All were right-handed (Edinburgh Handedness Inventory) males aged 8 years to 10 years and 11 months who were attending private schools in grades according to their age. They had estimated intelligence quotient (IQ) scores of 90 or more on the WISC-IV (sum of the scaled scores of cubes and vocabulary subtests, Wechsler, 2003) and normal or corrected visual acuity. Children with a history of neurological damage, neurodevelopmental disorders, attention deficit hyperactivity disorder (ADHD, Parents

Rating Scale, Conners, 1997), learning disorders, intellectual disability (Infant Neuropsychological Assessment Battery, ENI Matute, Rosselli, Ardila, & Ostrosky, 2007), or drug treatment that could affect the central nervous system were excluded. Only males were included because gender differences in emotional recognition have been found which indicate that females perform better than males. Girls have also shown more situational emotional knowledge than boys, while more boys manifest psychological/behavioral difficulties that have been associated with higher numbers of recognition errors (Montirosso et al., 2010; Nowicki et al., 2019; Sette, Bassett, Baumgartner, & Denham, 2015). For these reasons, we considered that boys could benefit more from this kind of training than girls.

Participants were semi-randomly assigned to two groups by age to homogenize them: 1) the emotional training group (EMG, n = 15); and 2) the identity training group (IDG, n=14). No significant differences existed between the groups for age (EMG, X=9.33, SD=0.95; IDG, X= 9.23, SD=1.01) or IQ (EMG, X=115.64, SD= 12.42; IDG, X=119.14, SD= 12.47). The project was carried out following the terms of the Helsinki Declaration. All parents signed their informed consent. The protocol was evaluated and approved by the Institution's Ethics Committee.

2.2 Emotional and Identity Recognition

Two paradigms were used to assess participants' ability to recognize emotions and identity: matching and memory. The matching paradigm required subjects to identify a sample stimulus that could be an emotion or a person, compare it to three other faces presented simultaneously, and then select the same emotion or person shown in the sample. In the memory paradigm, the sample face was presented but then withdrawn. Afterwards, three other faces appeared for comparison. In this case, the children had to maintain the sample stimulus in memory.

Each emotional task consisted of 30 stimuli, 10 for each target emotion: happiness, sadness, and anger. The happiness expressions were shown with mouths closed to increase recognition difficulty. Response options included other basic, distracting expressions (fear, surprise, disgust). The number of happy, sad, or angry expressions and male and female faces was equal in each task. The order of stimuli presentation was semi-randomized to avoid showing the same emotion on consecutive trials. For the identity tasks, 30 stimuli of men's and women's faces with neutral expressions were used. All tasks were programmed in PsychoPy v3.0.0b12 (Peirce et al., 2019).

The facial images were obtained from three databases: the one at our laboratory, the Radboud Faces Database (Langner et al., 2010), and the NimStim Set of Facial Expressions (Tottenham, Borscheid, Ellertsen, Marcus, & Nelson, 2002). Photographs of people with similar facial characteristics to those of the participants' culture were selected. Care was taken to control for lighting, contrast, black-and-white color, size, and shape. Ears and hair were erased to eliminate possible distractors and clues. The facial emotional expressions from the laboratory and NimStim series were tested before the study in children of a similar age range to that of participants. Only those images that yielded a recognition of 70% or greater were selected. The Radboud Faces Database stimuli showed an overall recognition of 82% (Lagner et al., 2010).

2.2.1 Emotion Matching Task

In the upper-middle part of a computer screen, a face with an emotional expression was shown against a white background with three other faces below it. One of those faces had the same expression as the central face but on a different person. Children were instructed to select the face on the bottom that expressed the same emotion as the one in the upper section, as quickly and accurately as possible. The stimuli disappeared when one of the three keys indicated for the three possible emotional responses was pressed. The duration of the stimuli in both matching tasks was a maximum of 4 s, depending on the child's response time. After 4 s, a white screen appeared for 0.5 s, followed by the subsequent trial. The children had six practice trials to ensure that they understood the instructions. (See figure 1).

2.2.2 Identity Matching Task

This task was similar to the previous one, except that the upper part of the screen showed a person's face with a neutral expression and the faces of three other people of the same sex below it. The child was asked to look at the face at the top, then select the same person from the three options below. (See figure 1)

2.2.3 Emotion Memory

First, a face with an emotional expression was shown for 2 s. Immediately, three emotional expressions appeared for a maximum of 2 s, including a face with the same emotion as the first one but of a different person. The next stimulus appeared after an interval of 0.5 s. The child had to choose which of the three emotional expressions represented the same one as in the first image.

2.2.4 Identity Memory

Similar to the emotion memory task, the child had to indicate the face of the person that was presented first.

2.3 Social Abilities Evaluation

Parents completed the Social Skills Improvement System (SSIS, Gresham, & Elliot, 2007) questionnaire, which evaluates social skills, behavioral problems, and academic competence. It asks parents to indicate the frequency with which their children present certain social abilities or behavioral problems. For purposes of this study, raw scores were used to assess social skills considering two domains: social skills, with a total raw score range of 0-138 (communication 0-21, cooperation 0-18, assertion 0-21, responsibility 0-18, empathy 0-18, commitment 0-21, self-control 0-21), and behavioral problems, with a total raw score range of 0-87 (externalization 0-36, bullying 0-15, hyperactivity/inattention 0-21, internalization 0-30).

Figure 1. Examples of the emotion and identity matching tasks

2.4 Emotional and Identity Training

One group received training in emotional recognition (EMG), while the active control group was trained in identity recognition (IDG). Both programs consisted of nine sessions, three per week for three consecutive weeks. Each session lasted around 20 min and was conducted individually in a quiet room at the school.

2.4.1 Emotional Training

For each emotion, the child was trained to pay attention to the eyes and specific facial features. Following the researcher's cue, the child reproduced the facial expression that was being trained in each session. In the first six sessions, the three emotions were shown separately (2 sessions each) in the following sequence: happiness, sadness, and anger. In the second session on each emotion, the researcher increased the level of difficulty by adding the emotions of surprise, disgust, and fear as response options. After training in the three basic emotions, the next session was designed to work on recognizing and comparing all three emotions. The final two sessions focused on training in recognizing emotional facial expressions in social contexts. A 2-min scene from a movie was shown in which different characters showed sadness and anger. Each character's role, the relationships between them, and their emotional expressions were analyzed. The session concluded with a reflection on how to manage emotions in the situation shown.

2.4.2 Identity Training

The activities performed were similar to those in the emotional recognition training but focused on the identity of the people shown. The child was guided to pay attention to characteristics like the shape and size of certain facial features of different people with neutral expressions, and to distinguish key features in different areas of the face. In the first seven sessions, neutral faces of distinct people were shown to identify differences in facial features. The level of difficulty was increased in each session by showing the child faces with different features from various visual angles. In the final two sessions, the child received instruction in identifying faces in social contexts by showing a 2-min scene from a movie with different characters. The characteristic facial features of each character, each one's role, and the relationships between them were analyzed.

After each session, the children in both groups received a non-monetary gift.

2.5 Procedure

Two evaluations were carried out with both groups: a pre-training session one week before training began, and a post-training session upon completing the corresponding training programs at our laboratory. The children were tested individually while seated comfortably in front of a computer screen placed at a distance of 60 cm. The evaluation sessions lasted about 40 min. The same four tasks were applied to all children in a counterbalanced way: 1) emotion matching; 2) identity matching; 3) emotion memory; 4) and identity memory. Work on each task lasted approximately 5 min with a break of 3 min after each one. Parents answered the SSIS questionnaire in both sessions.

2.6 Statistical Analysis

Performance accuracy was calculated as the difference in the percentage of correct responses minus commission errors. A Wilcoxon test was applied to analyze differences between the pre- and post-training sessions for each group and task and the SSIS scale scores. To evaluate differences between emotions, a Friedman test was performed with all participants in the pre-training session.

3. Results

3.1 Matching Tasks

Differences between the pre- and post-evaluations emerged in the EMG, which showed higher accuracy for sadness after training (Z=-2.2, p=0.03). (Figure 2, Appendix A). Regarding emotions, happiness showed higher scores than both sadness (p=0.002) and anger (p=0.0001), and sadness had higher scores than anger (p=0.03).

There were no significant effects of training on identity matching.

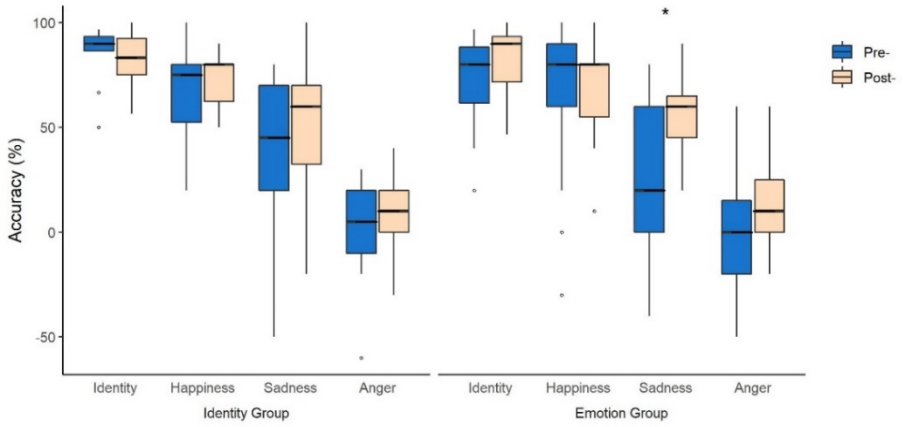

Figure 2. Accuracy (percentage of correct responses minus commission errors) in the matching tasks for the identity and emotion groups. Median and interquartile ranges. *p<.05, **p<.01

3.2 Memory Tasks

EMG showed higher accuracy for happiness (Z=-2.5, p=0.01) and sadness after training (Z=-2.5, p=0.01). Only EMG increased its scores for identity memory accuracy after training (Z=-2.3, p=0.02). (Figure 3, Appendix A). On the emotions tasks significant differences appeared for accuracy, as happiness showed higher results than sadness (p=0.001).

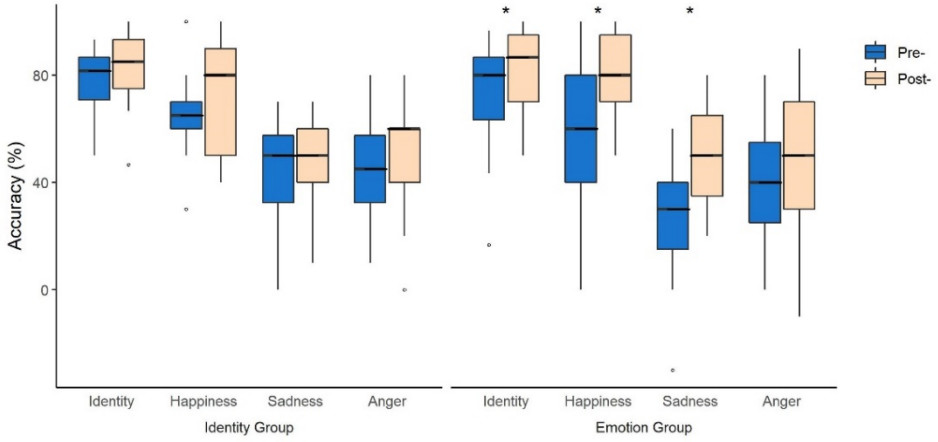

Figure 3. Accuracy in the memory tasks for the identity and emotion groups. Median and interquartile ranges. *p<.05, **p<.01

3.3 Social Abilities Evaluation

Significant differences were found between evaluations only in EMG after training, with higher scores for the global scale (pre-training: Mdn=101, IQR=29.25; post-training: Mdn=107, IQR=15.75; Z = -2, p = 0.04), and the

empathy (pre-training: Mdn=14, IQR=3.75; post training: Mdn=15.5, IQR=2.5; Z = -2.08, p = 0.03), commitment (pre-training: Mdn=16.5, IQR=5; post-training: Mdn=19, IQR=5.5; Z = -1.9, p = 0.05), and self-control subscales (pre-training: Mdn=10, IQR=4.74; post-training: Mdn=12.5, IQR=5; Z = -2.06, p = 0.03).

4. Discussion

Results indicate that only training in emotional recognition had positive effects on the children's ability to recognize and remember emotions and identity. The EMG children also showed enhancement of their social skills.

4.1 Emotion and Identity Recognition

EMG improved its performance from the pre- to post-training session for sadness on the matching task and for happiness, sadness, and identity on the memory task. Our results concur with those in Grinspan et al. (2003), who found a general improvement in the ability of typically-developing children (aged 7-10) to read facial emotions after an emotional recognition intervention program. Their work, however, did not address differences among emotions.

The improvement in accuracy on the emotions and identity matching and memory tasks in EMG may indicate that training provided strategies that helped them pay greater attention to relevant facial features. The area around the eyes is essential for recognizing emotions (Wells et al., 2016) and identity (Sadr, Jarudi, & Sinha, 2003). Some authors have proposed that training attention to focus on the eye region does not improve emotional recognition but does help interpret facial features (Hunnikin et al., 2021).

Specifically, the improvement in recognizing and remembering sadness in EMG could be related to the explicit training in attention to salient eye inflections that facilitated recognition of this emotion and its discrimination from others. Eisenbarth and Alpers (2011) described that fixations for identifying sadness refer most directly to the eye area of the face. Our results concur with previous studies, where improved recognition of sadness was found after training in emotional recognition in children with behavioral problems (Hunnikin et al., 2021).

EMG improved its recognition of emotions and identity after training, but IDG did not, suggesting that differences in intervention strategies are relevant. Activities were explicitly designed to train each emotion in EMG by addressing transient changes in specific facial features using static faces and dynamic social contexts that enhanced participants' conceptual knowledge. In contrast, the identity intervention focused on the facial features of neutral expressions and may involve the holistic processing of faces. Hence, IDG may have categorized emotions holistically with respect to their structure and visual properties (Young et al., 1997).

Our results for emotions also agree with other studies that have found better recognition of happiness than other emotions (Durand et al., 2007; Mancini et al., 2013; Vicari et al., 2000). Significantly, although we deliberately used faces that showed smiles with mouths closed, happiness was still the most easily-recognized emotion. This facility in reading happiness may be explained by children's frequent exposure to happy faces during early childhood, combined with its distinctiveness from other expressions (Calvo & Marrero, 2009).

Sadness is one of the most difficult basic emotions to recognize. Studies have shown that it tends to be confused with other expressions because its internal representation is less readily identifiable than that of other emotions (Mancini et al., 2013; Montirosso et al., 2010). Anger was the emotion that children had the greatest difficulty in identifying. Other studies suggest that it is one of the last emotions to be accurately recognized, usually not until after age 10 (Thomas et al., 2007; Vicari et al., 2000).

4.2 Social Abilities

Results indicate that only EMG improved its SSIS global scores and scores for empathy, self-control, and commitment post-training. This result agrees with Izard et al. (2001), who found that the ability to recognize and interpret emotional expressions has long-term effects on social behavior and academic competence in preschool children. Other studies involving emotional interventions have reported changes in empathy in children with autism spectrum disorders (Silver & Oakes, 2001) and behavioral problems (Dadds et al., 2012; Hunnikin et al., 2021), and in adolescents (Ornaghi et al., 2014). Emotional movie scenes have been used to guide children in identifying the emotional expressions displayed by different characters and the relationships between them and to reflect on the interpretation and management of emotional situations. All these strategies allowed participants to improve their social competence and prosocial behaviors. Several researchers emphasize the importance of emotional knowledge for socioemotional competence (Denham et al., 2003; Nowicki & Duke, 1994; Sette et al., 2015). This corpus of evidence suggests that the desirability of designing specific training programs to promote the development of emotional abilities from early childhood and, in this way, foster long-lasting social adjustment.

The limitations of our study include the small sample size, the exclusion of girls, and the fact that the social skills evaluation was conducted using a questionnaire answered by parents. In addition, we were unable to perform follow-up on the participants to test the persistence of this kind of training over time. Finally, the emotion training addressed only three basic expressions, so it omitted mixed expressions that are more difficult to recognize and understand in everyday interaction.

5. Conclusions

It is feasible to propose that typically-developing children will benefit from intervention programs in emotional recognition that focus not only on facial features but also on understanding and managing emotional signals. Positively enhancing these abilities may have beneficial effects on children's socioemotional adaptation.

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Declaration of Conflicting Interests

The authors declare that they have no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Appendix

Table 1A. Percentage of correct responses and commission errors on the matching and memory tasks: median (interquartile range) in both groups

		Matching tasks				Memory tasks			
		Identity group		Emotion group		Identity group		Emotion group	
		Pre-	Post-	Pre-	Post-	Pre-	Post-	Pre-	Post-
Correct responses	Identity	93 (4.8)	90 (8)	90 (16)	90 (14)	90 (12.5)	91.7 (13.3)	90 (23.3)	90 (23.3)
	Happy	80 (22.5)	85 (10)	90 (20)	80 (20)	75 (20)	80 (35)	70 (20)	90 (30)
	Sad	70 (30)	70 (22.5)	50 (40)	70 (20)	70 (22.5)	70 (15)	60 (10)	70 (20)
	Angry	45 (22.5)	50 (20)	50 (20)	50 (20)	60 (12.5)	70 (20)	60 (20)	60 (20)
Commission errors	Identity	3.3 (4.2)	6.7 (11.7)	10 (13.4)	3.3 (13.3)	6.7 (7.5)	5 (10)	6.7 (10)	3.3 (10)
	Happy	10 (12.5)	10 (10)	10 (20)	10 (20)	10 (12.5)	0 (10)	10 (30)	0 (10)
	Sad	25 (30)	10 (22.5)	30 (30)	20 (10)	20 (22.5)	20 (15)	20 (20)	10 (20)
	Angry	40 (20)	40 (20)	50 (30)	40 (20)	20 (20)	20 (10)	20 (20)	10 (20)