

Available online at [www.sciencedirect.com](http://www.sciencedirect.com)**SciVerse ScienceDirect**

Procedia - Social and Behavioral Sciences 84 (2013) 416 – 420

**Procedia**  
Social and Behavioral Sciences

3rd World Conference on Psychology, Counselling and Guidance (WCPCG-2012)

# Finding the Angry Face in the Crowd: A Comparison Between Preadolescents and Adolescents with an Emotional Visual Search Task

Irina Pitica<sup>a \*</sup>, Georgiana Susa<sup>a</sup>, Oana Benga<sup>a</sup><sup>a</sup> *Developmental Psychology Lab, Department of Psychology, "Babes-Bolyai" University, 37, Republicii str., Cluj-Napoca, 400015, Romania*

## Abstract

The facial expression of anger is considered a salient signal of threat that elicits preferential allocation of attention as expected on the basis of an evolved module of fear. Though not explicitly stated in the model, an evolved threat-detection bias should operate across different ages. However, developmental data on such an advantage of anger with photographic stimuli is limited to preschoolers. The current study compares the speed of preadolescents to those of adolescents when detecting angry and happy faces in a visual search task with photos of 9 individuals. Angry faces were detected more efficiently compared to happy ones, across the two age groups. Additionally, for adolescents, the anger advantage was modulated by face gender. These results offer among the first evidence of an anger advantage in attention processing across development.

© 2013 The Authors. Published by Elsevier Ltd. Open access under [CC BY-NC-ND license](http://creativecommons.org/licenses/by-nc-nd/3.0/).

Selection and peer-review under responsibility of Prof. Dr. Huseyin Uzunboylu &amp; Dr. Mukaddes Demirok, Near East University, Cyprus

*Keywords: angry face, emotional face processing, visual search, adolescents;*

## 1. Introduction

The facial expression of anger is considered an evolutionary relevant signal of social threat that should automatically activate the module of fear elicitation discussed by Öhman and Mineka (2001). Consequently, angry faces should be detected relatively faster in comparison to positive faces. Studies have frequently employed visual search tasks to investigate this hypothesis. Also, they have cornered the terms anger superiority effect or the face in the crowd effect of angry faces to describe the faster and more accurate detection of angry faces compared to happy ones (Frischen, Eastwood, & Smilek, 2008).

### 1.1. The face in the crowd effect with schematic and photographic faces

Studies have offered proof of the anger superiority effect especially with schematic faces, advocating the use of schematic expressions. Schematic faces are abstractions of actual facial expressions and have the same degree of familiarity, the same physical features that are arranged in different configurations to convey emotion, and are

---

\* Corresponding author name. Tel.: +0-740-840-072; fax: +0-264-59-1906.

E-mail address: [irinapitica@psychology.ro](mailto:irinapitica@psychology.ro)

† All three authors have equally contributed to this manuscript.

prototypes of real emotional expressions. Therefore, it is argued that they are easily recognized (Frischen, et al., 2008).

In parallel with studies of schematic faces visual search researchers have investigated the effect of real photographic emotional faces on search performance. Schematic representations of facial emotions can be problematic because they lack ecological validity and might artificially inflate the anger advantage by increasing similarity among distracters (Pinkham Griffin, Baron, Sasson, & Gur, 2010). Therefore, it is important to observe the anger superiority effect in more ecological, but still well controlled settings. Consequently, these studies displayed matrices of clones of the same face with the possibility of one of them having a different emotional expression. In these displays the only variation is due to the emotional expression. Several studies employing the emotional visual search task with photographic faces with one identity replicated the anger superiority effect (Hortsmann & Bauland, 2006).

Designing the task with only one identity in each display does not avoid the problems of artificially increased similarity between distracters and of ecological validity. In an investigation of visual search performance when using carefully controlled photographs of 9 different real persons, Pinkham and collaborators (2010) have shown a clear angry face search advantage compared to the happy face, both among neutral and emotional distracter faces. We also replicated these results in a preliminary investigation using photos of faces expressing anger and happiness, in both cases with open mouths to control for this low-level discrepant feature (Pitica, Susa, Benga, & Miclea, 2012).

### *1.2. Face gender effects in visual search for emotional faces*

Studies with real faces and multiple identities sometimes have inconclusive results. Juth, Lundqvist, Karlsson, & Öhman (2005) used a visual search task with black and white photos of real faces. Quite surprisingly, across 3 experiments, the happy face was found faster than threatening (angry or fearful) faces. In a subsequent study, results showed that the anger superiority effect is a valid effect but it depends on several factors (Öhman, Juth, & Lundqvist, 2009). The angry face was advantaged in search if it was either embedded among homogenous distracters (one identity), or it depicted a male. Williams and Mattingley (2006) have also shown that angry male faces seem to have an advantage in detection. It seems that in contrast to female faces female faces, male angry faces among neutral distracters are more often detected faster than happy faces.

### *1.3. The angry face advantage across development*

Though not explicitly stated in the fear elicitation model, an evolved threat-detection advantage should operate across development, and children and adolescents should also have an attentional preference for the angry face. The investigation of visual search for emotional faces across development is scarce. A few studies have shown that children manifest a threat advantage in search performance similar to adults. For example, preschool children showed adult like faster detection of both angry and fearful faces compared to happy ones with both photos of real faces of different individuals and schematic representations (LoBou, 2009). In a school-aged sample, Hadwin and her collaborators showed that children aged between 7 and 10 were faster to search for angry schematic faces compared to happy or neutral and on target absent trials heightened trait anxiety enhanced the speed of the response in the angry face condition (Hadwin et al., 2003). The detection advantage tended to generalise to both types of negative faces in the case of children with high levels of trait anxiety. However, to our knowledge, studies have not yet looked into the emotional search performance of adolescents.

### *1.4. Objectives of the current study*

If genuine, the face in the crowd effect of angry expressions would be a central mechanism of fast identification of potentially threatening conspecifics. Moreover, this phenomenon could represent the foundation of emotional vulnerability in certain conditions, such as when the observer has elevated levels of anxiety, turning into anxiety-

related attentional biases (Fox, Russo, & Georgiou, 2005). Based on the above-reviewed evidence we see as important to further investigate the face in the crowd effect of anger by considering three factors: the ecological value of photographic emotional faces, the role of face gender, and possible age-related differences during the transition from childhood into adolescence. As it has been argued that the facilitated detection of angry faces might be restricted to schematic stimuli it is important to use photos in order to look into the generalization of this effect in displays that are more similar to real life scenes. Also, the intriguing relation between the expression of anger and the male features of the face needs additional empirical support. Furthermore, an investigation of emotional visual search in children and teenagers might add valuable developmental data as current models of adolescence suggest a reorganization of brain functional circuits underlining socio-cognitive processing (e.g. Casey, Jones, Levita, Libby, Pattwell, et al., 2010). Therefore, in the current study we compared preadolescents and adolescents who were asked to locate discrepant angry and happy faces in a visual search task displaying photos of 9 different male and female individuals. We also included trait anxiety as a covariate in our design to explore the possible modulatory effects of this variable on the anger superiority effect. We took into consideration both detection reaction times and percentage of accurate responses, however, due to space limitations, we present in the following the reaction time data.

## 2. Method

### 2.1. Participants

A total of 85 children took part in this experiment. Participants were part of two age groups: 48 children (23 boys and 25 girls) were aged between 9 and 12, and 37 children (17 boys and 20 girls) were between 13 years of age and 15 years of age.

### 2.2. The visual search task with multiple identities

The visual search task consisted of 126 trials. Each started with a fixation point displayed for 500 ms, followed by a 3x3 matrix of either male or female faces until participant response, and ended with a blank screen for 500ms. All faces in one trial had a different identity, and the emotional expression of any one of the nine faces could differ from one trial to another. The facial expression combinations resulted in 7 conditions: angry target among neutral distracters, happy target among neutral distracters, angry target among happy distracters, happy target among angry distracters, all faces neutral, all faces angry and all faces happy. The matrixes with all faces of the same expression were used to give meaning to the task and were not analysed. Participants were asked to indicate by pressing one of two keys whether there was a face with a different expression in the matrix.

### 2.3. Spence Child Anxiety Scale (SCAS)

We used the SCAS to collect data on the level of trait anxiety of all participants. In the current experiment mean anxiety score for the global scale was 30.30 ( $SD=13.08$ ) for the 9 to 12 age group and 27.89 ( $SD=11.50$ ) for the 13 to 15 age group. We also obtained a good overall internal consistency for the global scale. Cronbach's Alpha coefficient in the whole sample reached .83.

## 3. Results

We conducted a 2x2x2x2 ANCOVA on reaction times, with Target Type, Target Gender and Distracter Type as within factors, Age Group as a between factor and Trait Anxiety as covariate. Results indicated a main effect of Target Type, with faster detection of angry faces ( $M=2777.43$ ,  $SD=511.40$ ) compared to happy ones ( $M=2915.99$ ,  $SD=574.80$ ),  $F(1, 81)= 6.84$ ,  $p < .05$ , partial  $\eta^2 = .08$ . Also, there was a main effect of Distracter Type, with targets being found faster among neutral distracters ( $M=2587.43$ ,  $SD=544.70$ ) than among emotional ones ( $M=3106.02$ ,  $SD=541.48$ ),  $F(1, 81)= 23.31$ ,  $p < .05$ , partial  $\eta^2 = .22$ . These effects were qualified by a Target Type x Target Gender

x Distracter Type x Age Group interaction,  $F(1, 81) = 9.85, p < .05$ , partial  $\eta^2 = .11$ . There was no significant main effect or interaction effect of the Trait Anxiety covariate. To further investigate the four way interaction we conducted additional separate ANOVAs on each age group. In the 9-12 years group the interaction between Target Type, Target Gender and Distracter Type was not significant,  $F(1, 47) = 2.83, p > .05$ .

However, in the group of adolescents the three-way interaction was significant,  $F(1, 36) = 7.16, p < .05$ , partial  $\eta^2 = .16$ . As *Figure 1* shows, the male angry faces were always detected faster, but the female angry faces were detected faster than the happy ones only among emotional distracters, the Target Type by Distracter Type interaction being significant only for female targets,  $F(1, 36) = 7.12, p < .05$ , partial  $\eta^2 = .16$ . For female targets we investigated further this interaction by means of follow-up, 2-tailed, *t*-tests. These indicated no significant difference in detecting an angry compared to a happy face among neutral distracters,  $t(36) = -1.07, p > .05$ , but a significant difference between detecting angry faces among happy distracters compared to happy faces among angry distracters,  $t(36) = 3.78, p < .05$ . As such, it seems that in adolescents the facilitated detection of angry faces in an ecological display is further enhanced by the fact that the target displaying the threatening expression is male or by the existence of an also emotional distracter background.

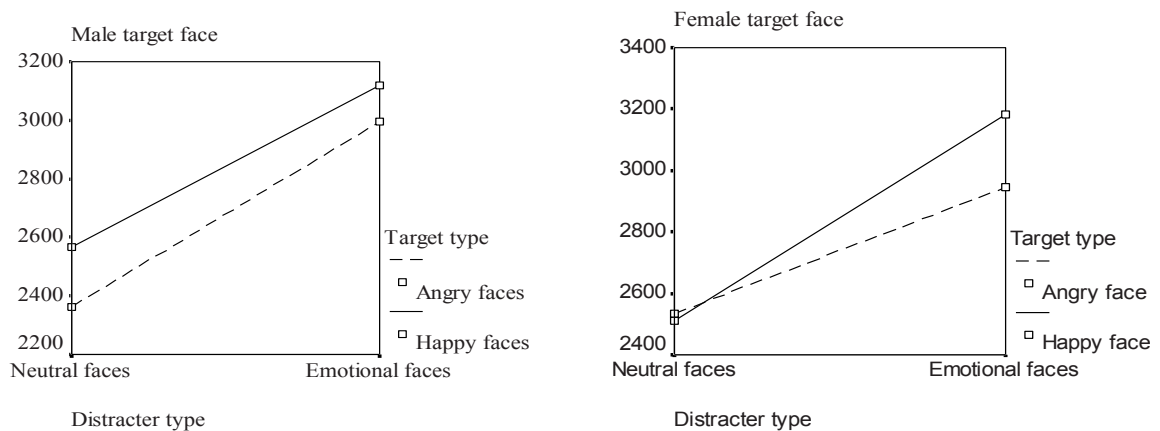


Figure 1. The interaction effect between Target Type, Target Gender and Distracter Type for the adolescent group

#### 4. Conclusions

In the present study we set out to investigate the anger advantage in visual search for photographs of real facial expressions with multiple identities, in preadolescents and adolescents, taking the gender of the target face into consideration. On the whole, angry faces were detected faster compared to happy ones, both among neutral and emotional distracters, across the two age groups. This result is similar to results from previous adult studies (e.g. Pinkham et al., 2010) and in line with the classic theory of Ohman and collaborators (Öhman & Mineka, 2001) supporting the view that the anger superiority effect is not restricted to schematic faces. However, an additional interaction effect revealed that this generalised anger advantage was specific only to preadolescents, while in adolescents it was restricted to male target faces or to female ones embedded among angry faces. Trait anxiety of participants had no effect in this pattern of results.

The present study offers among the first evidence of an anger advantage in visual search across development. Moreover, it points to a possible developmental change from a general anger advantage in preadolescence to one connected to the male face in adolescence. Such a trend would be consistent with recent results of male specific angry face advantage in adults (Williams & Mattingley, 2006; Öhman, et al., 2009; Lipp, Price, & Tellegen, 2009) and suggests that the male gender might facilitate the detection of angry faces beginning from adolescence. In adults, several studies have documented stronger associations between masculine face features and angry expressions or feminine features and happy or fearful expressions (Aguado, Garcia-Gutierrez, & Serrano-Pedraza,

2009; Pixton, 2011). It is hypothesised that this differential association pattern is not explained simply on the bases of gender stereotypes, but might reside in the inherent similarities between features of male faces and markers of anger and features of female faces and markers of happiness. Consequently, if the association between anger and maleness becomes salient during adolescence we might speculate that this is not necessarily due to internalization of social gender norms, but could be a result of increased encounters with adult male faces as the child and his/her peers mature throughout puberty and their faces gradually change into adult-like features.

The results of the current study need to be viewed in light of several limits of this investigation. First, due to a lack of a direct comparison of visual search performance of preadolescents and adolescents with adults any indication of developmental changes taking place from late childhood across the transition to adulthood must be seen as preliminary. The suggestion that the anger superiority effect becomes modulated by face gender only starting from adolescence and into adulthood is an interesting hypothesis that needs further investigation. Second, it would be important to compare the detection of angry faces to the detection of other types of emotional faces besides happy ones. Last but not least, it would be best to relate data on the attentional advantage of anger to data on emotional face recognition and evaluation in adolescence to describe a more fine-grained image of social cognition during this developmental interval.

### Acknowledgements

The first two authors are grateful to Dr. Ioana Tincas for support in designing the visual search task.

The first two authors also want to thank for the financial support provided from the program co-financed by the Sectoral Operational Program for Human Resources Development, Contract **POSDRU 6/1.5/S/3** – "DOCTORAL STUDIES, A MAJOR FACTOR IN THE DEVELOPMENT OF SOCIO-ECONOMIC AND HUMANISTIC STUDIES".

### References

- Aguado, L., García-Gutiérrez, A., & Serrano-Pedraza, I. (2009). Symmetrical interaction of sex and expression in face classification tasks. *Attention, Perception & Psychophysics*, 71(1), 9–25.
- Casey, B., Jones, R. M., Levita, L., Libby, V., Pattwell, S., Ruberry, E., Soliman, F., et al. (2010). The Storm and Stress of Adolescence: Insights from Human Imaging and Mouse Genetics. *Developmental psychobiology*, 52(3), 225-235.
- Fox, E., Russo, R., & Georgiou, G. A. (2005). Anxiety modulates the degree of attentive resources required to process emotional faces. *Cognitive, Affective, & Behavioral Neuroscience*, 5(4), 396-404.
- Frischen, A., Eastwood, J. D., & Smilek, D. (2008). Visual search for faces with emotional expressions. *Psychological Bulletin*, 134(5), 662-676.
- Horstmann, G., & Bauland, A. (2006). Search Asymmetries With Real Faces: Testing the Anger-Superiority Effect. *Emotion*, 6(2), 193-207.
- Juth, P., Lundqvist, D., Karlsson, A., & Öhman, A. (2005). Looking for Foes and Friends: Perceptual and Emotional Factors When Finding a Face in the Crowd. *Emotion*, 5(4), 379-395.
- Lipp, O. V., Price, S. M., & Tellegen, C. L. (2009). Emotional faces in neutral crowds: Detecting displays of anger, happiness, and sadness on schematic and photographic images of faces. *Motivation and Emotion*, 33(3), 249-260.
- LoBue, V. (2009). More than just another face in the crowd: superior detection of threatening facial expressions in children and adults. *Developmental Science*, 12(2), 305-313.
- Öhman, A., & Mineka, S. (2001). Fears, phobias, and preparedness: Toward an evolved module of fear and fear learning. *Psychological Review*, 108(3), 483-522.
- Öhman, A., Juth, P., & Lundqvist, D. (2009). Finding the face in a crowd: Relationships between distractor redundancy, target emotion, and target gender. *Cognition & Emotion*, 24(7), 1216-1228.
- Pinkham, A. E., Griffin, M., Baron, R., Sasson, N. J., & Gur, R. C. (2010). The face in the crowd effect: Anger superiority when using real faces and multiple identities. *Emotion*, 10(1), 141-146.
- Pitica, I., Susa, G., Benga, O., & Miclea, M. (2012). Visual search for real emotional faces: the advantage of anger, *Procedia – Social and Behavioral Sciences*, 33, 632-636.
- Pixton, T. S. (2011). Happy to see me, aren't you, Sally? Signal detection analysis of emotion detection in briefly presented male and female faces. *Scandinavian Journal of Psychology*, 52(4), 361–368.
- Williams, M. A., & Mattingley, J. B. (2006). Do angry men get noticed? *Current Biology: CB*, 16(11), R402-4