



Universiteit Utrecht



# **Socially anxious people show submissive behavior when subliminally confronted with an angry facial expression**

-Masterthesis-

**Toxopeus, S.L.**

*Utrecht University, august 2013*

*Supervisors: Jack van Honk and David Terburg*

*Department of Experimental Psychology, Utrecht University and Department of Psychiatry and Mental Health, University of Cape Town*

---

## **Abstract**

Social phobia affects 3-5% of the general population, often with high degrees of impairment and psychiatric comorbidity such as depression or addiction. It is an anxiety disorder defined by excessive fear reactions that are triggered by social or performance situations in which the person is exposed to possible evaluation by others.

Facial expressions are a primary source of nonverbal communication in humans and primates. When two primates establish eye contact, a staring contest may arise, wherein the subordinate will avert its gaze (gaze aversion), thereby showing submission, in order to prevent provoking aggressive confrontation. An angry facial expression can function as an anxiety-provoking cue, and could result in submissive gaze behaviour in socially anxious individuals. In several experiments has been showed that in social anxiety there is rapid gaze avoidance from a threatening facial expression. Controversially, increased dominance traits predicted a more prolonged gaze to a masked angry facial expression.

It is suggested that social anxious people show submissive behavior when subliminally confronted with an angry facial expression in comparison to people who are not socially anxious. To test this hypotheses eighteen high social anxious subjects and twenty low social anxious people performed a gaze aversion task to measure their eye gaze response times when facial expressions (angry, happy and neutral) were presented. In previous research, gaze behavior was tested with verbal responses, not with this unique gaze aversion task which measures submissive vs. dominant gaze behavior specifically.

As was expected, the response time on the angry facial expression was faster for high social anxious subjects. The current study implies that socially anxious individuals look away faster, and by this show submissive behavior, from threatening situations in comparison to not socially anxious individuals. The results suggest that implicit and reflexive mechanisms underlie submissive gaze behavior in face-to-face confrontations in socially anxious individuals.

**Keywords: Social anxiety, gaze behavior, submissive, dominant, gaze aversion, angry facial expression**

## **Introduction**

Social phobia affects 3-5% of the general population, often with high degrees of impairment and psychiatric comorbidity such as depression or addiction (Fehm, Schneider, & Hoyer, 2007). It is an anxiety disorder defined by excessive fear reactions that are triggered by social or performance situations in which the person is exposed to possible evaluation by others (Moukheiber et al., 2010). Socially anxious individuals are particularly concerned with humiliating or embarrassing themselves when they are surrounded by others (American Psychiatric Association, 1994).

When overt social aggression appears, one could prevent this by communicating submission in word or gesture. This mechanism in humans seem to share commonalities with primates during dominance contests (Terburg, Hooiveld, Aarts, Kenemans, Van Honk, 2011). When two primates establish eye contact, a staring contest may arise, wherein the subordinate will avert its gaze (gaze aversion), thereby showing submission, in order to prevent provoking aggressive confrontation (Terburg, Aarts, van Honk, 2012).

Facial expressions are a primary source of nonverbal communication in humans and primates. The angry face is a highly potent threatening stimulus, because it means that there is a risk for danger which could lead to possible psychical or psychological harm. Thus in a threatening social encounter, when an individual is confronted with an angry threat, the affective reaction of a person who is fearful or anxious would be to diminish eye contact and to gaze away from facial threat (Van Honk & Schutter, 2007). There are two types of subordinate gaze behaviour; gaze aversion and gaze avoidance. Gaze aversion means that when eye contact occurs, the submissive animal rapidly averts gaze, thereby signalling subordination and preventing aggressive confrontation. Conversely, gaze avoidance means that there is an avoidance of direct gaze to the dominant threat, because this might prevent potentially dangerous eye contact (Terburg, Aarts & van Honk, 2012). It could be said that fear and anxiety carry the submissive motivation to orient away from social threat, which reduces the possibility of encountering aggression (Van Honk et al., 2000)

Cognitive biases for facial expressions in relation to social anxiety have been studied widely. In multiple experiments has been shown that in social anxiety there is a rapid avoidance from social threat. Bogels and Mansell (2004) found evidence that high socially anxious individuals were more likely to attend away from negative faces, than low socially anxious individuals. A study by Putman, Hermans, and van Honk (2004) demonstrated, by use of self-reports of social anxiety, that individuals with relatively higher levels of social anxiety selectively attended away from angry facial expressions. Thirdly, Moukheiber et al. (2010) found a significantly lower amount of fixations and dwell time in social phobia

patients compared to normal subjects, for specific emotions like anger and disgust. Besides this, they observed that there was a correlation between the severity of the social phobia and the degree of gaze aversion. The higher the social phobia was, the more gaze aversion was observed.

Controversially, abundant evidence is found that anxious individuals rapidly detect and attend to threat. Heightened anxiety is associated with selective attention, also called vigilance, to threatening cues. To clarify these opposite findings, researchers came up with hypervigilance-avoidance theory of anxiety (Mogg, Bradley, de Bono, & Painter, 1997). This theory states that people who are socially anxious rapidly detect and attend to a threat because they are hypervigilant of danger (Bogels & Mansell, 2004). But the hypervigilance-avoidance theory does not clarify the primate example from above, where there is a rapid gaze aversion from submissive animals in a threatening encounter. Gaze aversion from a highly potent threatening stimulus is a dominance-submissive social interaction. Crucially, the hypervigilance-avoidance theory deals with avoidance of these interactions.

In earlier research is showed that there is submissive gaze aversion from subliminally presented angry stares. Van Honk et al. (1998) showed that subjects with a high level of cortisol attended away from a masked angry face. Furthermore, Putman et al (2004) demonstrated that subjects with higher levels of self-reported social anxiety were significantly related to facilitation of angry faces, which means that they selectively attended away from the angry facial expression. Thus, in humans, the stress-hormone cortisol and social anxiety are both markers for submissive behavior (Terburg et al. 2012).

The vigilant attention to these social threats are associated with both self-reported and biological markers of dominance (Terburg et al. 2012). Terburg et al. (2011) found that self-reported dominance motives caused a slowed down gaze-aversion, when angry faces were presented subliminally. Recently, Terburg, Aarts en van Honk (2012) showed that after biological manipulation with testosterone administration, gaze-aversion was also slowed down when angry faces were showed subliminally. These outcomes might lead to think that rapid gaze aversion from social threat is related to submissiveness, which is a form of reflexive subordination and can't be predicted by the vigilance-avoidant theory. This is also relevant for socially anxious people who could act in a submissive way when an angry facial expression is presented.

In the present research, the aim is to examine human gaze behaviour in socially anxious individuals, when angry facial expressions are presented. Usually, the Emotional Stroop task is used to examine selective attention to emotional material (Williams, Mathews, & MacLeod, 1996). In the Emotional Stroop task, while ignoring the meaning of the words,

colors in which threatening and neutral words are printed have to be named as fast as possible (Van Honk & Schutter, 2007). The angry face can serve as a potent naturalistic threat stimulus and has been used as a fear-related stimulus. The task used for this experiment, is akin to Emotional Stroop paradigms, but at present verbal color-naming responses were replaced with gaze aversion in face-to-face confrontations, this way submissive gaze aversion can be measured directly. The required response on this task was to look away (gaze aversion), as quickly as possible, from subliminally presented angry, happy, or neutral facial expressions (Terburg, Hooiveld, Aarts, Kenemans en van Honk, 2011).

With the gaze-aversion task, submissive and dominant gaze behavior can be measured directly. Socially anxious individuals are thought to act automatically in a more submissive way to facial anger. They will look away faster from the angry facial expression than not socially anxious individuals. So it is hypothesed that socially anxious subjects show submissive behavior when an angry facial expression is presented subliminally.

## **Methods**

### *Subjects and questionnaires*

In this study 57 healthy subjects between 18 and 25 years participated for either course credit or payment, mostly students of the University of Cape Town. In the months March, April, May, and June subjects were recruited with the aid of poster ads on the possibility to sign up for the experiment online. If people were interested they first needed to fill out a questionnaire that determined how their level of social anxiety was.

The Liebowitz Social Anxiety Scale (LSAS; Liebowitz, 1987) was used to explore if subjects belonged to the group of a high level of social anxiety (score range: 75-95), or to the group of a low level of social anxiety (score range: 15-35). Subjects with a high or a low level of social anxiety were invited for the experiment. During the experiment 2 other questionnaires had to be filled out to measure social anxiety. The Brief Fear of Negative Evaluation (BFNE; Leary, 1983) and the Social Fobia Inventory (SPIN; Connor, Kobak, Churchill, Katzelnick, & Davidson, 2001) were filled out. To measure depression as a comorbidity, the Beck's Depression Inventory (BDI; Beck, Ward & Mendelson, 1964) was filled out by all subjects.

19 subjects were excluded from analyses because there was a register failure or their data was not completed. Because an infrared eye-tracking system was used, not all the data (eye movements) of the participants was registered correctly. Also a few participants had filled out the first and the second LSAS not the same, the difference between the two questionnaires was too big, so these participants also couldn't take part. One participant was excluded because of the use of anti-depressants.

38 subjects ( 20 female; 18 male; mean age = 20.2 years, SD = 1,5) were used for analyses. Of the female subjects 10 had a low level of anxiety and 10 had a high level of social anxiety. Furthermore, of the male subjects 10 had a low level of social anxiety and 8 had a high level of social anxiety.

### *General procedure*

Before onset, a written consent was obtained from all participants. From every participant was written down if they had a visual disfunction. After that subjects need to fill out another LSAS, to compare this score with the first one. After the gaze aversion task was done, subjects needed to fill out two more questionnaires to measure social anxiety. Subjects are placed in front of a monitor, in a room free of environmental sounds. The monitor was placed on eye height, with a distance of 60 centimeters from the subject. The tasks were presented on this screen. In front of the subject a computer keyboard was placed, to register the

responses of the subjects. During the whole experiment a Tobii-1750 binocular infrared eye-tracking system was used, to follow gaze-shifts and measure the response times.

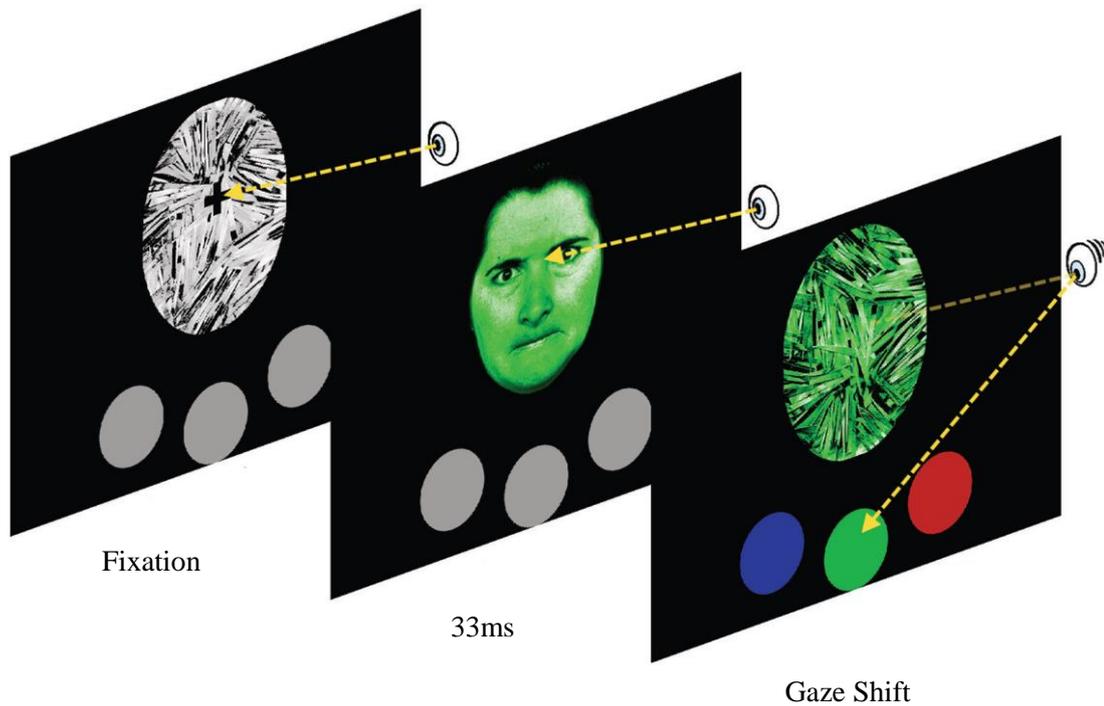
#### *Procedure and material in the gaze aversion task*

The face stimuli for the gaze-aversion task were colorized (blue, green and red) faces of 10 actors (5 female, 5 male), each with emotional expressions (angry, happy, and neutral; Ekman & Friesen, 1976). The 10 practice trials, with neutral faces only, were followed by 90 actual trials. These 90 stimuli were presented once in semi-random order. With every trial a grey mask with a fixation point was showed. Then a face was showed in blue, green or red for 33ms. After a mask stimulus of the same color is showed, the mask remained on the screen until the subject responded. These masked stimuli were cut-up and randomly reassembled faces. Below the stimulus, three grey dots were presented. During presentation of the mask, each grey dot was replaced by a dot of a different color (blue, green and red). These colors were randomly assigned in every trial. The response of the subjects was making a gaze-shift, as quickly as possible, away from the mask to the dot with the same color as the preceding face stimulus. At the end of the final session, subjects were asked whether they had seen anything during color transition, meaning by that; if they had seen a facial expression that was subliminally presented. All 30 face stimuli (10 faces x 3 emotions) were presented again, masked, and now the subjects were instructed to identify the facial expression as neutral, happy or angry. This was done by a forced-choice design. Gaze movements were recorded with a Tobii-1750 binocular infrared eye tracker with an integrated LCD display.

#### *Data analysis*

The results were analysed by use of SPSS. The hypotheses, that social anxious individuals will show submissive behavior when angry faces are subliminally presented in the gaze aversion task, meaning that the high socially anxious subjects will look away faster from the angry facial expression than the low socially anxious people, was computed with a 2 (emotion: angry vs. happy) x 2 (Condition: high anxiety vs. low anxiety) repeated measures analyses of variances. Mean latencies on angry-face and happy-face trials were baseline corrected by subtracting the mean latency on neutral-face trials. This way the contrast scores for angry-happy face trials were computed, from now on bias angry face trials and bias happy face trials. High contrast scores thus represented a shorter downward response from angry faces to the corresponding color, then the downward response from happy faces to the corresponding color. The difference between latencies on angry-face trials and happy face

trials can serve as a measure of submissive behaviour in socially anxious subjects (Terburg et al., 2011).



**Figure 1.** An illustration of the gaze aversion task. In each trial of the gaze aversion task, subjects watched a meaningless grey circle turn blue, green or red. At this point they were to shift their gaze, as fast as possible, to the circle with the corresponding color below. During the color transition a facial expression was showed outside of conscious awareness, thus too quickly to be perceived consciously (figure copied from Terburg, Hooiveld, Aarts, Kenemans, & van Honk, 2011).

## **Results**

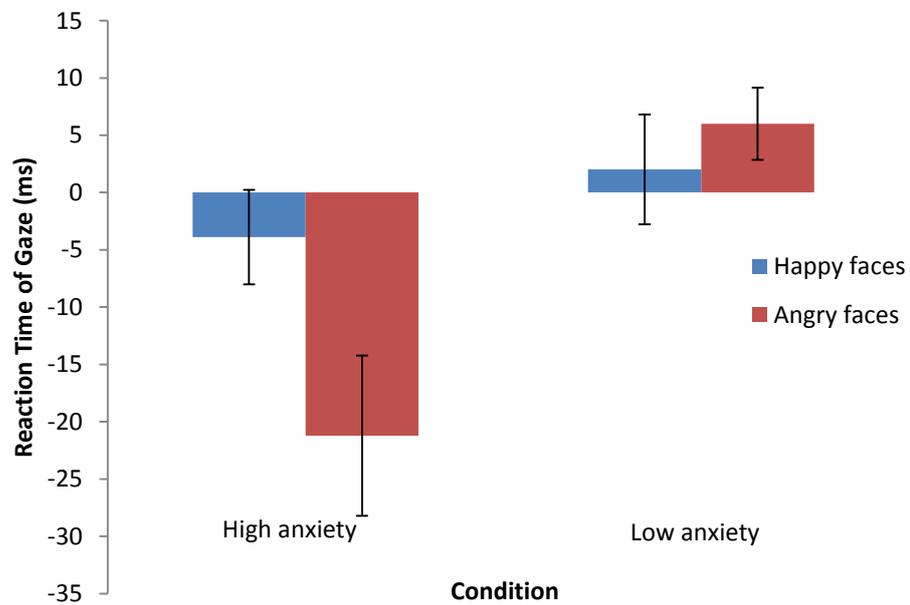
58 Subjects completed the two (first and second) LSAS forms. 19 subjects were excluded because of register failure or incomplete data. 20 subjects scored between 15 and 25 and were considered to be low socially anxious. 18 subjects scored between 75 and 95 and were considered to be high socially anxious. By use of a One-way ANOVA was examined if a good classification has been made per LSAS, between the groups (high vs. low social anxious). The first LSAS is significant:  $F(1, 37) = 673.322, p = .000$ . And the second LSAS is significant to:  $F(1, 38) = 347.204, p = .000$ . Thus, the difference between the two groups per LSAS is significant, so they're classified well.

To test the hypothesis, that social anxious individuals will show submissive behavior when angry faces are subliminally presented, a repeated measures analyses of variances has been conducted on the data of 38 healthy participants. The within subjects are; emotion 1: the bias angry face trials; and emotion 2: the bias happy face trials. The between subjects factors were sex (female vs. male) and condition (high vs. low social anxiety). The main effect of emotion was trend-line significant:  $F(1,38) = 3.909, p = .056$ . The results show that the subjects did not differ on their performances on the different emotions, happy vs. angry. There was an interaction effect between the high and low social anxiety group (condition) and the response times on the different face stimuli (emotion):  $F(1, 38) = 10.383, p = .003$ .

In addition a post hoc independent t-tests across conditions was conducted to investigate if there was a significant difference between the high and low social anxiety group, and the mean latencies on the bias happy face trials and the mean latencies on the bias angry face trials. Thus, it's investigated if the response time on angry faces were lower than on happy faces. A significant difference is found in response times on angry faces between high and low socially anxious subjects. High socially anxious subjects have lower response times on angry face stimuli:  $t(36) = 27.229, p = .001$ . No significant difference was found between low and high socially anxious subjects in response times on bias happy face trials:  $t(36) = 5.909, p = .496$ . For the mean difference in response times between high and low socially anxious subjects on bias angry and happy face trials, see figure 2.

None of the subjects reported awareness of the facial expressions before the awareness check was conducted. An individual score of 15 or higher was significantly above the chance level of 10 correct responses, measured with a binomial test with one-tailed  $\alpha$  of .05 for  $n = 30$  (Terburg et al., 2011).

After the awareness check was done, there was an average of  $\mu = 9.6$  correct responses. 1 subject scored significantly above the chance level of 10 correct responses on the awareness check (i.e. > 14 correct).



**Figure 2.** The bias angry face trials vs. the bias happy face trials from high vs. low socially anxious subjects.

## *Discussion*

The goal of this study was to investigate if socially anxious people show submissive behavior when confronted with an angry facial expression. It was expected that high socially anxious people would look away faster from the angry facial expression, than low socially anxious people.

This research was able to show this expected outcome. By use of a gaze aversion task with an infrared eye-tracking system, the response times on the emotional facial stimuli of 38 participants have been measured.

The results show that there was a significant effect between emotion (angry vs. happy) and condition (high vs. low social anxiety, which means that the reaction on the facial expressions (angry, happy or neutral) will depend on the degree of social anxiety (high or low). The results indicate that people with a high social anxiety have a faster gaze to the corresponding colour when they were confronted with an angry facial expression. Therefore the first hypotheses can be confirmed.

The analyses show that there is a difference in responding to the presented facial expression (angry, happy or neutral), regardless of whether the participants may or may not be socially anxious. This difference, however, is trend-line significant. On that account we can divert that there is no main effect for emotions. The trend-line difference that was found could be because there was indeed a faster gaze aversion from angry faces, then from happy faces for the whole group. The reason why this difference was not significant is because high and low social anxious subjects belonged to the same group in this part of the analyses, and this way the response times on the emotionally presented facial expression were compensated.

The results are in line with the research of Bogels and Mansell (2004) who found evidence that high socially anxious individuals were more likely to attend away from negative faces. Also Putman et al. (2004) demonstrated that individuals with relatively higher levels of social anxiety selectively attended away from angry facial expressions. To add, Moukheiber et al. (2010) found a correlation between the severity of the social phobia and the degree of gaze avoidance. These experiments are in line with what is found in the gaze aversion task that was done here. But in the present research this knowledge was expended by using this unique gaze aversion task. This way unconscious submissive vs. dominant gaze behavior was tested specifically in socially anxious individuals. They showed reflexive submissive behavior after subliminally confronted with an angry treat. The statement that has been made by Terburg et al. 2012, that social anxiety is a marker for submissive behavior, can be confirmed. This finding is particularly relevant for developing specific gaze exposure therapy in social anxiety, and by this, the cognitive maps that account for the submissive

behavior that is showed in social anxious people, can be changed.

At the end of the final session, an awareness check was done. None of the subjects reported awareness of the facial expressions, and only 1 subject scored significantly above chance level on the awareness check. This means that the masking procedure was efficient. The subjects did not recognize the emotional valence of the subliminal presented facial expressions. This way the gaze aversion task measures subliminal downward gaze aversion from facial expressions.

It has to be noted that there are a few limitations to the present research. The subjects that were used for this study were South-African students. When there was more spreading in the population, there could be a different response pattern in the gaze aversion task. Secondly, after filling out the LSAS form it was determined if the students were high or low socially anxious. Consequently this was no clinical population. When the students were determined to be high socially anxious it could be that they not meet the DSM-IV criteria for an anxiety disorder. But this experiment could have a predictive value for people who do meet the criteria for a DSM-IV disorder.

Future research should take the limitations of the present study into account. A more spreading of education and age in the population is recommended. Because social anxiety results in submissive behaviour in the gaze aversion task, it is interesting to research if this submissive behaviour is also the case in the presence of another anxiety disorder, like a specific phobia or a panic disorder. Next to the anxiety disorders there are also other disorders where anxiety plays a large role, like anorexia or bulimia. It would be interesting to see how these people respond to a threatening facial expression. Furthermore, it would be interesting to see if people with a social phobia show less submissive gaze behavior after use of medication, like benzodiazepine or anti-depressants.

In conclusion, the present study thus indicates that social anxiety is related to a submissive reaction when subliminally confronted with an angry facial expression in the gaze aversion task. Social anxiety acts directly, involuntary, automatically and unconsciously on submissive behavior in humans, just as in primates when the subordinate averts its gaze, away from a threatening situation, to flight from a harmful situation that could possibly arise (Terburg, Aarts, van Honk, 2012).

## References

- American Psychiatric Association, & American Psychiatric Association. Task Force on DSM-IV. (1994). *Diagnostic and statistical manual of mental disorders: DSM-IV*. American Psychiatric Pub Inc.
- Beck, A. T., Ward, C., & Mendelson, M. (1961). Beck depression inventory (BDI). *Arch Gen Psychiatry*, 4(6), 561-571.
- Bögels, S. M., & Mansell, W. (2004). Attention processes in the maintenance and treatment of social phobia: hypervigilance, avoidance and self-focused attention. *Clinical psychology review*, 24(7), 827-856.
- Connor, K. M., Kobak, K. A., Churchill, L. E., Katzelnick, D., & Davidson, J. R. (2001). Mini-SPIN: A brief screening assessment for generalized social anxiety disorder. *Depression and anxiety*, 14(2), 137-140.
- Ekman, P., & Friesen, W. V. (1976). Measuring facial movement. *Environmental Psychology and Nonverbal Behavior*, 1(1), 56-75
- Fehm, L., Schneider, G., & Hoyer, J. (2007). Is post-event processing specific for social anxiety?. *Journal of Behavior Therapy and Experimental Psychiatry*, 38(1), 11-22.
- Hock, M. (1993). Coping dispositions, attentional direction, and anxiety states. In H. W. Krohne (ed.); *Attention and avoidance: Strategies in coping with aversiveness*. (pp. 139-139). Bern, Switzerland: Hogrefe & Huber Publishers.
- Leary, M. R. (1983). A brief version of the Fear of Negative Evaluation Scale. *Personality and Social Psychology Bulletin*, 9, 371-375
- Liebowitz, M. R. (1987). Social phobia. *Modern problems of pharmacopsychiatry*.
- Mogg, K., Bradley, B. P., De Bono, J., & Painter, M. (1997). Time course of attentional bias for threat information in non-clinical anxiety. *Behaviour Research and Therapy*, 35(4), 297-303.
- Moukheiber, A., Rautureau, G., Perez-Diaz, F., Soussignan, R., Dubal, S., Jouvent, R., & Pelissolo, A. (2010). Gaze avoidance in social phobia: Objective measure and correlates. *Behaviour research and therapy*, 48(2), 147-151.

- Putman, P., Hermans, E., & van Honk, J. (2004). Emotional stroop performance for masked angry faces: it's BAS, not BIS. *Emotion*, 4(3), 305.
- Terburg, D., Aarts, H., & van Honk, J. (2012). Memory and attention for social threat: Anxious hypercoding-avoidance and submissive gaze aversion. *Emotion*, 12(4), 666.
- Terburg, D., Aarts, H., & van Honk, J. (2012). Testosterone affects gaze aversion from angry faces outside of conscious awareness. *Psychological science*, 23(5), 459-463.
- Terburg, D., Hooiveld, N., Aarts, H., Kenemans, J. L., & van Honk, J. (2011). Eye Tracking Unconscious Face-to-Face Confrontations Dominance Motives Prolong Gaze to Masked Angry Faces. *Psychological science*, 22(3), 314-319.
- Van Honk, J., & Schutter, D. J. (2007). Vigilant and avoidant responses to angry facial expressions. *Social neuroscience: Integrating biological and psychological explanations of social behavior*, 197-223.
- Van Honk, J. V., Tuiten, A., de Haan, E., van de Hout, M., & Stam, H. (2001). Attentional biases for angry faces: Relationships to trait anger and anxiety. *Cognition & Emotion*, 15(3), 279-297.
- Van Honk, J., Tuiten, A., van den Hout, M., Koppeschaar, H., Thijssen, J., de Haan, E., & Verbaten, R. (1998). Baseline salivary cortisol levels and preconscious selective attention for threat: A pilot study. *Psychoneuroendocrinology*, 23(7), 741-747.
- Van Honk, J., Tuiten, A., van den Hout, M., Koppeschaar, H., Thijssen, J., de Haan, E., & Verbaten, R. (2000). Conscious and preconscious selective attention to social threat: different neuroendocrine response patterns. *Psychoneuroendocrinology*, 25(6), 577-591.
- Van Honk, J., Tuiten, A., Verbaten, R., van den Hout, M., Koppeschaar, H., Thijssen, J., & de Haan, E. (1999). Correlations among salivary testosterone, mood, and selective attention to threat in humans. *Hormones and Behavior*, 36(1), 17-24.
- Williams, J. M. G., Mathews, A., & MacLeod, C. (1996). The emotional Stroop task and psychopathology. *Psychological bulletin*, 120(1), 3.
- Wirth, M. M., & Schultheiss, O. C. (2007). Basal testosterone moderates responses to anger faces in humans. *Physiology & Behavior*, 90(2), 496-505.